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Appendix D6

South West Rocks STP

ODOUR AND NOISE ASSESSMENT

- Final
- 15/11/2005

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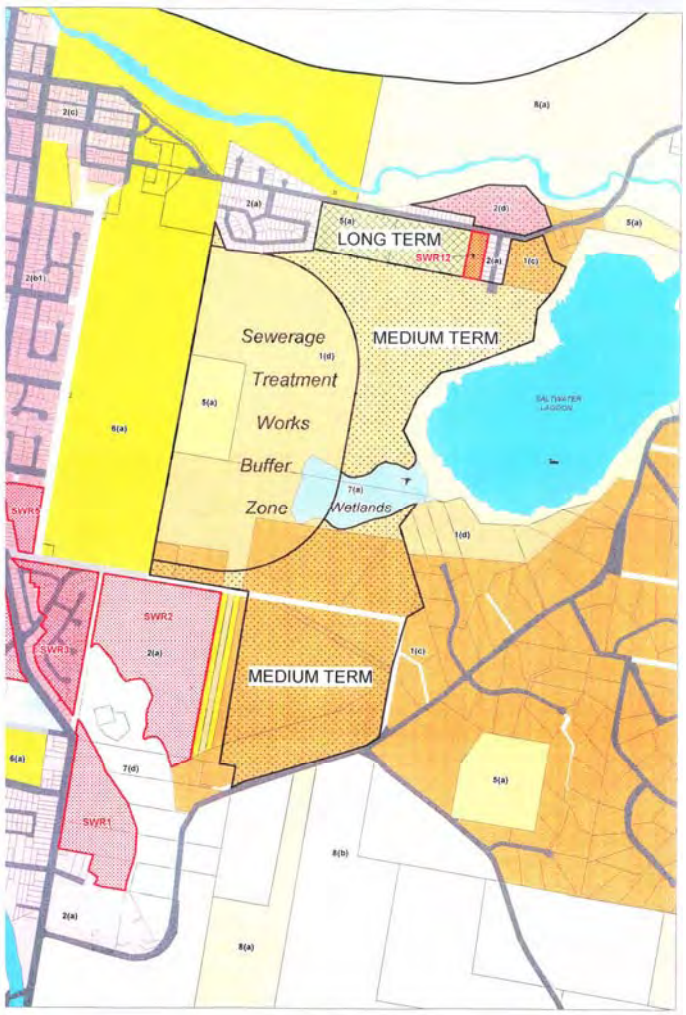
1. Introduction

1.1 General Introduction

Kempsey Shire Council have commissioned Connell Wagner to prepare a Local Environment Study (LES) for the South West Rocks area. An aspect of the plan is to assess potential noise and odour emission from the existing and sewerage treatment plant (STP) as well as consider future impacts in the event of the STP being upgraded.

The LES study area is shown on **Figure 1-1** along with the existing buffer zone around the treatment plant.

- **Figure 1-1 - Study Area**



1.2 Study Objectives

The objectives of this study are to assess potential noise impacts from the existing and upgraded treatment plant. This report will also provide an interim odour assessment, a full assessment will be conducted after one year of on-site meteorological data has been obtained, and site specific odour measurements have been undertaken.

Specifically the report contains the following components:

- a review of existing odour and noise assessments previously prepared for South West Rocks STP including previous report by SKM, June 2004;
- details of odour and noise issues associated with the operation of South West Rocks STP;
- a description of the existing air and noise environment in the South West Rocks area including on-site noise monitoring and background noise monitoring;
- analysis of meteorological data measured on-site to date and comparison with synoptic scale meteorology data generated by The Air Pollution Model (TAPM);
- determination of odour and noise criteria relevant to the treatment plant operation;
- assessment of odour and noise impacts; and
- provision of conclusions and recommendations regarding land development adjacent to the treatment plant.

2. Odour and Noise Issues

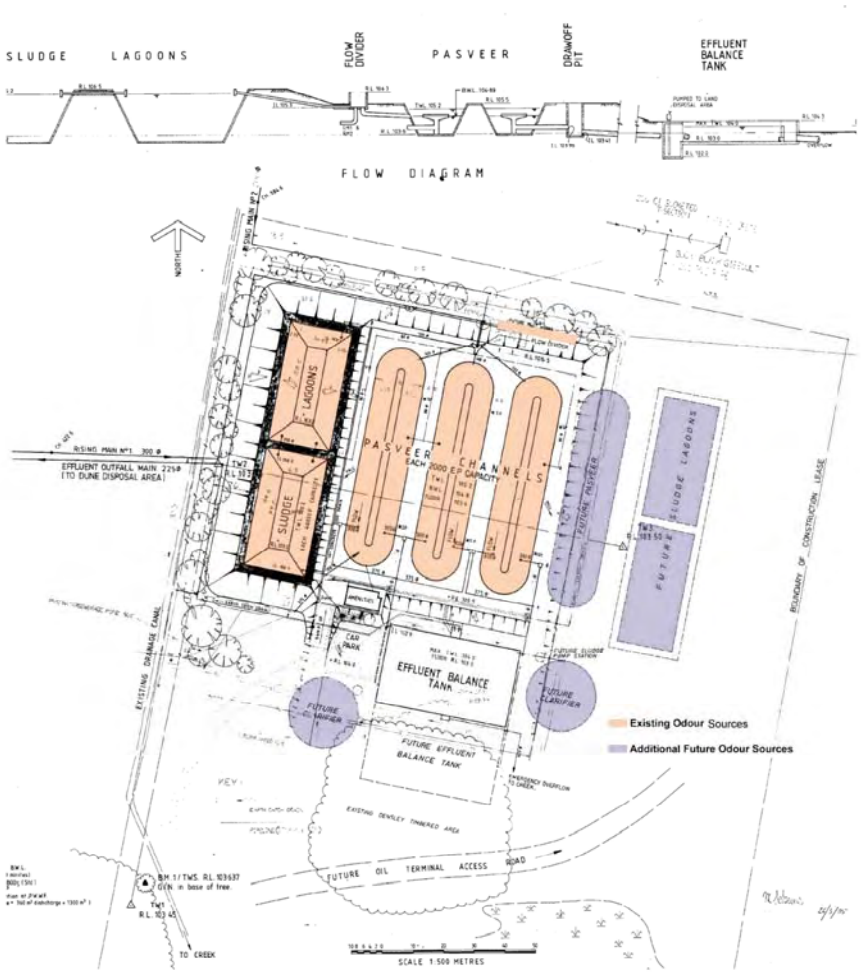
2.1 Overview

This section of the report sets out odour and noise issues associated with the operation of South West Rocks STP.

2.2 Existing and Proposed Upgraded STP Layouts

Figure 2-1 provides a plant layout for South West Rocks STP provided by Kempsey Shire Council for the initial SKM, 2004 study showing existing and potential future odour sources once the plant is upgraded.

- **Figure 2-1 STP Layout Including**



2.3 Review of Existing Reports

Several reports have been completed assessing the level of odour and noise impacts from the plant. These reports have been reviewed, with a summary of the assessment and outcomes provided in the following sections.

These reports include:

- Peter A. Jelliffe, Environmental Engineering and Planning Consultants (Jelliffe): Buffer Zone Assessment South West Rocks STP For the Proposed Subdivision Development South West Rocks (January, 1997)
- Holmes Air Sciences (HAS): Air Quality Assessment – Establishment of a Suitable Buffer Zone for South West Rocks STP (May, 1998)
- Sinclair Knight Merz (SKM): South West Rocks STP – Odour and Noise Assessment (June, 2004)

2.3.1 Comparison of Odour Assessments

A summary of the key findings of these reports with respect to odour impacts is presented in **Table 2-1**. It is difficult to compare the results of each assessments for a number of reasons as follows:

- The reports by Jelliffe, 1997 and Holmes Air Sciences, 1998 were based on odour criteria established under Section 15A of the pre-existing *Clean Air Act, 1961*, while the SKM, 2004 report assesses odours in accordance with *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*, 2001 as required by the *Protection of the Environment Operations (POEO) Act (1997)*.
- The report by Jelliffe, 1997 does not state the buffer distance required to mitigate odour impact, instead saying that odour impacts would be adequately managed within the 650 m buffer determined for management of nigh-time noise impacts. As such it is not possible to compare the results by Jelliffe, 1997 with Holmes Air Sciences, 1998 where both assessments were made using the same criteria.

