

# Visual Impact Assessment

# Chapter 10

## 10.1 Introduction

The purpose of the visual assessment is to determine the potential visual impact of the proposed AWT and Composting Facilities on people residing, working and travelling through the surrounding area and if required, to identify mitigation measures that would minimise any potential visual impacts.

## 10.2 Background

### 10.2.1 Site Description

The Woy Woy WMF site is situated within a gully, with a site elevation ranging between approximately 60m Australian Height Datum (AHD) at the base of the gully to 170m AHD along the ridgeline.

The site is elongated in the north-south orientation, with two parallel ridges forming the eastern and western boundaries. The general gully direction is from south to north, however local relief varies and is characterised by steep filled slopes and rock outcrops. A saddle occurs in the southern portion of the site.

Existing development on the site in relation to local visual amenity include a gatehouse and weighbridge, landfill, resource recovery area, and greenwaste sorting area.

Brisbane Water National Park surrounds the site on three sides (south, east and west). To the north is the Woy Woy Sewerage Treatment Works. The National Park consists of generally tall vegetation dominated by Eucalyptus sp.

### 10.2.2 Adjoining Land Uses

The land uses surrounding the site are described in Chapter 7. The adjoining land uses that could potentially be sensitive to visual amenity are the residential areas located to the east of the Woy Woy WMF, and a section of the Great North Walk located south of the proposed development area.

The closest residence to the Woy Woy WMF is approximately 600m to the east, however the nearest residences to the proposed Composting/AWT facilities, are located approximately 750m to the east of the site on The Citadel. These residences are located at an elevation of approximately 120m AHD well below the ridgeline of 170m AHD, located within Brisbane Water National Park between the proposed development and the residential area.

### 10.2.3 Proposed works

The proposal involves construction of an engineered platform for the proposed processing facilities. The platform would be constructed by excavating a section of the south eastern corner of the site and filling the south western area of the site, to establish the platform at approximately RL 115 AHD. Two enclosed buildings would be constructed on the engineered platform, one containing the greenwaste processing equipment, the other containing the MSW waste receipt, sorting and processing facilities. The buildings would be steel framed structures with coated steel sheet cladding for the walls and roof, and reinforced concrete floor. The buildings would be approximately 10m in height, well below the surrounding topography to the east and west of the site and therefore would not be visible from the nearest residences located to the east of the site.

## Chapter 10

## Visual Impact Assessment

### 10.3 Visual Impact Assessment

The potential visual impact of the proposed development would result from the combination of the following factors:

- visibility of the components to be developed as part of the works; and
- visual absorption capacity of the landscape in which these components are placed.

#### 10.3.1 Visibility

Visibility is a measure of the extent to which the development would be visible from surrounding areas, the relative number of viewers, the period of the view, distance of view and context of the view.

The underlying rationale for this visual assessment factor is that if a portion of the development is not visible from a particular location then the potential visual impact is nil. Similarly, if the number of people who would potentially see the development is low then the visual impact would be relatively low compared to a situation in which a large number of people had the same view.

Distance is a strong influence on potential visual impact as the proportion of the total view from a particular location that is taken up by the proposed development decreases with distance. In addition atmospheric influences would tend to reduce the level of visual contrast between the proposed development and adjoining landscape thus reducing the level of visibility.

The natural ridgeline within the Brisbane Water National Park provides a visual barrier for the proposed works, from the surrounding residential areas. South of the proposed development area is a section of the Great North Walk. The proposed development would be visible from sections of this walk, however the majority of the development would be screened by natural vegetation from bushwalkers. The extent of visibility of the AWT and Composting Facilities is therefore considered low due to the proposed works not being visible by surrounding residences and screened by natural vegetation from users of the Great North Walk.

#### 10.3.2 Visual Absorption Capacity

Visual absorption capacity is an estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality. The capacity to absorb development is primarily dependent on vegetation cover, landform and existing structures. A major factor influencing visual absorption capacity is the level of visual contrast between the proposed new development and the existing elements in that landscape.

The capacity of the landscape surrounding the development to absorb change was assessed and determined to be high, and was the result of a combination of the following factors:

- nature of the proposed development similar to existing facilities at the Woy Woy WMF and the Sewerage Treatment Works to the north; and
- landscape elements including the natural ridgeline (approximately 170 m AHD) present between the proposed development and residences.

## Visual Impact Assessment

## Chapter 10

### 10.4 Mitigation Measures

In order to mitigate any visual impact from security lighting of the site, appropriate selection of light fittings, and directional alignment to minimise light spill to the adjoining Brisbane Water National Park would occur.

### 10.5 Conclusion

The visual assessment indicates that the proposed development would have a nil level of visibility during daylight hours and at night time for the closest residences in the area.

The low level of potential visual impact is due to the following combination of factors including:

- extent of potential views to development entirely blocked by existing landform (ridgeline) and vegetation beyond the site boundary; and
- nature of existing viewers (i.e. workers and customers at the Woy Woy WMF site, or adjacent Woy Woy Sewerage Treatment Works).

It is concluded that overall the proposed development of the WMF would not have a significant impact on the visual quality of the area.

## 11.1 Introduction

The noise impact assessment was undertaken by URS in conjunction with specialist noise consultants Wilkinson Murray Pty Ltd. The Wilkinson Murray report is provided in **Appendix C** and the key findings from the assessment are summarised in this Chapter.

### 11.1.1 Terms Used

Key terms used in the following sections are defined as follows:

- dBA are 'A-weighted decibels';
- the  $L_{Aeq}$  noise level is the Equivalent Continuous Sound Level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound level;
- the  $L_{A1}$  noise level is the 'noise level exceeded for 1% of the sample time' and is typically described as the 'maximum noise level' due to individual noise events such as the occasional pass-by of a heavy vehicle;
- the  $L_{A10}$  noise level is the 'noise level exceeded for 10% of the sample time' and is typically described as the 'average maximum noise level';
- the  $L_{A90}$  noise level is the 'level of noise exceeded for 90% of the sample time' and is now the standard descriptor for traffic noise; and
- the Rating Background Noise Level (RBL) is the 'noise level representative of the average minimum background sound level', simply the 'background noise level'.

### 11.1.2 Site and Surrounds

As described in previous chapters the site adjoins Brisbane Water National Park. To the north of the proposed AWT site is Woy Woy WMF and the Woy Woy Sewerage Treatment Works (STW). With respect to on-site operational noise, a total of 6 receivers (approximate Locations R1 to R6 as shown on **Figure 11-1**) have been used to represent the residential receivers to the north, west, north-west and south-west. Their specific locations and RLs are presented in **Table 11-1**. **Figure 11-1** also shows the location of residential areas, other zoned areas and the proposed site.

## Chapter 11

## Noise

Table 11-1 Location of Surrounding Residences

| Residence No. | Description      | East (AMG) | North (AMG) | RL (m) |
|---------------|------------------|------------|-------------|--------|
| 1             | Woy Woy Road     | 342040.4   | 6292344.6   | 10     |
| 2             | Shoalhaven Drive | 342309.8   | 6292027.7   | 30     |
| 3             | Veron Road       | 342036.4   | 6291552.4   | 40     |
| 4             | Timbertop Drive  | 342036.4   | 6291247.3   | 75     |
| 5             | The Citadel      | 342171.1   | 6290569.9   | 115    |
| 6             | The Bastion      | 342068.1   | 6290035.2   | 95     |

It is considered that the residences referred to as 'receivers 5 and 6' are potentially affected the most by the proposed development. Therefore the assessment of operational noise focuses on these locations. The noise levels however have been calculated to all 6 residential locations as well as an assessment to the Brisbane Water National Park.

There are residences that run along the southern side of Nagari Road and Railway Street that may potentially be affected by vehicles movements related to the Facility which have also been assessed.

## 11.2 Existing Acoustic Environment

A noise logger was deployed at the rear yard of 1 The Citadel, Umina Beach (refer **Figure 11.1**) to quantify the existing background noise level. A noise logger (ARL215) was deployed on Friday, 13 July and retrieved on Monday, 23<sup>rd</sup> July 2007. The logger was set to A-weighted, fast response and to monitor every 15-minutes, with calibration checks before and after the survey finding no significant drift. The detailed measurement results can be found in **Appendix C**.

In regard to potential traffic noise from additional traffic movements during operation, a noise logger (ARL316) was deployed in the side yard (in free field) approximately 1 meter in from the existing façade at 274 Railway Street, Woy Woy (refer **Figure 11.1**). The logger was set to A-weighted, fast response and to monitor every three minutes. Given that the site is subject to railway noise a vibration logger was deployed and set to store data every 1.5-minutes, allowing noise from train movements to be excluded from the measured  $L_{Aeq}$  noise level.

### 11.2.1 Rating Background Levels

Background noise levels ( $L_{A90}$ ) measured at 1 The Citadel were used to determine the Rating Background Levels (RBLs) using methodology as recommended by the NSW Industrial Noise Policy (INP)(DEC, 2000). The INP (DEC, 2000) considers the RBL to represent the background noise level. **Table 11-2** summarises the results of the noise monitoring at 1 The Citadel.

**Table 11-2 Measured Noise Levels – Unattended at 1 The Citadel**

| Time Period <sup>(1)</sup> | Rating Background Level RBL (dBA) |
|----------------------------|-----------------------------------|
| Daytime                    | 32                                |
| Evening                    | 35 <sup>(2)</sup>                 |
| Night Time                 | 31                                |

- Note 1) The *INP (DEC, 2000)* considers daytime (7.00am-6.00pm); evening (6.00pm-10.00pm); night time (10.00pm-7.00am). On Sundays and Public Holidays, daytime begins at 8.00am and night time ends at 8.00am.
- 2) Influenced by road traffic from Woy Woy Road and possibly rail movements.

Extraneous noise and any effects due to adverse meteorological conditions (rain or wind greater than 5m/s at a height of 1.5m) have been excluded.

### 11.2.2 Current Industrial Noise

Industry that are likely to contribute to the existing industrial noise are Woy Woy STW and Woy Woy WMF.