What can be concluded, however, is that the odour emission rates used by SKM, 2004 in determining odour impacts are approximately 5 times higher than those calculated by Jelliffe, 1997 and Holmes, 1998. As such it is reasonable to assume SKM, 2004 presents a worst-case scenario with respect to odour emissions when compared with each of the other reports. It is also noted that both Holmes Air Sciences, 1998 and SKM 2004 recommend the collection of on-site meteorological data and odour emissions data for use in any subsequent odour impact assessment.

Table 2-1: Report Summary

Report	Total STP Odour Emission Rate Existing ($OU.m^3/s$)	Averaging Period	Peak-to-Mean	Suggested Buffer Distance (m) From Treatment Plant Process Units		Met File
				Existing	Proposed	
Jelliffe, 1997	286.3	3-minute	NA	-	-	Coffs Harbour
Holmes Air Sciences, 1998	339.3	3-minute	NA	150	300	-
SKM, 2004	1550.1	1-second	Near Field (2.5 / 2.3)	100 (normal ops)	250 (normal ops)	TAPM data for STP site and data assimilation with Smokey Cape observations

2.3.2 Comparison of Noise Assessments

In comparing the noise assessments completed by Jelliffe, 1997 and SKM, 2004 - Jelliffe determines that a 650 m buffer zone is required around the existing STP to meet noise criteria established for night-time periods. The preliminary conclusions from SKM, 2004 is that noise impacts from the plant could be could be managed within the 100 m buffer determined for odour management.

Considering these results there is a clear difference in the buffer requirement of the two studies.

The following provides a brief summary of source noise monitoring results from the studies.

Table 2-2 Summary of Source Noise Monitoring Results

Noise Source Data Jelliffe, 1997 LA_{10}	Noise Source Data SKM, 2004 LA_{10}
1) Pasveer Channel x 1 = 60 dB(A) @ 41 m	1) Pasveer Channel x 1 = 74 dB(A) @ 4 m
2) Pasveer Channel x 2 = 63 dB(A) @ 41 m	2) Pasveer Channel x 2 = 76 dB(A) @ 4 m
3) Balance Tank Pump = 71 dB(A) @ 7 m	

It is not possible to directly compare the results from each report as noise measurements were made at different distances from the sources. On the basis of noise attenuation at a rate of approximately 6 dB(A) per doubling of distance from a noise source, the noise measurement results the comparable noise from 2 x pasveer channel aerators at 41 m from the SKM, 2004 measurement is at most 54 dB(A). Jelliffe, 1997 measured 63 dB(A) – a substantially higher noise level.

It is also noted that the balance tank measured by Jelliffe, 1997 has since been replaced by a submerged pump located at the base of the balance tank which would be inaudible beyond the immediate vicinity of the tank.

In summary the lower pasveer channel noise levels measured by SKM, 2004 and the fact the balance tank pump has been replaced explains the significant difference in noise impacts measured between the Jelliffe, 1997 and SKM, 2004 reports.

Noise impacts are investigated in more detail in Section 3 and 4 to follow.

3. Existing Air and Noise Environment

3.1 Overview

This section of the report provides a summary of the existing air (meteorology and air quality) and noise environments in the South West Rocks area.

3.2 Local Meteorology

The closest Automatic Weather Station (AWS) to South West Rocks is at Smokey Cape Light House, which is approximately 2.5 km to the east of South West Rocks. However, data collected at this site is insufficient for AUSPLUME modelling, and wind speeds and directions may not accurately reflect the conditions at the STP.

In this instance there are two options available to gain site representative meteorology, the first being to set up an AWS on site, which was done at the end of June, 2005. The second is to use a prognostic meteorological model to generate this data. In this instance The Air Pollution Model (TAPM) was used to generate meteorology at the site.

TAPM is a three-dimensional prognostic meteorological and air pollution model. TAPM can predict winds, temperature, pressure, water vapour, cloud/rain water and turbulence. The model is driven by six-hourly analysis fields of wind, temperature and specific humidity from the BOM Limited Area Prediction System (LAPS) model, which account for the larger-scale synoptic variability (CSIRO, 2003; Hurley, 2002).

It is was noted that TAPM was used to generate meteorological data for the modelling of odour impacts in the SKM, 2004 report. This report conclude that a AWS should be installed at the STP site.

The following sections provide a summary of climatic conditions at the site.

3.2.1 Temperature

A temperature profile for South West Rocks is shown in **Figure 3-1**. Here 9am temperatures range from 14°C in July to 23°C in January. Temperatures at 3pm range from 17°C in July to 25°C in January.

3.2.2 Rainfall

The annual pattern of rainfall is displayed in **Figure 3-2**. Mean monthly rainfall in January is 148 mm at South West Rocks over an average of 13 days.

Figure 3-1 Temperature Variation at South West Rocks

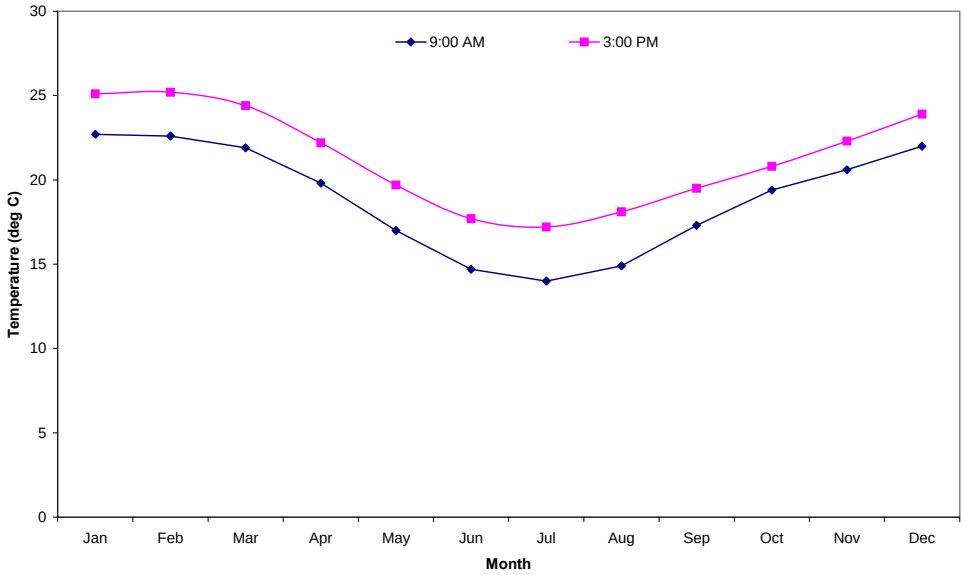
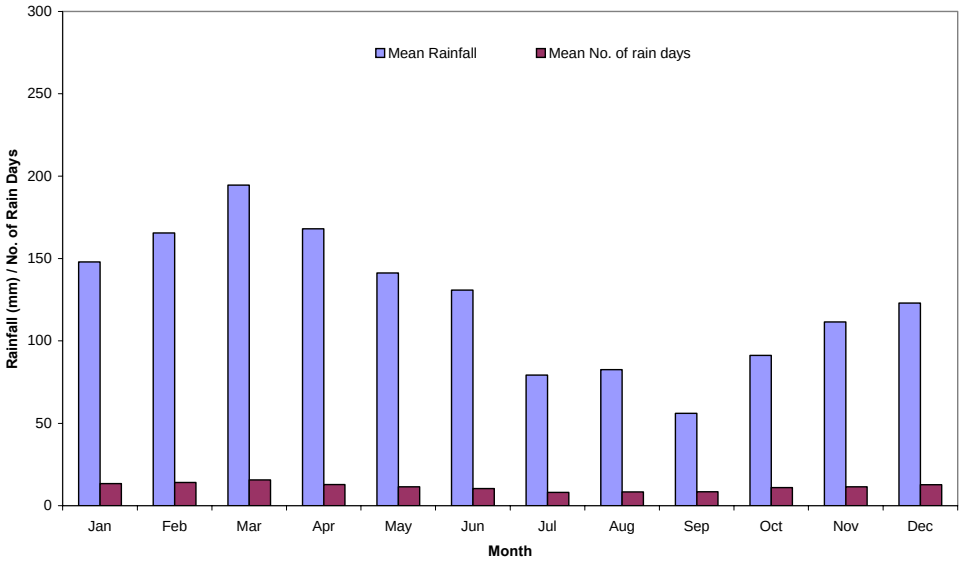


Figure 3-2: Rainfall at South West Rocks

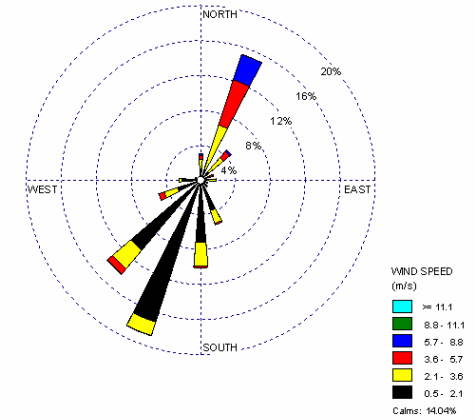


3.2.3 Wind Speed and Direction

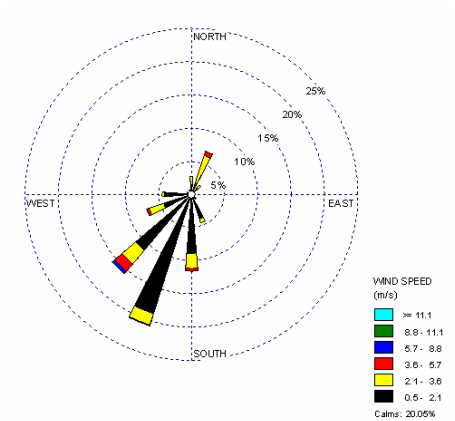
This section of the report sets out a comparison of wind speeds and directions as logged by the on-site AWS, and TAPM predicted meteorology.

- **Figure 3-3: Observed Data**

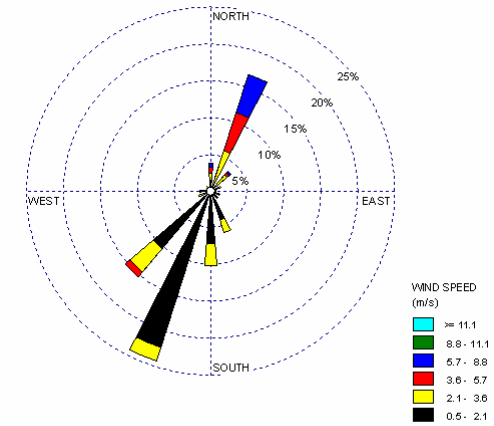
All Hours to Date (July – September 2005)



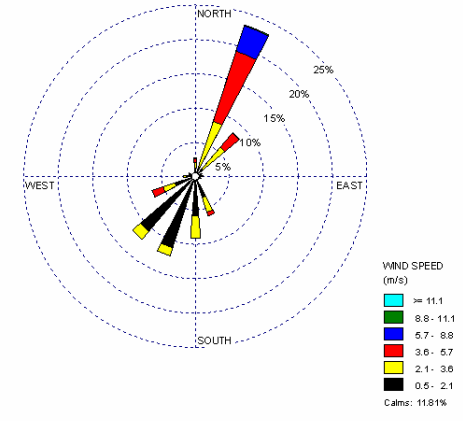
July 2005



August 2005

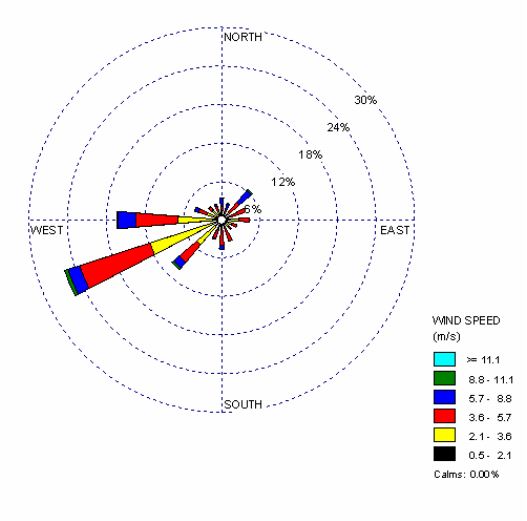


September 2005

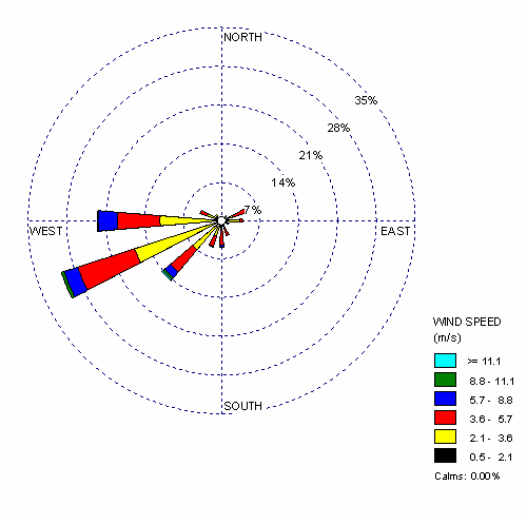


- **Figure 3-4: TAPM Modelled – No Observation Nudging**

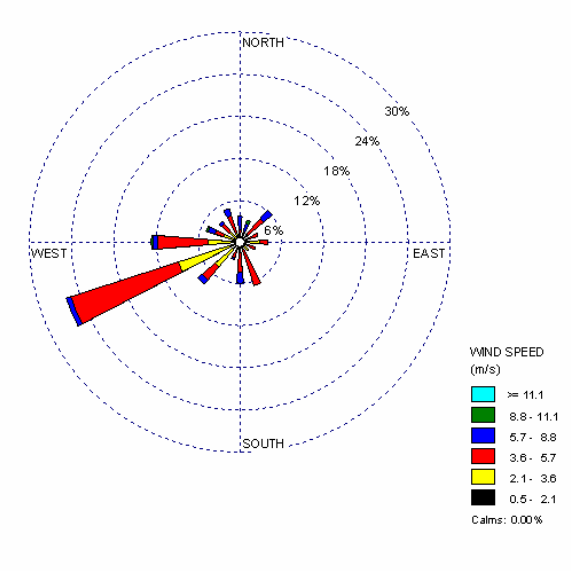
All Hours to Date (July – September)