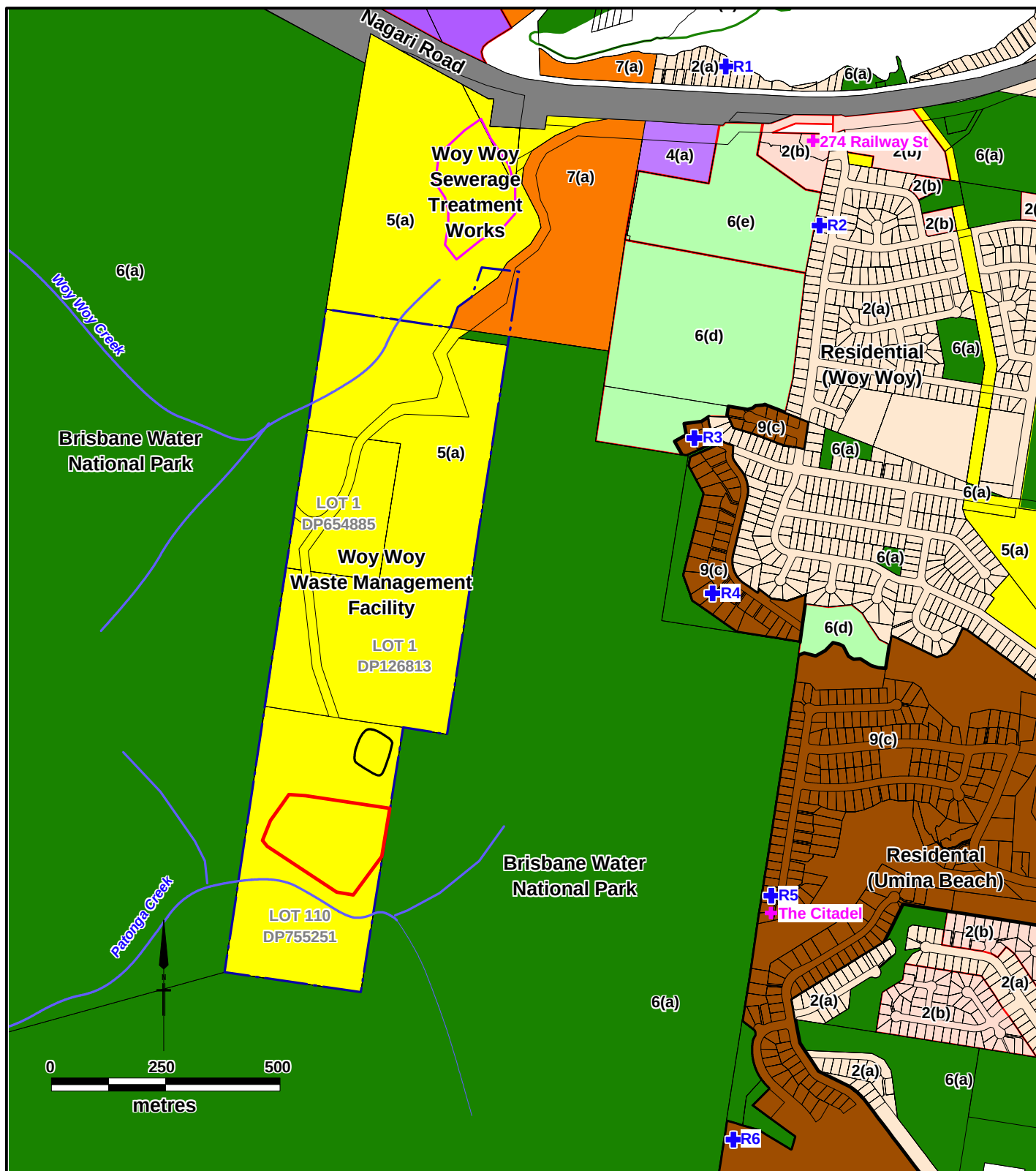
The STW is a small operation with major noise producing plant and processes located below ground. The general operation is relatively consistent, with plant and processes continuously switching on and off, over all time periods.

The Woy Woy WMF associated noise sources include truck movements both delivering waste and leaving, non-stationary plant (compactor, front-end loader and excavator), drainage system incorporating tanks and pumps and landfill gas extraction system. There are time restrictions on some of these sources. The movement of trucks and non-stationary plant is restricted to daytime operation only (7.00am-6.00pm). The WMF actually operates Monday to Friday between 7.00am-5.00pm and on weekends and public holidays between 8.00am – 4.00pm. There are no works on Christmas Day, New Years Day and Good Friday. The drainage system and landfill gas extraction system operate continuously, 24 hours per day.

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 1 The Citadel, 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



### Legend

|  |                   |  |                                          |  |                                      |  |                                                        |
|--|-------------------|--|------------------------------------------|--|--------------------------------------|--|--------------------------------------------------------|
|  | Property Boundary |  | 4(a) Industrial (General)                |  | 6(a) Open Space (Recreational)       |  | 6(e) Open Space (Proposed)                             |
|  | Project Boundary  |  | 4(d) Industrial (Offensive or Hazardous) |  | 6(b) Open Space (Special Purposes)   |  | 7(a) Conservation and Scenic Protection (Conservation) |
|  | 2(a) Residential  |  | 5(a) Special Uses                        |  | 6(c) Open Space (Private Recreation) |  | 9(c) Restricted development (Steep Land)               |
|  | 2(b) Residential  |  | 5(b) Special Uses (Railways)             |  | 6(d) Open Space (Regional)           |  | Noise Logger Locations                                 |
|  |                   |  |                                          |  |                                      |  | Residential Receivers                                  |

Client

GOSFORD CITY COUNCIL

Project

Environmental Assessment of Proposed  
Alternative Waste Technology and Composting  
Facilities at Woy Woy WMF

Title

**LOCATION OF RESIDENTIAL AREAS,  
SITE BOUNDARY, NOISE LOGGERS  
AND RESIDENTIAL RECIEVERS**

Drawn: AJW

Approved: FINAL

Date: 24/08/2007

Job No: 43177409

File No: 43177409-035.wor

Figure: 11-1

### 11.3 Noise Regulation and Criteria

#### 11.3.1 Operational - Continuous Noise

The INP (DEC, 2000) is designed to assess “industrial noise” using the following two approaches:

- preventing intrusive noise impacts in the short term for residences; and
- preserving amenity for particular land uses, including residences.

The INP's (DEC, 2000) intrusive goal is set 5dBA above the Rating Background Level (RBL) for each time period (daytime, evening or night time) of interest. The RBL's are derived from the measured  $L_{A90}$  noise levels as per DEC guidelines.

The amenity goal sets an upper limit to the total noise level ( $L_{Aeq}$ ) in an area from all industrial noise (existing and future). The Acceptable Noise Level (ANL) for the development is set based on the time of day, area classifications and the total measured  $L_{Aeq}$  (and contribution from existing industrial noise) and are set out in **Table 11-3**.

**Table 11-3 Recommended  $L_{Aeq}$  Amenity Criteria Noise Levels**

| Receiver Type      | Time of Day | Recommended $L_{Aeq}$ Noise Level, dB(A) |                     |
|--------------------|-------------|------------------------------------------|---------------------|
|                    |             | Acceptable                               | Recommended Maximum |
| Suburban residence | Day         | 55                                       | 60                  |
|                    | Evening     | 45                                       | 50                  |
|                    | Night       | 40                                       | 45                  |

Amenity criteria are also to be considered at other receivers, notably the adjacent Brisbane Water National Park, where the Acceptable Noise Level ( $L_{Aeq, period}$ ) is 50dBA and the maximum 55dBA.

Further to this, the INP (DEC, 2000) requires that where noise sources contain certain characteristics, such as tonality, impulsiveness, intermittency or dominant low frequency content, a modifying factor of +5dBA (to a maximum of +10dBA) should be applied because these type of noises typically cause greater annoyance to the community.

#### 11.3.2 Operational - Sleep Disturbance

Where the possibility exists that instantaneous, short-duration, high-level noise events may occur during night time hours (10.00pm-7.00am), the INP (DEC, 2000) requires that consideration be given to the potential for sleep disturbance within residences.

It is recognised that the sleep disturbance criterion,  $L_{A1,1min}$  is not to exceed the background noise by more than 15dBA. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis would be required.

A detailed analysis should cover at least the following:

- Absolute level (either  $L_{A1}$  (1 minute) or  $L_{Amax}$ );

## Chapter 11

## Noise

- The amount by which the absolute level “emerges” above the general ambient ( $L_{Aeq}$ ) and background ( $L_{A90}$ ) at the time of the event (usually the  $L_{A90, 1 \text{ hour}}$  or  $L_{Aeq, 1 \text{ hour}}$ );
- Number of events per hour (usually between 10.00pm-7.00am inclusive).

Daytime is defined in the INP (DEC, 2000) as 7:00 am to 6:00 pm Monday to Saturday and 8:00 am to 6:00 pm on Sundays and public holidays; evening 6:00 pm to 10:00 pm and night the remaining periods.

### 11.3.3 Road Traffic Noise Criteria

Additional road traffic movements generated by the proposed development may lead to increased noise potentially impacting residential receivers along Nagari Road / Railway Street. Particularly for heavy vehicles, this is the only vehicular access for the STW, Woy Woy WMF and proposed development. The functional category of this road (confirmed via telephone conversation with the RTA) is a “local” road providing vehicular access to the STW, Woy Woy WMF and proposed development and Hillview Street.

**Table 11-4** sets out the applicable criteria as given in the Environmental Criteria for Road Traffic Noise (NSW EPA, 1999), during the daytime.

**Table 11-4 Road Traffic Noise Criteria**

| Road Type                                                                              | Recommended Criteria<br>$L_{Aeq, 1hr}$ |
|----------------------------------------------------------------------------------------|----------------------------------------|
| Land use development with potential to create additional traffic on ‘Local’ road       | 55dBA                                  |
| Land use development with potential to create additional traffic on a ‘Collector’ road | 60dBA                                  |

In addition to these criteria, there is an allowance for up to 2dB increase above existing traffic noise levels once all reasonable and feasible mitigations have been considered.

#### Existing Noise from Traffic

**Table 11-5** summarises the  $L_{Aeq, 1hr}$  for weekdays and weekend days during the time periods that the proposal will operate (noise logger located at 237 Railway Street).

**Table 11-5 Summary of Road Traffic Noise ( $L_{Aeq, 1hr}$ )**

| Hour beginning | 07.00 | 08.00 | 09.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 | 16.00 |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Weekday        | 69.7  | 69.1  | 67.4  | 67.1  | 66.5  | 66.5  | 66.2  | 67.3  | 67.7  | 68.4  |
| Weekend day    | -     | 66.9  | 68.3  | 69.2  | 68.2  | 68.3  | 67.8  | 67.7  | 68.0  | -     |

The noise levels tabulated are median levels (from either weekdays or weekend days) and include a façade reflection of 2.5dBA.

**Table 11-5** shows that the existing noise levels due to road traffic exceed the criteria for both local and collector roads. Mitigation measures to reduce the impact from the additional road traffic noise (resulting from additional traffic movements associated with the proposed development) should be considered. Possible mitigation measures would include:

- Alternate entry to Facility or alternate routes; and
- Reduced speeds, particularly for garbage trucks or the use of quieter trucks.

As there are no other roads that lead to either the Woy Woy WMF or STW, and considering the ridge located east of the Woy Woy WMF and a railway line north of the STW, the option for an alternate entry is not feasible.

The reduction of garbage truck speed and the use of quieter garbage trucks would reduce the absolute noise levels from vehicle movements. However, Woy Woy Road also contributes to significant noise levels and the reduction in speed or use of quieter trucks along Nagari Road would result in only a limited benefit to residents.

It is therefore considered that the 2dB allowance is reasonable and has been applied to assess the increased noise from increased vehicle movements associated with the proposed development.

### 11.3.4 Project Specific Noise Criteria – Residential Receivers

Based on the measured night-time RBL value of 31dBA (**Table 11-2**), the primary sleep disturbance criterion adopted for this project is  $L_{Amax}$  46dBA during the hours 10.00pm-7.00am, assessed external to a bedroom window.