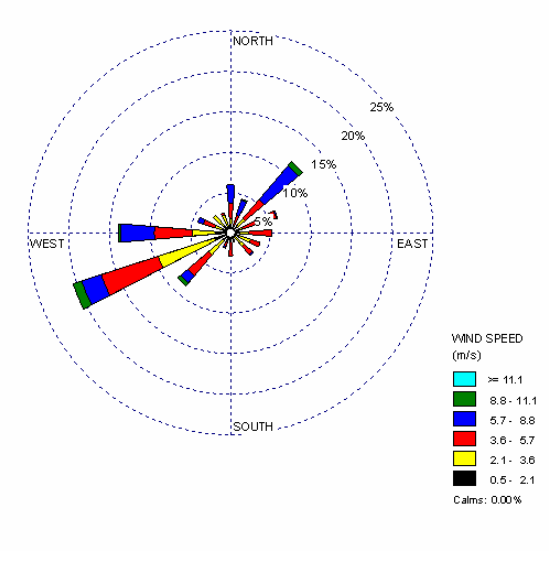
July



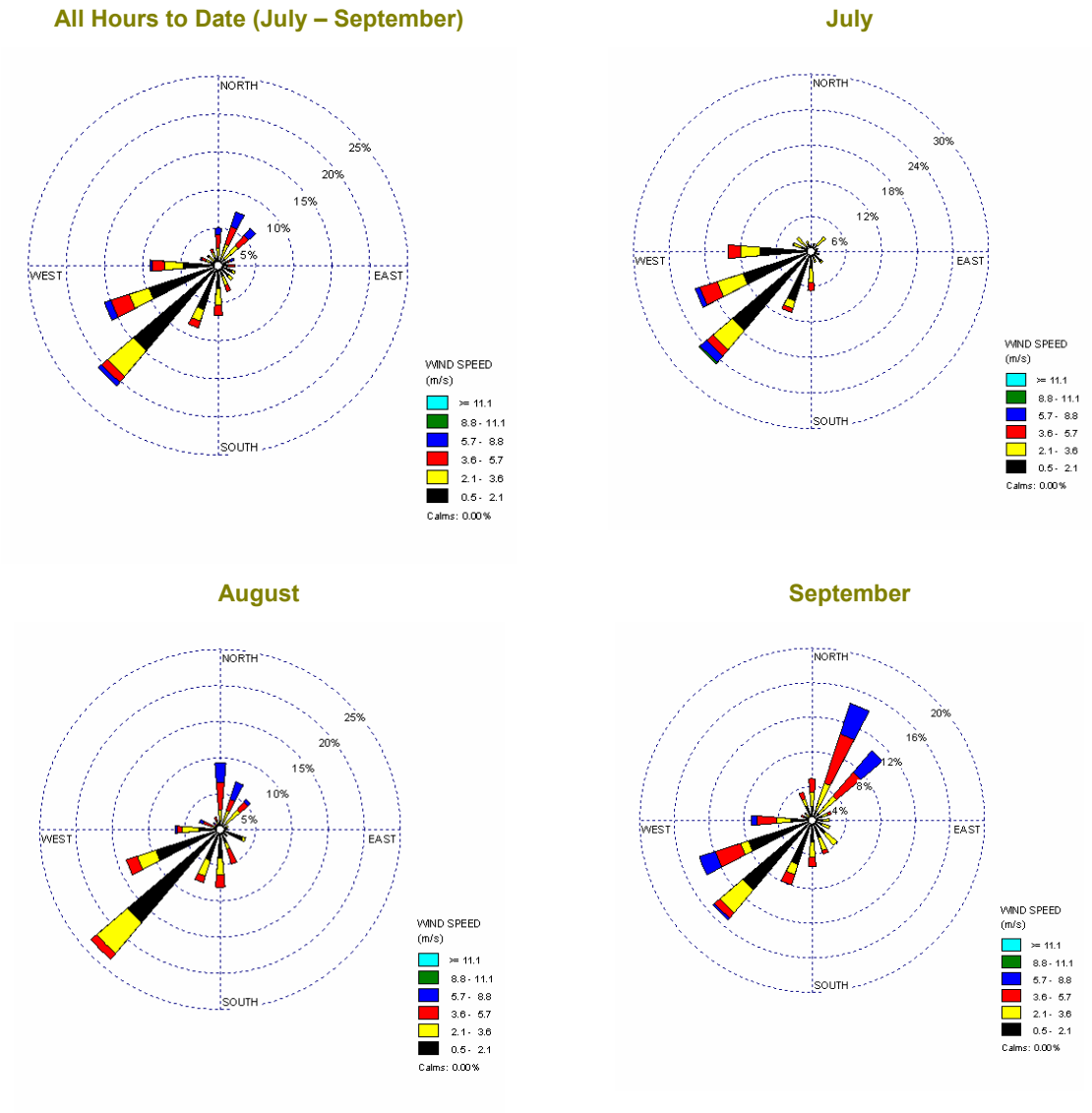
August



September



- **Figure 3-5: TAPM Modelled – With Observational Nudging**

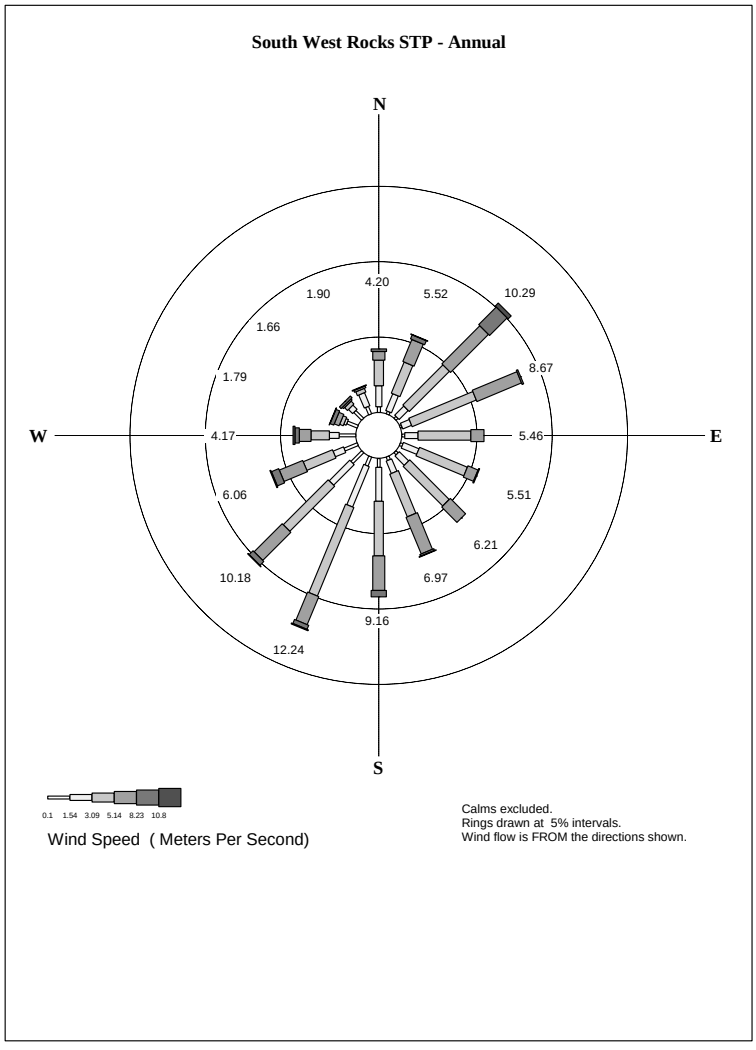


Comparing **Figure 3-3** which is the observation wind data with **Figure 3-4** which is the TAPM prediction for the same time period it can be seen that TAPM does a reasonable job of determining the South West Rocks STP site wind direction patterns during the period July – September 2005. The main difference is in the wind speed patterns where TAPM fails to recognise the significant periods of calm to very low wind speeds measured at the site. Giver the coastal location of South West Rocks it is surprising that there is such a large percentage of time with calm to low wind speeds.

The TAPM prediction is improved when nudged with the observational data as presented in **Figure 3-5**. The wind field data presented in **Figure 3-5** is considered appropriate for odour dispersion modelling to determine interim buffer zone requirements for the treatment plant.

The TAPM generated wind data (annual) used for dispersion modelling in the SKM, 2004 report is shown in **Figure 3-6**.

- **Figure 3-6 Annual Wind Rose for South West Rocks STP, TAPM Generated Data**



3.2.4 Existing Air Quality

Existing air quality in the South West Rocks area, in particular the area to surrounding the treatment works, is considered good with very few sources of air pollution in the area. There are no major industries in the general vicinity of the site with odour from the treatment plant and possibly the mangrove/wetland area to the east being the only potential sources of air pollution in the area.

3.3 Existing Noise Environment

To categorise the range in the background noise levels that prevail from day to day, the EPA's Industrial Noise Policy (INP) recommends that 15 minutes of ambient noise monitoring be undertaken for those times when industry (in this case the STP) would be operational. The monitoring should be undertaken at the most affected noise sensitive location(s). In accordance with the INP, to determine the current ambient noise levels, environmental noise loggers were set up at the locations shown in **Table 3-1** (also shown in **Figure 3-7**).