Given that there is effectively no industrial noise contribution at the residential receivers likely to be most impacted by this proposal, the INP's (DEC, 2000) intrusiveness criterion is applicable. Based on the measured RBL values, this criterion is  $L_{Aeq,15min}$  36dBA at the most affected residential receiver under meteorological conditions that could enhance noise propagation. The INP (DEC, 2000) requires consideration of the 'character' of the noise emitted to determine whether any "modifying factors" should be applied. It is considered very unlikely these "modifying factors" would apply to the proposed type of noise, at the receiver locations considered.

### 11.3.5 Project Specific Noise Criteria – National Park

An amenity level of  $L_{Aeq,period}$  50dBA (including the consideration of any modifying factor corrections) has been adopted for the Brisbane Water National Park during the day, where the noise sources are higher than during the evening or night periods. It has been considered that the use of the National Park during the evening and night time would be minimal and therefore assessment during these times has not been undertaken.

## Chapter 11

## Noise

## 11.3.6 Construction Noise Criteria

Noise associated with construction activities typically involves the use of heavy vehicle traffic, excavators, loaders, trucks, power tools and in the case of the Woy Woy WMF, ongoing operational noise of the existing facility.

Noise from conventional construction activity is generated by the broad array of powered, noise-producing mechanical equipment used in the construction process. The exact complement of noise-producing equipment that would be in use at a given construction site during any particular period is often difficult to predict. The magnitude of construction noise levels varies over time because construction activity is intermittent, equipment is moved from place to place, and power demands on construction equipment are cyclical. It has been found that various phases of construction (e.g., clearing and grading, excavation, finishing) generate fairly consistent noise levels during a particular construction activity. Therefore, except for special activities such as pile driving and blasting, the evaluation of project construction noise impacts that would occur during a project is often based on typical noise level ranges for industrial construction sites. For this project, it is understood that pile driving is not necessary but some blasting may occur.

Construction noise emissions have been studied and reported by the US Federal Environmental Protection Agency and by URS. The loudest phases (excavation and finishing (or paving)) generate a maximum average noise level of 89 dBA  $L_{eq}$  at a distance of 15 metres from the activity, when all pertinent equipment is present and operating. The sources of construction noise would move from place to place but would be located within in the area of the new facilities. Noise from construction activity decreases with distance (or by any "point source"), such that the noise levels would be six decibels lower for every doubling of distance away from the construction vehicle or activity, assuming no intervening barriers. **Table 11-6** shows how the noise level would decrease with distance from the source. Additionally, the effects of molecular air absorption and anomalous excess attenuation that occur at distances greater than approximately 300 metres would further reduce noise levels from construction activities at more distant locations.

**Table 11-6 Estimated Maximum  $L_{eq}$  Construction Noise Levels**

| Distance from centre of activity (metres) | Estimated Noise Level* ( $L_{eq}$ , dBA) |
|-------------------------------------------|------------------------------------------|
| 15                                        | 89                                       |
| 30                                        | 83                                       |
| 60                                        | 77                                       |
| 500                                       | 59                                       |
| 1000                                      | 53                                       |

\* Assuming no intervening structures, terrain, or noise barriers and not accounting for air and ground absorption.

**Table 11-7** shows some typical noise levels of individual items of construction equipment. As with any incoherent sound source, if the number of sources is doubled, the resultant sound pressure level is not the arithmetic sum of the two identical sound pressure levels, but 3 dB greater than the sound level generated by one source. For example, if a piece of equipment is producing 81 dBA  $L_{eq}$  at the reference distance of 10 metres, and an identical piece of equipment is positioned next to the first (i.e., twice the number of equipment), the sound pressure level at 10 metres from both pieces of equipment would be 84 dBA  $L_{eq}$ .

Table 11-7 Noise Levels from Construction Equipment

| Equipment         | Typical Noise Level, $L_{eq}$ (dBA), at 10 metres |
|-------------------|---------------------------------------------------|
| Bulldozer         | 81                                                |
| Wheeled Excavator | 82                                                |
| Grader            | 84                                                |
| Trencher          | 82                                                |
| Truck             | 84                                                |
| Masonry Saw       | 78                                                |
| Backhoe           | 85                                                |
| Jackhammer        | 88                                                |

Construction noise would vary considerably from the maximum levels to substantially lower levels during any given day or week. The screening provided by the ridge between the site and receptors provides an additional minimum attenuation of 23 decibels. Therefore the construction noise would be below 30 dBA  $L_{eq}$  at the nearest residence and would not be audible.

### 11.3.7 Blasting

At this point it is unknown whether blasting would be necessary during the construction period and would depend on the type of rock encountered. If it is required, it would be during ground preparation for the construction of the concrete pad. Typically during near-surface blasting for rock fracturing a brief (approximately 1 second duration) blast noise would be audible at some distance from the blast site but due to site and receptor considerations, no adverse effects would occur. If blasting is required during construction, the blasts should be designed to minimize noise and vibration. Due to the distance and topography to the nearest residences, ground vibration from the potential blasting would not be perceptible and airblast levels would not cause any damage to residences or human hearing. A blast may be audible yet is very unlikely to alarm nearby residents. Public notification of the blasting would be carried out. If blasting is carried out airblast overpressure and ground vibration limits as given in the ANZECC Guideline – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, (ANZECC, 1990) would not be exceeded.

## 11.4 Noise Assessment

### 11.4.1 Construction

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 as noted in **Chapter 22** that would further assist in minimising any construction noise on-site.

## Chapter 11

## Noise

## 11.4.2 Operational Noise Assessment

**Operational Activities**

The final technology to be used will not be selected until the detailed design phase. Therefore a conservative approach has been used to consider the worst case scenario using common technologies and assumed the noisier activities. The following is a summary of assumptions:

- Waste to be brought onto the site via garbage trucks of up to approximately 10 tonnes. As provided in the **Chapter 13** a total of 78 trucks (additional 57 trucks) is predicted (156 movements) in a day (7.00am-5.00pm). On average this would result in two to three truck movements in a given 15-minute period, however considering peak periods are likely to carry two to four times this traffic, the calculations have conservatively assumed 10 movements in a given 15-minute period. The anticipated speed onsite would be 20-30km/h.
- The Composting Building is assumed to be a simple metal clad (approx 0.48mm thick steel, approx  $R_w$  19), portal framed building of 10m in height. The transmission loss of the roof and entry door has been reduced to  $R_w$  15 and  $R_w$  10 to allow for louvers, translucent sheeting and the like. Green waste would be delivered to this building using the garbage trucks. A front end loader, screen and shredders would be used to sort, shred etc prior to being processed.
- The AWT building is assumed to be similar to the above building. Waste would also be delivered to this building using garbage trucks. A front-end loader and screens would be used to sort prior to being processed.
- On occasion some items would be disposed off site (hazardous waste, recyclables) or sent to the maturation area.
- All air from both buildings would be treated using a biofilter.
- The delivery, sorting of waste would be between the hours of 7.00am-5.00pm, whereas the biological processing of waste is of course a continuous (24 hour) operation.

**Assigned Noise Levels**

The noise levels of similar technologies were obtained from a report for Jacks Gully by Heggies Australia *Jacks Gully Proposed Alternate Waste Facility, Noise Assessment, Report 10-4578R1R1*, (Heggies, 2006). This information was further supplemented with data from Wilkinson Murray's internal database.

Garbage Trucks

A Sound Exposure Level (SEL or  $L_{AE}$ ) of 84dBA @ 9m for a 14t truck, travelling at 50km/h has been used to derive a sound power level (SWL) of  $L_{Aeq,15min}$  73dBA/m (travelling 30km/h) for 10 truck movements in a 15-minute period during the day. The SEL is a measure of the entire energy of a single event, such as a truck pass-by, normalised to one second.

Biofilter Fans

The previously mentioned Heggies report (Heggies, 2006) used an SWL of 95dBA and assumed a single fan. For this assessment two fans were considered (one for each building) and a total SWL of  $L_{Aeq,15min}$  98dBA. These are assumed to operate continuously (24 hours).

### The AWT and Composting Buildings

The reverberant noise level within the composting building has been predicted to be  $L_{Aeq,15min}$  92dBA assuming the worst case scenario that a front end loader, shredder and screen would operate continuously in a 15-minute period during the day. As a comparison, the Heggies report (Heggies, 2006) assumed 85-90dBA. During the evening and night time period, only the green waste processing plant would operate. For these scenarios, a reverberant noise level of  $L_{Aeq,15min}$  66dBA has been predicted, assuming the major noise contribution would be fans, pumps etc.

With respect to the AWT building, a reverberant noise level of  $L_{Aeq,15min}$  86dBA has been predicted assuming the worst case scenario that a front end loader and screen would operate continuously in a 15-minute period during the day. As a comparison, the Heggies report (Heggies, 2006) assumed 75-78dBA. During the evening and night-time period, only the waste processing plant would operate. For these scenarios, a reverberant noise level of  $L_{Aeq,15min}$  66dBA has been predicted, assuming the major noise contribution would be fans, pumps etc.

For each of these buildings, a point source on each building element (roof, wall, door) has been modelled. The sound power level of each building element was calculated considering the reverberant noise, transmission loss, surface area and directivity (roof only).

The above assumptions, where relevant, would be included in the contract specification for the selection of an appropriate AWT and Composting Facility.

### **11.4.3 Calculated Noise Levels - Unmitigated**

The unmitigated noise levels have been calculated using the ENM modelling software and are summarised in **Table 11-8**. Levels for both neutral meteorological conditions and meteorological conditions that could enhance the propagation of noise are presented. **Figure 11-2** presents the 36dBA daytime noise contour in the worst-case season, to graphically represent the impact (from **Table 11-8**, daytime represents the worst-case time period for assessment). In this regard it is important to understand that the calculated (point to point) levels in **Table 11-8** are more accurate than the contours presented in **Figure 11-2**.

The calculated noise levels comfortably meet the relevant criteria at all residential receivers. It is to be noted that the expected enhancement due to wind was limited due to the size of the barrier between the sources and receivers.

The noise levels for the considered sources are general and would be further assessed during the detailed design stage.

## Chapter 11

## Noise

Table 11-8 Summary of Calculated Noise Levels to Residences – Unmitigated

| Residence No. | Time Period        | Calculated $L_{Aeq,15min}$ Noise Level (dBA) |                              | Noise Criteria $L_{Aeq,15min}$ (dBA) |
|---------------|--------------------|----------------------------------------------|------------------------------|--------------------------------------|
|               |                    | Meteorological Condition                     |                              |                                      |
|               |                    | Neutral                                      | Enhanced (worst case Season) |                                      |
| 1             | Daytime            | 9                                            | 10                           | 36                                   |
|               | Evening/Night Time | <0                                           | <0                           |                                      |
| 2             | Daytime            | 9                                            | 10                           |                                      |
|               | Evening/Night Time | <0                                           | <0                           |                                      |
| 3             | Daytime            | 11                                           | 12                           |                                      |
|               | Evening/Night Time | <0                                           | <0                           |                                      |
| 4             | Daytime            | 13                                           | 14                           |                                      |
|               | Evening/Night Time | <0                                           | <0                           |                                      |
| 5             | Daytime            | 17                                           | 18                           |                                      |
|               | Evening/Night Time | <0                                           | <0                           |                                      |
| 6             | Daytime            | 13                                           | 14                           |                                      |
|               | Evening/Night Time | <0                                           | <0                           |                                      |

#### 11.4.4 Sleep Disturbance

The potential for sleep disturbance within the residences will be greatest during the early morning hours when background noise levels are at their lowest.

Given that the operation will be continuous and not involve sudden instantaneous noise sources, maximum noise levels can be estimated as no more than 5dBA higher than the  $L_{Aeq,15min}$  values shown in **Table 11-8**, and well below the conservative criterion of 46dBA. Hence the risk of sleep disturbance for the residences assessed will be negligible.

#### 11.4.5 Brisbane Water National Park

An assessment of the noise impact, represented by noise contours, on the national park during the day is presented in **Figure 11-3**. This indicates the area over which noise levels due to the project will exceed the amenity criterion of 50dBA  $L_{Aeq, period}$ . It can be seen that the 55dBA contour is totally within the site boundary, however there are some parts of the 50dBA contour that intersect with the boundary. No contours project more than 50m into the park (they are within 50m of the site boundary as shown in blue in **Figure 11-3**).

The small area resulting from the intersection of the boundary to the west and the 50dBA contour is approximately 25m long and located from 0m to 3m into the National Park. Along the eastern boundary the 50dBA contour intersects with the boundary for a length of approximately 160m and is located a distance of 0m to 25m into the National Park.

Note that these values represent a conservative estimate of actual  $L_{Aeq, Period}$  noise levels, as they assume the sound power emission of equipment would be constant at its maximum level during an entire daytime period.

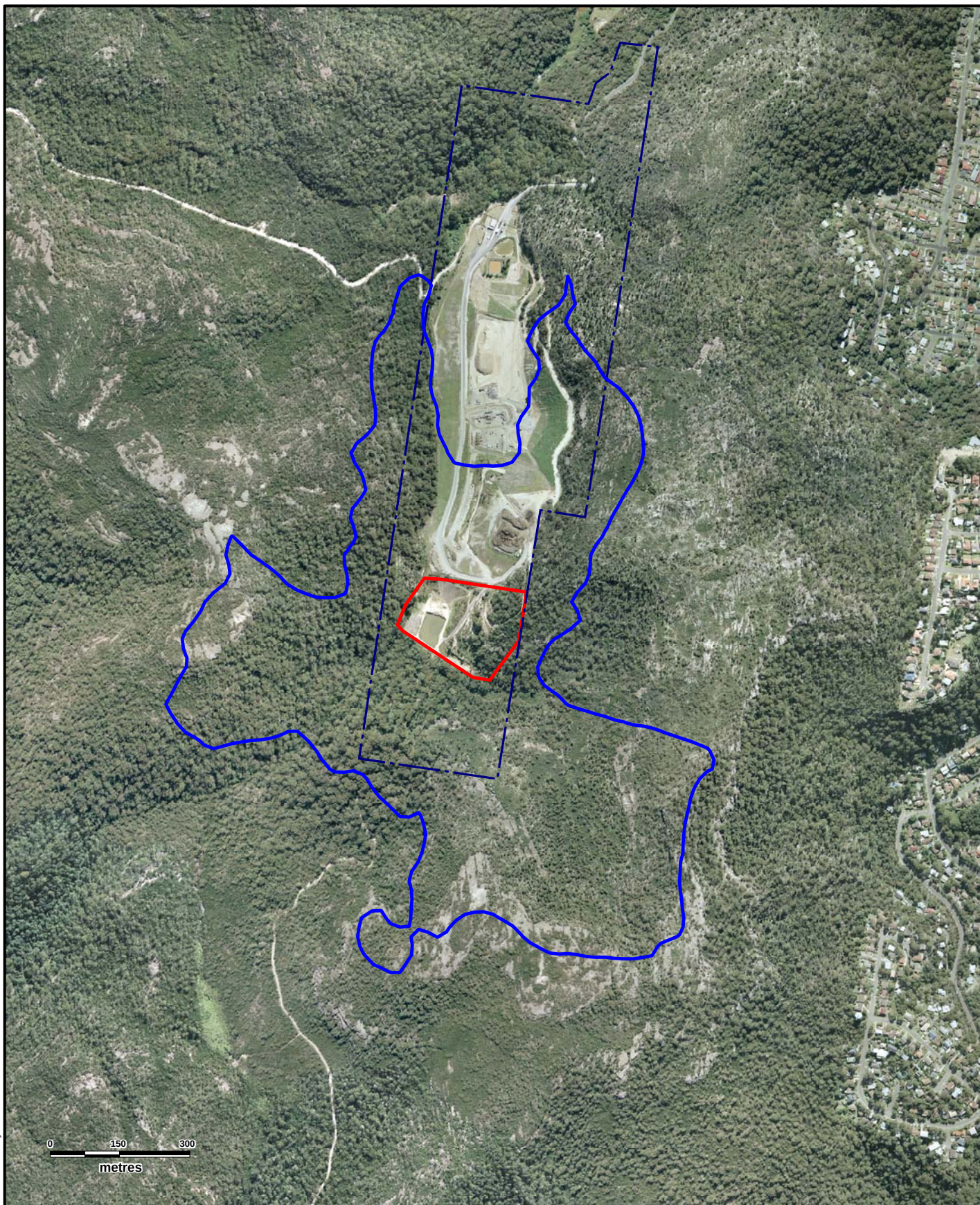
### 11.4.6 Operational Road Traffic Noise

This section assesses the impact of increased noise potentially impacting residential receivers due to additional road traffic generated by the proposed Facility, particularly medium to heavy vehicles,

As given in **Chapter 13** an additional 57 trucks, or 114 movements, are predicted in a typical day (7.00am-5.00pm). Based on data provided by Council, the hourly movements would vary from 7 to 17. As a worst case scenario, the absolute noise level from 17 medium to heavy vehicle movements has been calculated and then added (logarithmically) to the existing noise level between 1:00pm and 2:00pm on weekdays (from **Table 11-5**), calculated to be the quietest hourly period with an existing level of  $L_{Aeq,1hr}$  66.2dBA from road traffic noise.

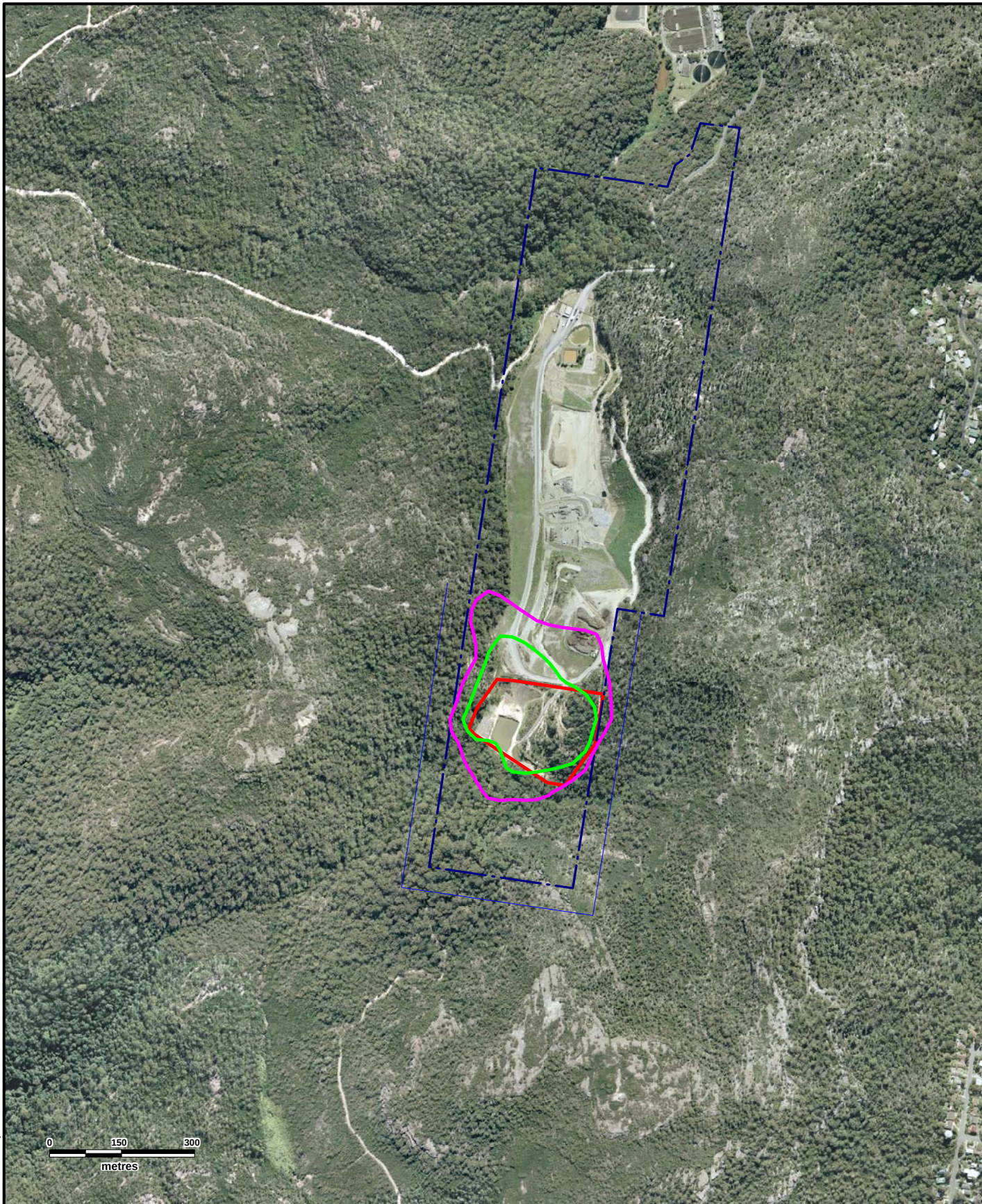
The Federal Highways traffic noise prediction method (FHWA) has been used to calculate the noise level from medium to heavy vehicle pass-bys. The equations applicable to 'hard ground' have been used at a distance of 13m (closest lane) and 17m (furthest lane) and these two levels added logarithmically. Although the sign posted speed is 50km/h, a speed of 64km/h has been used in the calculation as derived from continuous automatic traffic counts. To represent the most exposed residential receivers, such as 273 Railway Street, no shielding (such as a fence) was allowed for in the calculation. To account for facade reflections, 2.5dB was added to the calculated level.

A level of  $L_{Aeq,1hr}$  61.2dBA was calculated to represent 17 medium to heavy vehicle movements an hour past the most exposed residential receiver along Railway Street / Nagari Road. Should all 17 movements occur during the quietest hourly period during the daytime ( $L_{Aeq,1hr}$  67.4dBA), the increase in traffic noise would be 1.2dB, which is below the allowable 2dB increase.