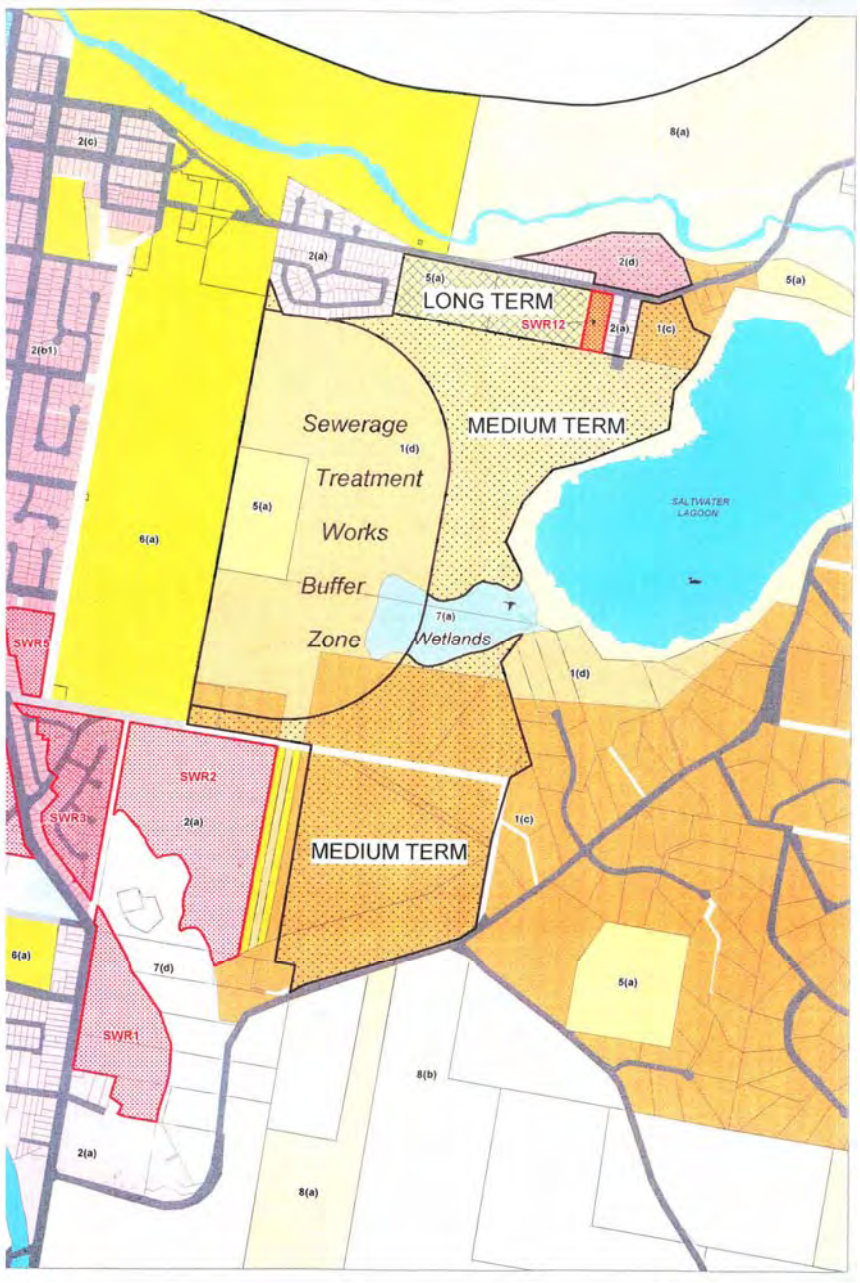
Table 3-1 Noise Logger Locations

Logger #	Location	Easting; Northing: Elevation (m)
194628	Northern LES Area	504816; 6582033; 5 m
194589	Southern LES Area	504788; 6581385; 6 m

The two noise loggers were operated for 10 days (more than the 7 days specified in the INP) from 14/10/05 to 24/10/05. Plotted noise data is included in **Appendix A**. A summary of noise statistics determined from the noise logger data is provided in the following tables:

- **Table 3-2** - Northern LES Area; and
- **Table 3-3** - Southern LES Area.

- **Figure 3-7 Noise Logger Locations**



- **Table 3-2 Summary of Unattended Noise Monitoring – Northern LES Area**

Statistic		Noise Level
Rating Background Level (L90)		
	Day	34.0
	Evening	34.4
	Night-time	33.8
L_{Aeq} over the monitoring Period		
	Day	51.4
	Evening	40.6
	Night-time	45.1

- **Table 3-3 Summary of Unattended Noise Monitoring – Southern LES Area**

Statistic		Median Noise Level – dB(A)
Rating Background Level (L90)		
	Day	48.5
	Evening	41.3
	Night-time	43.6
L_{Aeq} over the monitoring Period		
	Day	53.6
	Evening	50.5
	Night-time	51.3

The measured noise data was screened to exclude adverse meteorological conditions (wind and rain) which may have influenced the results of noise monitoring. The meteorological data was supplied from the AWS operating at South West Rocks STP.

In reviewing the noise data it can be seen that the median ambient noise levels measured in the Southern LES Area are significantly higher than those measured in the Northern LES Area. This was not evident during the site visit on 14 October when measured background (LA_{90}) noise levels at both the Northern and Southern LES Area monitoring locations were 30 – 32 dB(A) during day, evening and night-time periods (refer to **Appendix A**). The treatment plant was fully operational on 14 October when attended noise measurements were made with the exception of one pasveer channel. No noise from the treatment plant was determined to be contributing to these very low background noise levels on 14 October. It is expected that inclement weather between 19 and 24 October which has not been entirely excluded from the noise survey data has caused the increase in ambient noise levels in the second half of the survey period.

Additional noise monitoring undertaken on the night of Friday 4 November 2005 identified the significant difference in noise levels between the Northern and Southern LES Areas to be insect noise within the Southern LES Area, with this area being densely vegetated, while the Northern LES Area is cleared.

4. Odour and Noise Criteria

4.1 Overview

This section of the report sets out odour and noise criteria for the assessment of impacts at South West Rocks STP.

4.2 Odour Criteria

4.2.1 Overview

Odorous compounds or mixtures of compounds require an assessment of odour levels. The intensity of a particular odour as determined by olfactometry is described in terms of odour units (OU) which relate to the number of times odorous air must be diluted with odour-free air in order for 50% of a selected panel of 'sniffers' to detect a smell. Hence 1 OU indicates that an equal volume of air is required to dilute a particular volume of odorous air to a level at which half the panel were able to detect the smell. The point at which only 50% of the panel can detect the smell is called the odour threshold.

4.2.2 Odour Criteria in NSW

The NSW DEC regulates air quality in NSW, with odour criteria objectives being set to minimise the adverse effects of dispersion of odorous emissions from odour-producing activities. These objectives are used in association with the results from odour dispersion modelling to assess the likelihood of odour nuisance from South West Rocks STP.

The objectives of reducing odour annoyance are regulated by the Protection of the Environment Operations (POEO) Act (1997). Section 129(1) of this Act states:

> *The occupier of any premises at which scheduled activities are carried on under the authority conferred by a licence must not cause or permit the emission of any offensive odour from the premises to which the licence applies.*
>
> The Act then defines an "offensive odour" as:
>
> *that, by reason of its strength, nature, duration, character, or quality, or the time at which it is emitted, or any other circumstances:*
>
> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.*

The level at which an odour is perceived to be of nuisance depends on: the combination of odour quality; The sensitivity of the given population to odours, the background odour level, the tolerance of the community to odour, and the characteristic of the source (NSW DEC). Consequently the odour performance criteria in the document are based on population density and these are displayed in **Table 4-1** (*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*). These criteria state that no individual should be exposed to ambient odour levels greater than 7 OU and the level from which odours cause annoyance is 2 OU.

Table 4-1 Recommended Odour Performance Criteria

Size of Affected Community	Odour Performance Criteria # (Odour Units)
Urban (Population ≥ ~ 2000)	2.0
Population ~ 500	3.0
Population ~ 125	4.0
Population ~ 30	5.0
Population ~ 10	6.0
Single Residence (≤ ~2)	7.0

nose-response time average, 99th percentile

A Level 2 impact assessment was used to assess odour impacts for this assessment. The Level 2 assessment is defined as a "refined dispersion modelling assessment using site-specific input data. This is the most realistic and comprehensive level of assessment available" (DEC, 2005).

For a Level 2 impact assessment, odour criteria must be complied with 99% of the time, using site representative hourly-averaged meteorological data of at least one year's duration and suitable peak-to-mean ratios.

Based on the existing and possible future population distribution and density within the area immediately beyond the boundary of the sewage treatment plant, an odour performance criterion level of 2 OU is considered appropriate to assess odours at and beyond the boundary of the site.

4.3 Noise Criteria

In January 2000, the EPA released the Industrial Noise Policy (INP), which provides a framework for deriving project specific noise limits for consents and licences for particular projects. The following assessment has been conducted in accordance with the guidelines of the INP.

The assessment of noise is complex and can be subjective when assessed to a particular individual. The INP is targeted at assessing the potential for noise impacts expected at a community level, and is based on reactions to social surveys. The EPA advocates that the assessment procedure should not be considered in isolation from other social and economic aspects of a development.

The INP requires that if noise from the development under assessment complies with the lower of the amenity or intrusiveness criterion level, then no acoustical impact would be expected. The intrusive criteria relates to the difference between the noise under assessment and the RBL (or long-term) background noise level. The amenity criterion is set based on the zoning and the landuse of the receiver location and the extent of the existing industry noise in the area. The project specific noise criteria is generally set, based on the more stringent of the amenity or intrusive criteria.

4.3.1 Operational Noise Objectives

The project specific noise objectives determined for the treatment plant were derived in accordance with the INP and are to be regarded as design objectives for the project.

Intrusive Noise Criteria

A noise source will be deemed to be non-intrusive if the $L_{Aeq,\ 15\ minute}$ level does not exceed the rating background level (RBL) by more than 5 dB(A) for each of the day, evening and night-time periods. The noise must not be tonal, impulsive or have other modifying factors as outlined in Chapter 4 of the INP.

To categorise the range in the background noise levels that prevail from day to day, the EPA recommend that at for large projects, one week of ambient noise monitoring be undertaken. For each discrete day, evening and night-time period, the 10^{th} percentile of the individual background noise levels needs to be determined. The RBL is the median of each of the 10^{th} percentile values over all of the days within each time period.