- Residential 36dBA L<sub>Aeq, 15min</sub> Noise Contour
- - - Site Boundary
- Project Boundary

|                                           |                                                                                                                                                                                          |                                                                                       |                 |                  |                         |                           |  |                            |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------|------------------|-------------------------|---------------------------|--|----------------------------|
| <p>Client</p> <p>GOSFORD CITY COUNCIL</p> | <p>Project</p> <p>Environmental Assessment of Proposed<br/>Alternative Waste Technology and Composting<br/>Facilities at Woy Woy WMF</p>                                                 | <p>Title</p> <p><b>RESIDENTIAL 36dBA L<sub>Aeq, 15min</sub><br/>NOISE CONTOUR</b></p> |                 |                  |                         |                           |  |                            |
| <p><b>URS</b></p>                         | <table> <tr> <td>Drawn: AJW</td><td>Approved: FINAL</td><td>Date: 28/08/2007</td></tr> <tr> <td>Job No: <b>43177409</b></td><td colspan="2">File No: 43177409-036.wor</td></tr> </table> | Drawn: AJW                                                                            | Approved: FINAL | Date: 28/08/2007 | Job No: <b>43177409</b> | File No: 43177409-036.wor |  | <p>Figure: <b>11-2</b></p> |
| Drawn: AJW                                | Approved: FINAL                                                                                                                                                                          | Date: 28/08/2007                                                                      |                 |                  |                         |                           |  |                            |
| Job No: <b>43177409</b>                   | File No: 43177409-036.wor                                                                                                                                                                |                                                                                       |                 |                  |                         |                           |  |                            |



- |                                                                                     |                                                     |                                                                                     |                        |
|-------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------|------------------------|
|  | National Park 50dBA $L_{Aeq, Period}$ Noise Contour |  | Site Boundary          |
|  | National Park 55dBA $L_{Aeq, Period}$ Noise Contour |  | 50m from Site Boundary |

Client  
GOSFORD CITY COUNCIL

**URS**

Project  
Environmental Assessment of Proposed  
Alternative Waste Technology and Composting  
Facilities at Woy Woy WMF

|                  |                 |                           |
|------------------|-----------------|---------------------------|
| Drawn: AJW       | Approved: FINAL | Date: 28/08/2007          |
| Job No: 43177409 |                 | File No: 43177409-037.wor |

Title  
**NATIONAL PARK 50dBA and  
55dBA  $L_{Aeq, Period}$  NOISE CONTOUR**

Figure: 11-3

## Chapter 11

## Noise

### 11.5 Mitigations Measures

#### 11.5.1 Construction Phase

The analysis showed that the use of conventional construction equipment would not be audible at the nearest residential receptors. The standard mitigation practices presented here should be implemented, as necessary for each project component, to enable normal activities at the rest of the Woy Woy WMF to continue:

- 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.
- 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.
- 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.
- Where feasible, use electrically-powered equipment instead of pneumatic or internal combustion powered equipment.
- 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.
- 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.
- Public notification of the blasting would be done in a sensitive manner to avoid alarm. The notice may include text such as "We will 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." If blasting is carried out airblast overpressure and ground vibration limits as given in the ANZECC Guideline – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, (ANZECC, 1990) would not be exceeded.
- Planting of trees and shrubbery while useful for visual screening is not an effective noise control mechanism and is not considered a mitigation measure for noise impacts.

### 11.5.2 Operation Phase

The following minimum specifications would be adopted in the design / operation of the proposed AWT and Composting Facilities to ensure noise generated meets the criteria outlined in this report:

- Waste to be brought onto the site via garbage trucks of up to approximately 10 tonnes. As provided in the **Chapter 13** a total of 78 trucks (additional 57 trucks) is predicted (156 movements) in a day (7.00am-5.00pm). On average this would result in two to three truck movements in a given 15-minute period, however considering peak periods are likely to carry two to four times this traffic, the calculations have conservatively assumed 10 movements in a given 15-minute period. The anticipated speed onsite would be 20-30km/h.
- The Composting Building would be a simple metal clad (approx thickness equal or greater than 0.48mm thick steel, approx  $R_w$  19), portal framed building approximately 10m in height. The transmission loss of the roof and entry door would be  $R_w$  15 and  $R_w$  10 respectively to allow for louvers, translucent sheeting and the like. Green waste would be delivered to this building using the garbage trucks. A front end loader, screen and shredders would be used to sort, shred etc prior to being processed.
- The AWT building is assumed to be similar to the above building. Waste would also be delivered to this building using garbage trucks. A front-end loader and screens would be used to sort prior to being processed.
- On occasion some items would be disposed off site (hazardous waste, recyclables) or sent to the maturation area.
- All air from both buildings would be treated using a biofilter. It is noted that if an anaerobic process is chosen the biogas would be supplied to the existing Woy Woy landfill gas treatment system.
- The delivery, sorting of waste would be between the hours of 7.00am-5.00pm, whereas the biological processing of waste is of course a continuous (24 hour) operation.

As part of the detailed design of the development, the above assumptions and estimates used in this assessment would be reviewed, despite the conservative nature of the estimates used. Should the expected noise emission rates increase over values used, the assessment would be revised to ensure that they are compliant with DECC noise criteria and goals. In addition, throughout the design process, opportunities to minimise noise impacts would be investigated and implemented wherever possible to ensure that off-site operational impacts are minimised.

## 11.6 Conclusions

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.

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.

## Chapter 11

## Noise

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.

The analysis has shown that the construction and operation of the proposed AWT and Composting Facilities would not adversely affect the nearby noise-sensitive receptors. Recommended noise control measures for construction have been provided to ensure the existing on-site activities would not be impacted during the construction period. It is also expected that blasting would not impact the nearest residences, provided the blasts are appropriately designed.

This Chapter provides an assessment of the air quality impacts associated with the proposed development. The air quality impact assessment report prepared by URS is given in **Appendix D**. The air quality impact assessment of the proposed development has been assessed against the Department of Environment and Climate Change, incorporating the New South Wales Environment Protection Authority (NSW EPA) Impact Assessment Criteria as specified within DEC (2005) *Approved methods for the modelling and assessment of air pollutants within New South Wales* and DEC (2006) *Technical framework: Assessment and management of odour from stationary source in NSW*. Air quality criteria provided within this chapter have been set with the aim of protecting public health, and to provide mitigation against nuisance odour.

## 12.1 Existing Environment

### 12.1.1 Climate

The closest Automatic Weather Station (AWS) is located at Narara Research Station, north of Gosford in the foothills of Mount Penang. This data was considered inappropriate for use in dispersion modelling due to the highly specific terrain-induced flows present at the sheltered location, coupled with its distance from the proposed site (14km to the north). However this data was considered generally indicative of the local climate. A summary of climatological data collected at the Narara Research Station AWS is provided in **Table 12-1**.

#### *Temperature*

The climatological data indicates that the region experiences warm summers and mild winters. The records indicate that average daily temperatures for summer are approximately 27°C but can exceed 40°C in January, February and March.

#### *Rainfall*

The area experiences a high amount of rainfall for the region. An annual rainfall of 1320mm over an average of 116 rain days per year is reported. In comparison, Sydney's mean annual rainfall is 1094mm. The wettest months are between January and June.

#### *Wind*

Mean wind speeds are lightest in the months between March and August. Afternoon winds show more seasonal variability than the morning winds, which may be attributed to coastal sea breezes. The morning winds remain consistently light until August to November where the monthly mean wind speed increases

### 12.1.2 Odour – Background 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.

## Chapter 12

## Meteorology and Air Quality

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).

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.

### 12.1.3 Particulate Matter and Criteria Pollutants

Emissions of ozone ( $O_3$ ), nitrogen dioxide ( $NO_2$ ), particulate matter ( $PM_{10}$ ) and sulphur dioxide ( $SO_2$ ) from the site will be negligible. Anthropogenic creation of  $O_3$  within the troposphere is not the result of direct emission; rather it is the result of chemical reactions of oxides of nitrogen ( $NO_x$ ) and volatile organic compounds (VOCs) with other natural atmospheric constituents and isolation.

Anthropogenic generation of  $O_3$  in large quantities requires large volumes of traffic and insolation. It would not be expected that the site would provide sufficient additional traffic to generate added  $O_3$ , and has therefore not been considered further in this assessment.  $NO_x$  emissions from the site will

## Meteorology and Air Quality

## Chapter 12

also be minimal due to the low number of site vehicles and other on site combustion sources, and it would not be expected that the additional site traffic would result in an exceedance of the assessment criteria.

PM<sub>10</sub> emissions are likely to be generated from site vehicles passing over unsealed roads. The majority of roads on site will be sealed reducing PM<sub>10</sub> emissions to the maximum extent achievable. Only machinery within the cells will pass over unsealed roads; emissions of PM<sub>10</sub> will be kept to a minimum within these areas by control techniques. It is not anticipated that site activities will significantly add to background concentrations of PM<sub>10</sub>, and these have therefore not been considered further within this assessment.

Finally emissions of SO<sub>2</sub> will be limited to those generated through the use of sulphur containing fuels on site. The amount of sulphur in fuels is controlled in Australia by the Fuel Quality Standards Act, 2000, which limits sulphur in diesel to 50ppm as from 1 January 2006 and to 10ppm from the 1<sup>st</sup> January 2009. The low sulphur fuels will ensure that site sulphur emissions are minimal and that site contribution to ambient concentrations will not result in exceedance of the assessment criteria over any averaging period.

Carbon monoxide was not measured at the Wallsend site, however, background concentrations are likely to be low and site emission sources, namely vehicle emissions, are derived from relatively few sources and are not expected to add significant concentrations to background concentrations. Hence, carbon monoxide is not considered to be a significant pollutant in relation to this assessment.

Background concentrations for the pollutants considered within this section over all averaging periods combined with the expected emissions would not be expected to exceed the assessment criteria specified by the DEC. The only significant pollutant likely to arise from the proposed development is additional odour, which is further assessed in the following sections.

## Chapter 12

## Meteorology and Air Quality

Table 12-1 Climate Data from Narara Research Station Automatic Weather Station (BoM)

|                                    | JAN   | FEB   | MAR   | APR   | MAY   | JUN   | JUL   | AUG   | SEP   | OCT   | NOV   | DEC   | ANN    | No. Years |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-----------|
| Mean Daily Max Temp (deg C)        | 27.5  | 27.1  | 26    | 23.7  | 20.2  | 17.8  | 17.4  | 18.8  | 21.1  | 23.6  | 24.9  | 26.9  | 22.9   | 23.6      |
| Mean no. Days, Max $\geq 40$ deg C | 0.4   | 0.2   | 0.1   | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0.2   | 1      | 20.7      |
| Highest Max Temp (deg C)           | 42.8  | 43    | 40.1  | 32.8  | 28    | 25    | 25.5  | 29.3  | 36.1  | 36.5  | 39.9  | 43    | 43     | 20.8      |
| Mean Daily Min Temp (deg C)        | 16.6  | 17.1  | 15.4  | 11.9  | 8.3   | 6.4   | 4.5   | 5.4   | 7.6   | 10.6  | 12.7  | 15.2  | 10.9   | 23.9      |
| Mean no. Days, Min $\leq 0$ deg C  | 0     | 0     | 0     | 0     | 0     | 0.5   | 2.1   | 0.7   | 0     | 0     | 0     | 0     | 3.3    | 20.9      |
| Lowest Min Temp (deg C)            | 7.5   | 9.7   | 5.8   | 3.1   | 0.1   | -1.1  | -4.2  | -1.1  | -0.6  | 1.1   | 3.9   | 6     | -4.2   | 21        |
| Mean 9am Air Temp (deg C)          | 22.9  | 22.4  | 20.9  | 18.4  | 14.2  | 11.6  | 10.3  | 12.7  | 16.1  | 19.1  | 20.4  | 22.4  | 17.6   | 23.9      |
| Mean 9am Wind Speed (km/hr)        | 8.3   | 7.2   | 7     | 6.8   | 6.9   | 7.3   | 7.2   | 9     | 10.1  | 10.8  | 9.6   | 8.5   | 8.2    | 20.3      |
| Mean 3pm Air Temp (deg C)          | 26.8  | 26    | 24.4  | 21.7  | 18.7  | 16.3  | 15.8  | 17.6  | 19.7  | 21.9  | 22.8  | 25    | 21     | 8.3       |
| Mean 3pm Wind Speed (km/hr)        | 13.7  | 11.7  | 11.2  | 9.1   | 7.9   | 7.6   | 8.4   | 10.2  | 12.4  | 11.5  | 12.8  | 13.4  | 10.8   | 8.6       |
| Mean Rainfall (mm)                 | 139   | 148.1 | 149.8 | 136.2 | 119.1 | 127.6 | 79    | 75.9  | 68.6  | 82.9  | 92.4  | 102.2 | 1320.8 | 81.6      |
| Highest Monthly Rainfall (mm)      | 517.5 | 597.7 | 500.3 | 661.9 | 634   | 664   | 455.6 | 426.2 | 232.1 | 344.1 | 361.5 | 417.1 | -      | 81.6      |
| Lowest Monthly Rainfall (mm)       | 4.3   | 0     | 6     | 4.6   | 6.1   | 1.9   | 0     | 0     | 2     | 1     | 4.1   | 6     | -      | 81.6      |
| Highest Recorded Daily Rain (mm)   | 210.8 | 191.8 | 205.5 | 218.4 | 177.3 | 170.7 | 194.8 | 119.2 | 106.9 | 129.3 | 155.2 | 155.2 | 218.4  | 75.9      |
| Mean No. Raindays <sup>1</sup>     | 11.1  | 10.8  | 11.1  | 10.6  | 9.2   | 9.7   | 8     | 8.1   | 8.4   | 9     | 9.8   | 10.1  | 115.8  | 67.3      |
| Mean no. of Clear Days             | 6.7   | 8     | 7.3   | 9.3   | 7.3   | 6.6   | 9.8   | 12.4  | 6.2   | 9.8   | 5.8   | 6.8   | 96     | 4.3       |
| Mean no. of Cloudy Days            | 11.3  | 7.7   | 8     | 5     | 10    | 6.8   | 6.4   | 5     | 8     | 6.2   | 7.2   | 5.6   | 87.2   | 4.3       |
| Maximum Wind Gust (km/hr)          | 53.6  | 51.8  | 50    | 57.2  | 48.2  | 77.8  | 50    | 57.2  | 51.8  | 64.8  | 53.6  | 50    | 77.8   | 3.9       |

<sup>1</sup> A rainday is a day where more than 0.2mm of precipitation was recorded.

## Meteorology and Air Quality

## Chapter 12

### 12.2 Assessment Criteria

There are three main types of air quality criteria which are generally assessed as part of developments:

**Emission Standards** – which are maximum allowable pollutant concentrations specified for particular classes of equipment;

**Air Impact Assessment Criteria** – which are designed for use in air dispersion modelling studies and air quality impact assessments for new or modified emission sources; and

**Ambient Air Quality Standards** – set standards against which ambient air quality monitoring results may be assessed.

The Emission Standards are primarily used to limit major industrial processes emissions such as oxides of nitrogen and sulphur from power plants. For this development, Emissions Standards are not as relevant as the principal air quality impacts would be from fugitive odour during operation and potentially fugitive dust emission during construction. The Air Impact Assessment Criteria are more relevant to this development.

Air Impact Assessment Criteria are used in evaluating the expected impact of air emissions on local air quality and the effectiveness of plant design and any associated mitigation measures. Another objective of these criteria is to ensure that the resulting local and regional ambient air quality meets the relevant Ambient Air Quality Standards.

The Ambient Air Quality Standards refers to the NEPM guidelines which provide regional guidelines for several key air pollutants and the guidelines and have not been designed to provide guidelines for assessing individual developments, rather for setting broad scale regional limits.

#### 12.2.1 Air Impact Assessment Criteria

Department of Environment and Conservation (incorporating the New South Wales Environment Protection Authority) have published impact assessment criteria to be applied in the design stages of an activity to ensure that there would be no impact on public health or amenity values. These criteria are set on the basis of the toxicity of a chemical or, if more stringent, the odour threshold of a pollutant. DEC impact assessment criteria relevant to the proposed development are given in **Table 12-2**.

## Chapter 12

## Meteorology and Air Quality

Table 12-2: DEC (NSW EPA) Impact Assessment Criteria

| Pollutant        | NSW EPA Impact Assessment Criteria ( $\mu\text{g}/\text{m}^3$ ) | Averaging Time                             |
|------------------|-----------------------------------------------------------------|--------------------------------------------|
| Odour            | 2 OU (nose response time) <sup>B</sup>                          | 1 hour                                     |
| PM <sub>10</sub> | 50<br>30                                                        | 24 hours<br>annual                         |
| Nitrogen Dioxide | 246<br>62                                                       | 1 hour<br>annual                           |
| Carbon Monoxide  | 100,000<br>30,000<br>10,000                                     | 15 minutes<br>1 hour<br>8 hours            |
| Sulphur Dioxide  | 712<br>570<br>228<br>60                                         | 10 minutes<br>1 hour<br>24 hours<br>annual |

<sup>A</sup> all criteria listed in  $\mu\text{g}/\text{m}^3$ , unless otherwise specified.

<sup>B</sup> See Table 12-3 for more detail on odour units.

### 12.2.2 Odour Regulations in New South Wales

The NSW EPA provides odour criteria in DEC (2006a) *Technical Framework: Assessment and management of odour from stationary sources in NSW*. The criteria is shown in **Table 12-3**, and ranges from 2 OU to 7 OU (99.0%, nose response time) and corresponds to an affected population of >2000 (2 OU criteria) to 2 (7 OU criteria).

Table 12-3 Odour Performance Criteria (from Table 3.1, DEC, 2006)

| Population of affected community | Odour performance criteria (odour units/ $\text{m}^3$ ) |
|----------------------------------|---------------------------------------------------------|
| Urban areas ( $\geq 2000$ )      | 2.0                                                     |
| 500 - 2000                       | 3.0                                                     |
| 125-500                          | 4.0                                                     |
| 30-125                           | 5.0                                                     |
| 10-30                            | 6.0                                                     |
| Single residence ( $\leq 2$ )    | 7.0                                                     |

The nose response time essentially refers to a 1 second averaging time and incorporates “peak to mean ratios”. The peak to mean ratio is defined by DEC (2006a, p55) as “a conversion factor that adjusts mean dispersion model predictions to the peak concentrations perceived by the human nose”. Peak to mean ratios for odorous area and volume sources (likely for this development) are presented in **Table 12-4**.

## Meteorology and Air Quality

## Chapter 12

Table 12-4: Peak to Mean Ratios (from Table 6.1, DEC, 2005)

|        | Pasquill-Gifford stability class | Near field<br>$i_{maz}$ | Near field<br>$x_{max}$ | Near field<br>$P/M_{60}$ | Far field<br>$i$ | Far field<br>$P/M_{60}$ |
|--------|----------------------------------|-------------------------|-------------------------|--------------------------|------------------|-------------------------|
| Area   | D                                | 0.5                     | 500 to 1000             | 2.5                      | 0.4              | 2.3                     |
|        | E,F                              | 0.5                     | 300 to 800              | 2.3                      | 0.3              | 1.9                     |
|        | A,B,C                            | 0.5                     | 500 to 1000             | 2.5                      | 0.4              | 2.3                     |
| Volume | A-F                              | 0.4                     | -                       | 2.3                      | 0.4              | 2.3                     |

Peak to mean ratios, can be further explained in the following example. Where a 1-hour averaging time has been used for modelling and an odour concentration at a receptor (resident) is predicted to be 0.5 OU, a peak to mean ratio of 3 would increase the predicted odour concentration to 1.5 OU. During that hour, the dispersion model predicts an average concentration of 0.5 OU at the receptor, however, the odour concentration at the receptor may rise to 1.5 OU and fall to 0.1 OU, but the fluctuations may only last for a matter of seconds. As the nose has a relatively quick response time, namely in the order of seconds, the peak to mean ratio incorporates the quick response time of the human nose when perceiving natural variations (increases) in odour concentration throughout that hour period.

NSW EPA (2001, p12) further states that “*Experience gained through odour assessments for proposed and existing facilities in NSW indicates that an odour performance criterion of 7 OU/m<sup>3</sup> is likely to represent the level below which ‘offensive’ odours should not occur...*”. This is the basis of the 7 OU limit listed in **Table 12-3**.

Based on the residential area to the east, the odour performance criterion to be adopted is 2 OU.

### 12.2.3 Ambient Air Quality Standards

In June 1998, the National Environment Protection Council (NEPC) released a National Environment Protection Measure (NEPM) for Ambient Air Quality, setting out national standards and goals for six common ambient air pollutants (NEPC, 1998).

When reviewing the standards and goals set out in the NEPM for Ambient Air Quality, it should be noted that they are designed for use in assessing regional air quality and are not intended for use as site boundary of atmospheric dispersion modelling criteria. Consequently, proposed facility emissions have not been assessed directly against NEPM guidelines, however, the guidelines provided by the NEPM match the Air Impact Assessment Criteria provided in DEC (2005).

## 12.3 Emission Inventory and Dispersion Modelling

### 12.3.1 Proposed Operations

The two major sources of air emissions related to this project include dust emissions during the construction phase and odour emissions during the operational phase. As dust generated during construction would be temporary and can be effectively controlled using mitigation measures, this report would focus on the assessment of odour during the operational phase of the project. Whilst the introduction of the AWT facility will reduce the proportion of waste to be directed to landfill, the existing Landfill and Leachate system will continue to operate on the site.

## Chapter 12

## Meteorology and Air Quality

### 12.3.2 Odour Emission Rates

The final design selection of the AWT and Composting Facility to be employed at the Woy Woy facility is yet to be made. Thus Odour Emission Rates (OERs) have been calculated based on the proposed tonnage of material to be processed, in accordance with emission rates from existing facilities which employ similar processes to those proposed for the Woy Woy facility. The OERs calculated include significant margin for safety, in order to be consistent with the conservative nature of this assessment. Where a range of OERs have been available, the most conservative rates have generally been selected.

#### *AWT Facility*

OERs for the AWT facility have been estimated from a proposed Municipal Solid Waste Facility at South Windsor (Thiess Services, 2003). The odour emission data presented in Thiess Services (2003) was based on empirical odour data collected from waste at a plant with similar operations, hence the data is considered suitable for use in this assessment.