Based on the RBL noise levels at the nearest representative residential dwellings to the treatment plant (Northern and Southern LES Areas) the project specific intrusive noise objective has been determined as an L_{Aeq} level of 35.0 dB(A) within the general vicinity of any residential dwelling, that is the lowest RBL of 30 dB(A) plus 5 dB(A).

Amenity Noise Criteria

The amenity criteria applicable at existing and future residential receivers adjacent to the treatment plant determined in accordance with Table 2.1 of the INP, is defined as:

- Day: 50 dB(A)
- Evening: 45 dB(A)
- Night: 40 dB(A)

These levels are based on the determination that the surrounding environment is “Rural”.

4.3.2 Project Specific Criteria

The project specific noise criteria is equivalent to the potential for intrusive noise as outlined above. That is, the noise levels (LA_{eq}) in the vicinity of any future residential dwellings within the Northern and Southern LES Areas resulting from operation of the treatment pant should not exceed 35 dB(A).

For day-time only operations eg. sludge dewatering or mobile pump use an appropriate criteria would be 40 dB(A).

5. Odour Impact Assessment

5.1 Overview

This section of the report provides an assessment of odour impacts associated with operation of South West Rocks STP.

5.2 Odour Modelling Methodology

The methodology employed for assessing odour impacts from the STP is based on the NSW EPA guidelines "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*". For this study the Gaussian plume dispersion model, AUSPLUME (v6), was used to model odour from the STP. Modelled impacts were then compared to NSW EPA criteria as discussed in **Section 4.2**.

5.3 Odour Emission Rates

Figure 2-1 shows odour sources at South West Rocks STP, both existing and future, once the treatment plant is upgraded.

At this stage no odour measurements have been made at the treatment plant. Rather for this initial assessment odour source concentrations for normal treatment plant operating conditions were derived from existing data from similar treatment plant process units at other STPs.

As previously discussed the odour emission rates considered here are very conservative when compared with those adopted by Jelliffe, 1997 and Holmes Air Sciences, 1998. Odour concentrations and calculated emission rates used in this assessment are presented in **Table 5-1**.

From the initial site visit by SKM in 2003 the strongest source of odour was that associated with one of the sludge lagoons being emptied and sludge dewatering with a mobile belt press (MBP). The other sludge lagoon had a thick cake of dry sludge on the top and no odour was present.

There was no sludge dewatering during the recent site visit in October 2005.

Table 5-1 – Assumed Odour Emissions for South West Rocks STP

Source	Odour Concentration OU	SOER $OU.m^3/s/m^2$	Area (m^2)	Emission rate with peak-to-mean ratio (Oum^3/s)	
				Convective Atmosphere*	Stable Atmosphere**
Existing Sources					
IW	2230	0.763	27	51.480	47.361
PS 1	300	0.103	864	221.616	203.887
PS 2	260	0.089	864	192.067	176.702
PS 3	280	0.096	864	206.842	190.294
SL 1	720	0.246	684	421.070	387.385
SL 2	720	0.246	684	421.070	387.385
MBP	2000	0.684	21	35.910	33.037
Future Sources					
PS 4	280	0.096	864	206.842	190.294
SL 3	720	0.246	583	358.895	330.183
SL 4	720	0.246	583	358.895	330.183
C 1	250	0.086	314	67.118	61.748
C 2	250	0.086	314	67.118	61.748
Total (exist + future)				**2608.921**	**2400.207**

IW = inlet works, PS = pasveer channel, SL = sludge lagoon, C = clarifier, MBP = mobile belt press
* Refers to atmospheric stability class A-D
**Refers to atmospheric stability class E and F

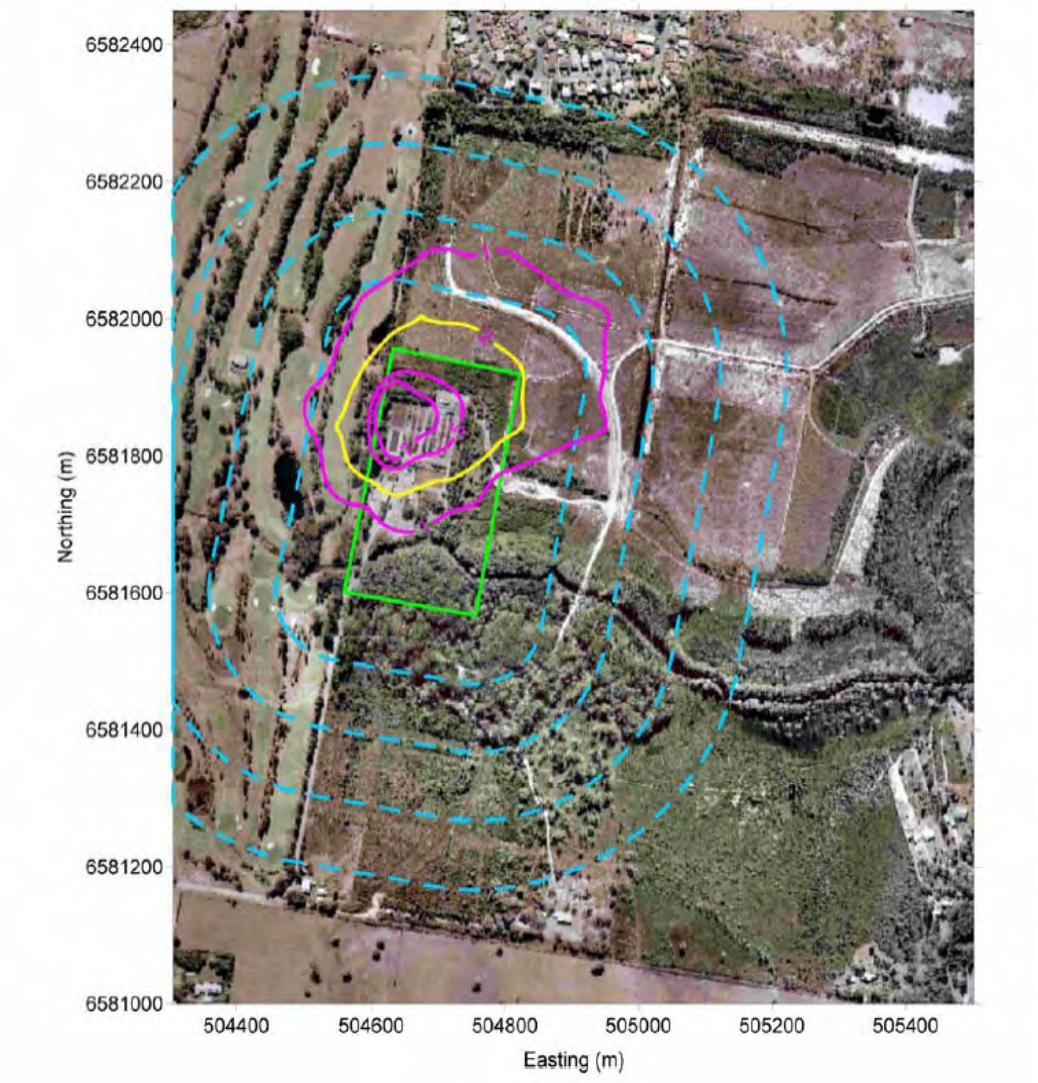
5.4 Odour Modelling Results

5.4.1 Existing Plant

The odour modelling for the existing plant has been undertaken using TAPM meteorological data nudged with STP site observations collected during July – September 2005 as described in Section 3.2.

The results of odour modelling are shown in **Figure 5-1**.