The proposed AWT facility is to consist of a waste receival hall where municipal solid waste is delivered by trucks and unloaded inside the building. The waste is then to be conveyed to adjoining rooms for processing using a rotating drum. An extraction system captures air from the primary processing areas which is then vented to a biofilter. The estimation of odorous emissions from the facility have also included a large quantity of fugitive emissions from the building, however, it is expected that the odours will primarily be treated by the biofilter.

The OERs for the Woy Woy AWT facility are based on this work, as the process proposed for the Woy Woy AWT is similar to that investigated at South Windsor. Thiess Services (2003) calculated a fugitive odour emission rate of 5100 OU.s<sup>-1</sup> based on a throughput of 155,000 tonnes per annum with the odour control technology being a biofilter, which was designed to have a surface area of 100m<sup>2</sup>, with a total emission rate 556 OU.m<sup>3</sup>s<sup>-1</sup>.

The OERs for the proposed Woy Woy AWT were scaled linearly to the throughput of 70,000 tonnes per annum for the AWT (as shown below in Equation 5-1), which resulted in an OER of 2303 OU.m<sup>3</sup>s<sup>-1</sup> for the AWT facility and an OER of 250 OU.m<sup>3</sup>.s<sup>-1</sup> for the biofilter.

$$OER_D = OER_T \times \frac{Throughput_D}{Throughput_T}$$

Where:

OER<sub>D</sub> and OER<sub>T</sub> are the Odour Emission Rates proposed for Woy Woy and South Windsor respectively.

Throughput<sub>D</sub> and Throughput<sub>T</sub> are the proposed development throughputs for Woy Woy (70,000 Tpa) and South Windsor respectively (155,000Tpa)

It should be noted that all wastewater generate as part of this facility will be contained within storage tanks, hence this source does not warrant inclusion in the odour modelling.

## Meteorology and Air Quality

## Chapter 12

### Greenwaste / Biosolids Composting Facility

The Composting Facility would comprise an enclosed building where the majority of processing is to occur. In a manner similar to the AWT facility, air from within the building would be ducted to a biofilter, whilst a large allowance for fugitive emissions has been made.

Based on the likely throughput of approximately, 45,000 tonnes of material annually, and given 20,000 tonne would generally comprise 8 windrows operating continuously, 18 windrows were assumed to be situated within the building. Each windrow used in the modelling assumed dimensions shown in **Figure 12-1**, with a height of 3m.

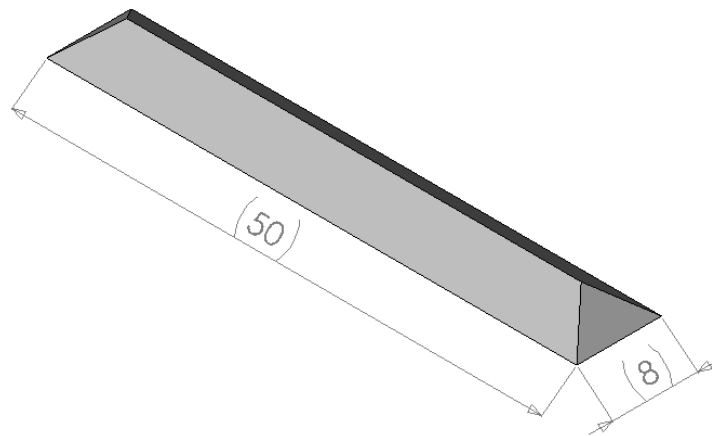


**Figure 12-1 Windrow dimensions (in metres) used in emission calculations**

The surface area of each cell was calculated by assuming that each cell occupied 50 x 8m of ground, and formed a triangular prism. Each end was angled at 40 degrees from horizontal which gave a total exposed surface area of approximately 571 m<sup>2</sup> per cell. This area allows the Odour Emission Rate (OER) for a single windrow to be calculated from the Surface Odour Emission Rate (SOER).

Work undertaken by Kühner *et al.* 1999 has shown that for a Gore covered windrow, such as those proposed, have an SOER of 1.25 OU.m<sup>-2</sup>.s<sup>-1</sup>, resulting in an average odour emission rate of 714 OU.s<sup>-1</sup> per windrow. On the basis that 18 windrows are contained within the Composting Facility, and that 50% of the odorous air is either treated using a biofilter or retained by the enclosure, the odours produced by the windrows that escape the building as fugitive emissions, is estimated to be 6,424 OU.s<sup>-1</sup>. Whilst it is known that odour emissions from the windrows are increased during turning, the biofilter and enclosure will act to contain those peak emissions.

The Composting Facility is proposed to have a biofilter which is used to treat the extracted air from the building. GHD (2006b) indicated that a 440 m<sup>2</sup> biofilter attached to a similar green waste facility (30,000 tpa) generated an SOER of 2.8 OU.m<sup>-2</sup>.s<sup>-1</sup>. Similar to the method used to calculate the biofilter area of the AWT facility, the area of the proposed biofilter has been designed to be 660m<sup>2</sup>, based on 45,000 tpa of biosolids and greenwaste combined. This would produce a net emission rate of 1848 OU.s<sup>-1</sup> from the biofilter.

It should be noted that all wastewater generated as part of this facility will be contained within storage tanks, hence this source does not warrant inclusion in the odour modelling.

## Chapter 12

## Meteorology and Air Quality

### Greenwaste Maturation Windrows

It is known that greenwaste processing can generate significant odorous emissions, however, it is generally during the initial weeks where the majority of the odours are released. After 12 weeks of processing within the enclosed composting facility, significant odour emissions are unlikely to be generated when the windrows are moved outside for further drying.

Mature windrows, such as these, have been shown to have an SOER of approximately  $0.46 \text{ OU.m}^{-2}.\text{s}^{-1}$ . The value of  $0.46 \text{ OU.m}^{-2}.\text{s}^{-1}$  was calculated from other mature compost odour emission rates, as shown in **Table 12-5**. It should be noted, in **Table 12-5**, that URS considers the inclusion of the Mature Product, with an SOER of  $4.5 \text{ OU.m}^{-2}.\text{s}^{-1}$  as being overly conservative, and it is the experience of URS that SOERs for this type of source would generally be significantly less than shown. Consequently, the geometric average was used to reduce the skew which resulted from the inclusion of this datum.

**Table 12-5 Literature review of SOER from Mature Compost Product**

| Odour Emission Source       | SOER<br>(OU/min.m <sup>2</sup> ) | Geometric<br>Average <sup>A</sup><br>(OU.m <sup>-2</sup> .s <sup>-1</sup> ) | Sampling<br>Method | Reference           |
|-----------------------------|----------------------------------|-----------------------------------------------------------------------------|--------------------|---------------------|
| Finished Product – Fine     | 0.83                             | 0.46                                                                        | Flux Hood          | AWT 2001            |
| Finished Product – Coarse   | 0.18                             |                                                                             | Flux Hood          | AWT 2001            |
| Unscreened Finished Compost | 0.08                             |                                                                             | Flux Hood          | AWT 2001            |
| Mature Product              | 4.5                              |                                                                             | Wind Tunnel        | Kühner et al (1999) |
| Final Product               | 0.4                              |                                                                             | Unknown            | Haug (1993)         |

It has been assumed that approximately 12 windrows of material, each having a surface area of 571 m<sup>2</sup>, will be stored in the maturation area at any one time. The net emission rate from the external windrows would therefore be  $5500 \text{ OU.m}^3\text{s}^{-1}$ .

### Existing Tip Face

The existing tip face will remain operational to accept the fraction of waste which the AWT is unable to treat or use elsewhere. Emission rates incorporated into this assessment are for tip faces which accept putrescible Municipal Solid Waste. Table 12-6 gives a range of emission rates for active tip faces including emission rates measured Woy Woy in 2003. The site specific data has not been included as there is more conservative data available. The dispersion modelling has assumed an odour emission rate of  $2.7 \text{ OU.m}^{-2}.\text{s}^{-1}$ , which was sourced from GHD, 2006.

# Meteorology and Air Quality

# Chapter 12

**Table 12-6: SOERs for Putrescible Solid Waste Landfill Tip Faces**

| Odour Emission Source | SOER (OU.m <sup>-2</sup> .s <sup>-1</sup> ) | Sampling Method | Reference    |
|-----------------------|---------------------------------------------|-----------------|--------------|
| Kincumber Landfill    | 0.146                                       | Flux Hood       | Bowly (2003) |
| Woy Woy Landfill      | 0.110                                       | Flux Hood       | Bowly (2003) |
| Buttonderry Landfill  | 0.335                                       | Flux Hood       | Bowly (2003) |
| Jacks Gully WMC       | 2.71                                        | Flux Hood       | GHD (2006)   |

<sup>1</sup> This incorporates a scaling factor of two in order to account for cooler weather during sampling (GHD,2006)

Given that the tip face will move around the site as the landfill takes on new material, the tip face has been assumed to be located at the southern-most point of the landfilling area. This allows for the emissions of the AWT and tip face to consolidate, hence ensuring the most conservative location has been assessed. The tip face was assumed to be 30 x 30 m<sup>2</sup>, a total of 900 square metres. This results in a source emission rate of 2,430 OU/s. As an added level of conservativeness, the tipface emissions were assumed to emit continuously, even though the tipface is generally covered by soil during night times.

## Leachate Pond

The leachate pond on the site will remain operational in order to process the leachate produced by the existing landfill. Table 12-7 gives a range of emission rates for leachate ponds.

**Table 12-7: SOERs for Leachate Ponds**

| Odour Emission Source | SOER (OU.m <sup>-2</sup> .s <sup>-1</sup> ) | Sampling Method       | Reference    |
|-----------------------|---------------------------------------------|-----------------------|--------------|
| Buttonderry Landfill  | 0.833                                       | Flux Hood (converted) | Bowly (2003) |
| Jacks Gully WRC       | 0.108                                       | Flux Hood             | URS(2004)    |
| Jacks Gully WRC       | 0.054                                       | Flux Hood             | URS(2004)    |

The existing leachate pond is approximately 23 x 23m<sup>2</sup> in size, totalling 529 square metres. Taking the most conservative SOER from Table 12-7, this constitutes a total of 441 OU/s being emitted from the leachate pond for every hour of the year.

## Chapter 12

## Meteorology and Air Quality

**Odour emission rate summary**

The odour emission rates used in the modelling are provided in **12-8**, and have been derived from various studies of other similar facilities both internationally and within Australia as described above. These emission rates do not incorporate a peak to mean ratio, as a peak to mean ratio of 2.5 has been incorporated in the post processing of the model results. The locations of the sources are shown in **Figure 5.2** of **Appendix D**. These emission rates, where relevant, would be included in the contract specification for the selection of an appropriate AWT and Composting Facility.