- **Figure 5-1 Existing STP Odour Impacts – July to September 2005 Meteorology**



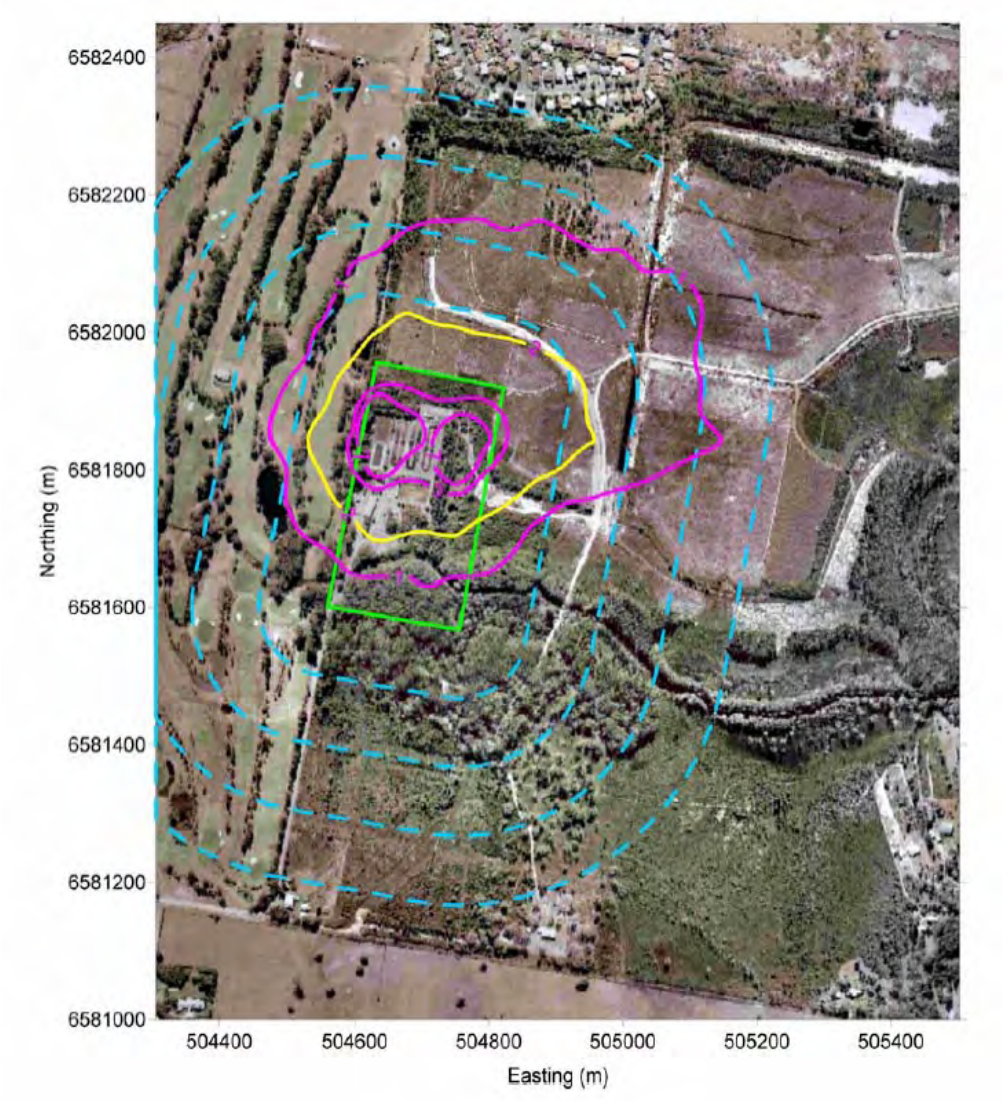
It can be seen from the results of modelling that the 2 OU/m^3 criterion contour does not extend into the Northern or Southern LES Areas more than 70 m beyond the treatment plant boundary.

5.4.2 Future Upgraded Plant

The odour modelling for the future upgraded plant has been undertaken using TAPM meteorological data nudged with STP site observations collected during July – September 2005 as described in Section 3.2.

The results of odour modelling are shown in **Figure 5-2**.

- **Figure 5-2 Future STP Odour Impacts – July to September 2005 Meteorology**



It can be seen from the results of modelling that the 2 OU/m^3 criterion contour does not extend into the Northern or Southern LES Areas more than 150 m beyond the treatment plant boundary.

5.4.3 Discussion of Results

Odour modelling using odour emissions data which is considered conservative compared with emissions estimated by Jelliffe, 1997 and Holmes Air Sciences, 1998 and meteorological data collected at the STP in the period July – September 2005 has been undertaken for the both the existing treatment plant and a possible future upgraded treatment plant layout.

In both the existing and future cases it is shown that odour impacts (2 OU/m^3) do not extend more than 70 m and 150 m respectively into the LES area.

The odour modelling results are, however, larger than those predicted by SKM, 2004. The main reason for this is that the measured wind speeds at the site as detailed in Section 3.2 are in general lower than those determined by TAPM in the absence of any data assimilation (nudging) with site measured data. The lower wind speeds as measured do not provide for enhanced odour dispersion and hence result in higher ground level odour concentrations.

These results demonstrate the importance of site specific meteorological data as recommended by SKM, 2004.

As the modelling is only based on 3 months of meteorological data it is strongly recommended that at least 12 months data is collected and the odour modelling finalised before final buffer distances are determined.

6. Noise Impact Assessment

6.1 Overview

This section of the report provides an assessment of noise impacts associated with the operation of South West Rocks STP.

6.2 Noise Impact Assessment

As outlined in Section 2.3.2 the only continuous source of dominant noise at the treatment plant are the surface aerators used in the 3 pasveer channels.

A mobile pump is also located on-site and is used on occasions to pump out the various treatment lagoons at the site. It is understood that a mobile sludge dewatering plant (centrifuge) is also used on occasions. Both the mobile pump and sludge dewatering plant are only used during day-time working hours. **Figure 6-1** provides photographs of each of these noise sources.

- **Figure 6-1 Noise Sources - Pasveer Aerators and Mobile Pump**

The aerator noise data was measured on-site, while the pump data was sourced from another SKM project for a similar pump.

6.2.1 Modelling Approach

In order to assist with the assessment of potential noise impacts from the project, a number of noise investigation models were established. **Table 6-1** provides a summary of the noise investigation scenarios.

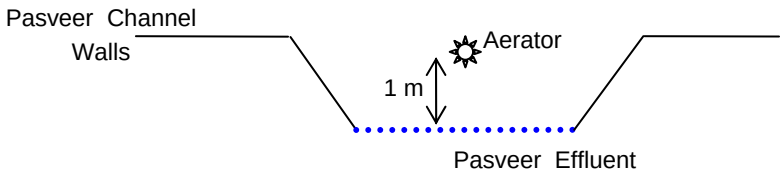
Table 6-1 Noise Investigation Scenarios

Scenario	Noise Source	No.	Meteorological Conditions
1. Two pasveer channels	Aerator	4	▪ night-time temperature inversion (F-class stability), calm winds, relative humidity: 70%, temp: 10°C.
2. Three pasveer channels	Aerator	6	▪ night-time temperature inversion (F-class stability), calm winds, relative humidity: 70%, temp: 10°C.
3. Four pasveer channels	Aerator	8	▪ night-time temperature inversion (F-class stability), calm winds, relative humidity: 70%, temp: 10°C.
4. Four Pasveer channels and 1.9 m NOISE WALL along N and E perimeter of pasveers	Aerator	8	▪ night-time temperature inversion (F-class stability), calm winds, relative humidity: 70%, temp: 10°C.
5. Four pasveer channels and one sludge dewatering pump	Aerator Sludge Dewatering	8 1	▪ daytime atmospheric lapse conditions (D-class stability), calm winds, relative humidity: 55%, temp: 20°C

The predictions were made using the CONCAWE algorithms as implemented within the SoundPLAN suite of noise prediction programs. The model calculates noise levels, considering the effects ground terrain, meteorology, the locations of representative sensitive receivers and the level of noise emission from the various work activities.

Terrain information was sourced from survey data for the site.

The source sound power level spectral information used as input to the investigation scenarios are summarised in **Table 6-2.** The aerators for each pasveer channel where input to the model as two point sources, located midway along each channel, at an elevation of 1.0 m above the liquid surface.



- **Table 6-2 Sound Power Level Data (dB(L))**

Item	Frequency (Hz)										
	Total (A)	Total (L)	31.5	63	125	250	500	1250	2000	4000	8000
Pasveer Aerator	97.2	101.8	78.2	86.5	91.3	89.1	87.0	85.4	84.7	84.1	82.6
Pump (no noise control)	110.4	115.3	102	101	112	106	105	107	104	93	77
Pump (with noise control)		82.47	69	70	80	76	71	66	63	55	

Two arbitrary sensitive receivers were input to the model at a height of 1.5m above local ground levels (refer to **Figure 3-7**). The specified locations are the same locations as those where environmental noise loggers were located

Free field noise level predictions were made at each of the receiver locations.