**Table 12-8 Odour Emission Rates**

| Odour Source                               | Source Type | Surface Odour Emission Rate (OU.m <sup>3</sup> .m <sup>-2</sup> .s <sup>-1</sup> ) | Odour Emission Rate (OU.m <sup>3</sup> .s <sup>-1</sup> ) |
|--------------------------------------------|-------------|------------------------------------------------------------------------------------|-----------------------------------------------------------|
| AWT Treatment Facility                     | Fugitive    | -                                                                                  | 2303                                                      |
| AWT Treatment Facility (Biofilter)         | Area        | 2.5                                                                                | 250                                                       |
| Green Waste Treatment Facility             | Fugitive    | -                                                                                  | 6,424                                                     |
| Green Waste Treatment Facility (Biofilter) | Area        | 2.8                                                                                | 1,848                                                     |
| Green waste Maturation Area                | Area        | 1.2                                                                                | 3,152                                                     |
| Tip Face                                   | Area        | 2.7                                                                                | 2,430                                                     |
| Leachate Pond                              | Area        | 0.833                                                                              | 441                                                       |
| TOTAL                                      |             |                                                                                    | 16,848                                                    |

**12.4 Assessment of Potential Impacts****12.4.1 Odour**

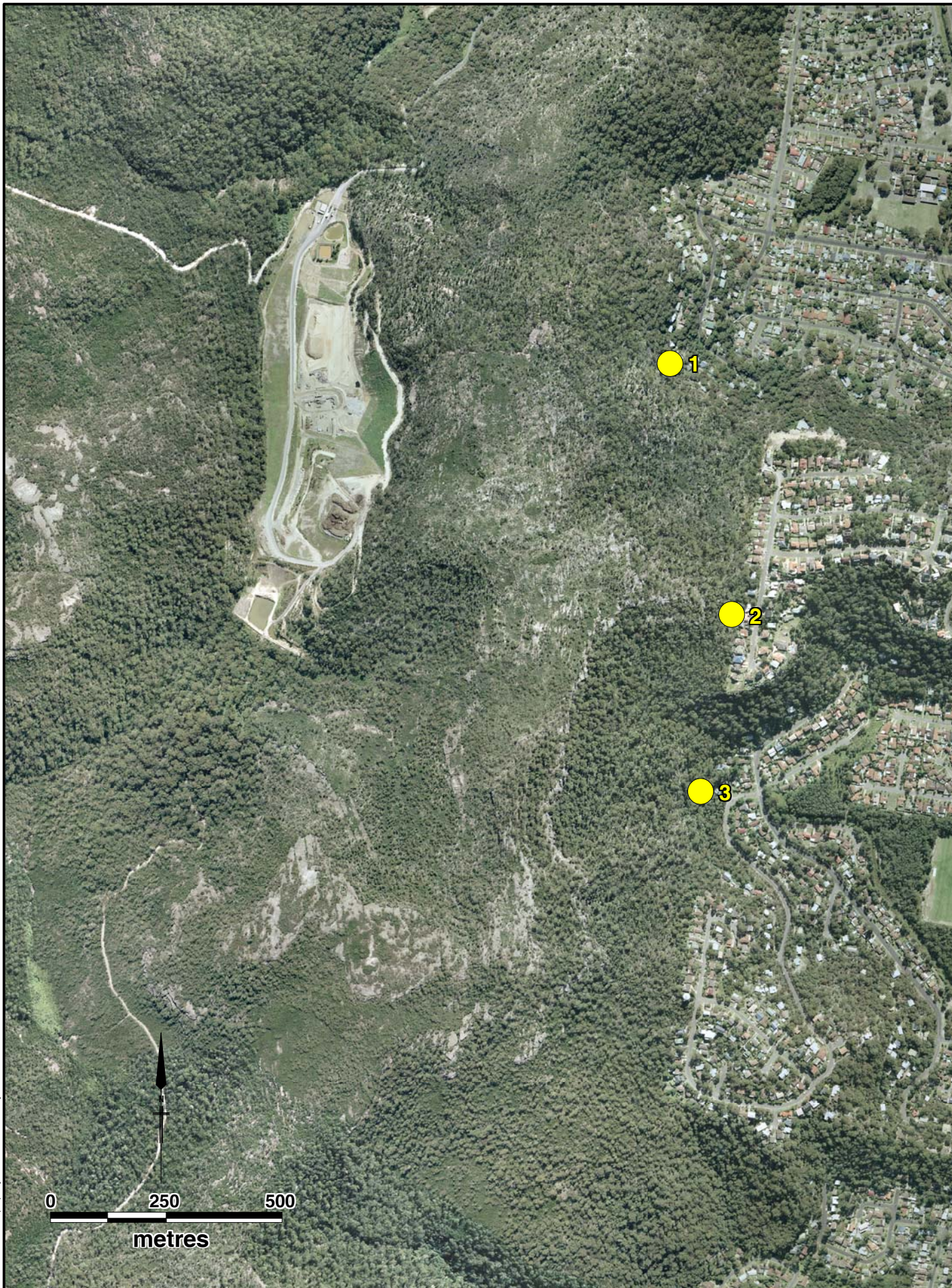
On the basis that 2 OU (nose response time) represents the odour performance criteria, **Figure 12-2** shows that the modelling has predicted an odour concentration contour 2OU approximately 900m to the east of the proposed development, located within the Brisbane Water National Park. Thus, the predicted odour concentration at the residential area to the east of the site is below the criteria of 2OU (nose response time).

To confirm the impact of odour on sensitive receptors close to the site, four sensitive receptor locations were chosen to be examined. **Figure 12-3** shows the three closest residential receptor locations close to the proposed site. The odour concentration predicted at these locations, were below 2OU, confirming odour impact at sensitive receptors to meet regulatory guidelines.



GDA94 Coordinates

|                                           |                                                                                                                                          |                                                                                                            |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <p>Client</p> <p>GOSFORD CITY COUNCIL</p> | <p>Project</p> <p>Environmental Assessment of Proposed<br/>Alternative Waste Technology and Composting<br/>Facilities at Woy Woy WMF</p> | <p>Title</p> <p><b>OPERATING FACILITY<br/>20U CONCENTRATION CONTOUR<br/>(99.0% NOSE RESPONSE TIME)</b></p> |
| <p><b>URS</b></p>                         | <p>Drawn: AJW    Approved: FINAL    Date: 24/08/2007</p> <p>Job No: <b>43177409</b>    File No: 43177409-008.wor</p>                     | <p>Figure: <b>12-2</b></p>                                                                                 |



|                                                                                     |                                                     |                 |                           |                                 |
|-------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------|---------------------------|---------------------------------|
| Client<br><br>GOSFORD CITY COUNCIL                                                  | Project<br><br>WOY WOY WASTE<br>MANAGEMENT FACILITY |                 |                           | Title<br><br>DISCRETE RECEPTORS |
|  | Drawn: AJW                                          | Approved: FINAL | Date: 13/02/2007          | Figure: 12-3                    |
|                                                                                     | Job No: 43177409                                    |                 | File No: 43177409-025.wor |                                 |

## Meteorology and Air Quality

## Chapter 12

**Table 12-9 Odour concentrations at sensitive receptors**

| Location                      | Odour concentration (OU)<br>(99.0%ile, Peak to Mean Ratio of 2.5) |
|-------------------------------|-------------------------------------------------------------------|
| Sensitive receptor location 1 | 1.1                                                               |
| Sensitive receptor location 2 | 1.7                                                               |
| Sensitive receptor location 3 | 0.7                                                               |
| Woy Woy STP                   | 0.1                                                               |

### **Particulate Matter**

Particulate emissions generated during construction would be temporary and can be controlled using known and effective dust mitigation measures.

During operation, PM<sub>10</sub> emissions are likely to be generated from site vehicles passing over unsealed roads, however, the majority of roads on site would be sealed, limiting the adverse impacts of PM<sub>10</sub>. Other site activities, such as those being performed within enclosed buildings are not anticipated to significantly add to background concentrations of PM<sub>10</sub>, and therefore PM<sub>10</sub> is not considered to have a significantly adverse impact on local air quality.

### **Oxides of Nitrogen**

NO<sub>x</sub> is generated through the combustion of nitrogen containing fuels, and also in high temperature environments, such as a combustion engine, where nitrogen and oxygen within the air become combined to form NO and NO<sub>2</sub> in approximately a 9:1 ratio. The site would have an increase of approximately 57 trucks per day, as well as a small number of site vehicles. There is currently planned to be no other combustion sources on site. Due to the low number of site and delivery vehicles and the lack of other combustion sources, it is considered that site contribution to ambient NO<sub>2</sub> concentrations would not be significant. Furthermore, it is known that NO<sub>x</sub> generated by transport sources would disperse to background concentrations within 200m of generation (Highways, 2003). The nearest sensitive receptors to site are 1000m from the site access roads or workings.

### **Oxides of Sulphur**

Emission of sulphur dioxide from the site would be limited to the combustion of fuels such as petrol and diesel which contain sulphur. The amount of sulphur within petrol and diesel is controlled by the *Clean Fuels Act, 2000*, which would continue to reduce the amount of sulphur within fuels. As a result of this legislation, high concentrations of sulphur dioxide are not associated with high traffic densities, and it is therefore considered that the site would not contribute significant amounts of sulphur dioxide to the surrounding environment.

### **Carbon monoxide**

High CO levels are only expected where there is a high concentration of vehicles to generate the pollutant. Due to the low number of site and delivery vehicles, it would be expected that the site would not generate a high concentration of CO.

## Chapter 12

## Meteorology and Air Quality

### 12.5 Mitigation Measures

#### 12.5.1 Construction Phase

Environmental safeguards that would be implemented during the construction phases of the expansion are listed below. Any emissions of particulates (dust) would be specifically controlled through the implementation of these mitigation measures, which would be incorporated into a Construction Environment Management Plan (CEMP) for the works.

- Before works begin, a CEMP would be prepared which addresses air monitoring and management issues.
- 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.
- 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.
- Vehicles would only be loaded to less than the height of the side and tailboards and loads of contaminated 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.
- Any long-term stockpiles would be stabilised using fast-seeding grass or synthetic cover spray.
- All major access roads would be sealed and vehicle speeds on unsealed areas would be controlled to minimise dust

#### 12.5.2 Operation Phase

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 and operational 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. Should the expected emission rates increase over values used, the modelling would be revised to ensure that they are compliant with DECC air quality standards and goals.

In addition, throughout the design process, opportunities to minimise emissions to air would be investigated and implemented wherever possible to ensure that off-site impacts are minimised.

### 12.6 Conclusion

As the primary air quality issue relating to waste processing and composting facilities is odour, the meteorology and air quality investigation focused on the generation and dispersion of odour. The odour emissions were modelled using the Calpuff dispersion modelling package, based on TAPM generated meteorological data.

## Meteorology and Air Quality

## Chapter 12

Due to the highly exposed nature of the areas around the proposed site and despite conservative odour emission estimates, the proposed facility was found to have no adverse odour impacts at the nearest sensitive receptors. The predicted results showed the odour concentration to be present at a maximum concentration of 1.7OU, at the nearest sensitive receptors, falling below the NSW odour performance criteria of 2OU (nose response time).

The majority of site generated total suspended particulates and PM<sub>10</sub> 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.

Representative background data for these compounds 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<sub>10</sub>. It is likely that this is due to a naturally occurring dust event and may be discounted from the record.

Such a 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.

The proposed activities would not present an adverse impact on the air quality in the area.