6.2.2 Predicted Noise Levels

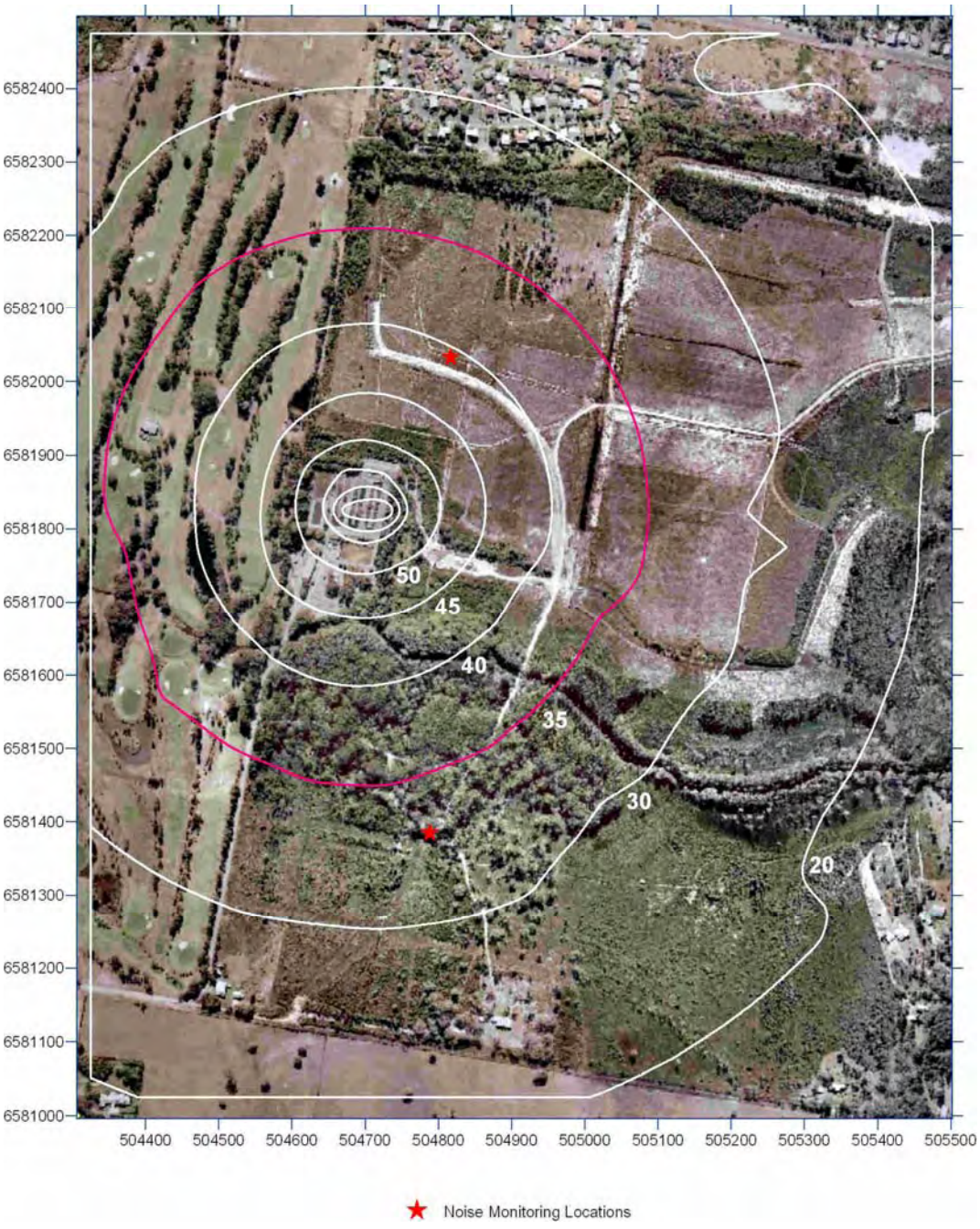
The calculated L_{Aeq} noise levels at the arbitrary receiver locations, for the assessment scenarios outlined in **Table 6-1**, are summarised in as single point predictions in **Table 6-3**. The results for Scenario 3 and 4 have also been presented as noise contour plots in **Figure 6-2** to **Figure 6-3**, however the contours have been interpolated from the modelling grid and are considered to be a less accurate representation of the noise levels than the point calculations.

- **Table 6-3 Predicted L_{Aeq} Noise Levels (dB(A))**

Receiver Location	Predicted L_{Aeq} Noise Levels (dB(A))					Criteria
	Scenario 1	Scenario 2	Scenario 3	Scenario 4 (Including Noise Wall)	*Scenario 5 (Non-adverse Meteorology)*	
Northern LES Area	**37.6**	**39.2**	**40.7**	34.4	*37.8*	35 dB(A) Scenario 1-4 40 dB(A) Scenario 5
Southern LES Area	30.0	31.6	33	32.4	*28.9*	35 dB(A) Scenario 1-4 40 dB(A) Scenario 5

Scenario 4 incorporates a 1.9 m noise wall, located along the northern and eastern perimeter of the pasveer channel area of the plant (represented as an orange line in Figure 6-3). The model assumes that the noise wall footings were at the same RL as the pasveer channel bunds (that is RL 5 m).

- **Figure 6-2 Predicted Noise Levels – 4 Pasveers Nigh-time Noise Impact with Temperature Inversion (Scenario 3) (dB(A))**



- **Figure 6-3 Predicted Noise Levels – 4 Pasveers with 1.9m Noise Wall along northern and eastern boundary (Scenario 4) (dB(A))**

6.2.3 Discussion of Results

In summary the results of noise modelling show that predicted noise impacts from the continuous pasveer aerator operations do not exceed the pre-determined night-time noise criteria of 35 dB(A) within the Southern LES Area beyond 100m of the treatment plant boundary under either the existing or upgraded STP operational scenarios.

Within the Northern LES Area the 35 dB(A) criteria is exceeded up to 200 m from the treatment plant boundary. The placement of a 1.9 m barrier wall constructed immediately to the north and east of the pasveer channels, provides for compliance with the 35 dB(A) criteria at locations within 150 m of the treatment plant boundary.

Alternatively the provision of covers over the aerators to reduced sound power levels by 5 dB(A) would also ensure compliance with the predetermined noise criteria within the same buffer area. This may be a more cost effective solution to the provision of noise walls, however, the feasibility of installing covers would need to be discussed with Council and the Macleay Water treatment plant operators.

Noise impact associated with the operation of the mobile sludge dewatering plant or mobile pump as well as operation of four pasveer channels (Scenario 5) does not cause any exceedance of the 40 dB(A) criteria beyond the buffer distances identified above determined for day-time periods.

7. Conclusions and Recommendations

7.1 General Conclusions

This report has provided a preliminary assessment of odour and noise impacts at South West Rocks STP.

Odour impacts have been assessed in accordance with the EPA document: *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*. A nose response time odour criteria of 2 OU (99th percentile) has been applied to the assessment.

Noise impacts have been assessed in accordance with EPA's *Industrial Noise Policy (INP)*. An intrusive noise criteria of 35 dB(A) for the continuous 24 hours per day operation of the treatment plant has been determined. For day-time operations a criteria of 40 dB(A) would apply.

With respect to odour impacts based on site meteorological data collected during July – September 2005 it is concluded that for the existing plant under normal operating conditions odour impacts (2 OU/m^3) do not extend beyond 70 m from the treatment plant boundary into the Northern and Southern LES Areas. For the upgraded plant with no odour controls odour impacts (2 OU/m^3) are maintained within 150 m of the treatment plant boundary.

In terms of noise impact, noise emissions from the STP are not considered substantial and from the preliminary investigation it can be concluded that the construction of 1.9 m noise wall immediately to the north and east of the pasveer channels would mitigate any exceedance of noise criteria beyond 150 of the treatment plant boundary from operation of the plant that otherwise may occur. Alternatively covers over the pasveer aerators could be used to manage noise impacts.

7.2 Recommendations

This report assesses and concludes that both odour and noise impacts associated with the operation of South West Rocks STP can be managed within a buffer area less than the typical 400 m prescribed for sewage treatment plants.

It should be noted that this assessment is considered preliminary, using odour emission which is considered a best estimate for the site, in the absence of any site specific measurements being made. It is also based on only 3 months meteorological data out of a total of 12 months data typically required for such assessments.

The following is recommended to confirm the results of this assessment:

- Collection of 12 months meteorological data at South West Rocks STP to confirm longer term meteorological conditions are similar to those used for the assessment.

- Odour measurements made at the treatment plant to confirm the odour emissions data used in this assessment. Any odour sampling should be completed in accordance with AS/NZS4323.3. Typically odour measurements are made in dry weather flow conditions in both winter and summer months to capture any seasonal variation in odour associated with varying temperatures.
- Reconsideration of odour impacts using site specific meteorological and odour emission data, and with any alternative odour controls determined with Council input.

Appendix A Noise Survey Data

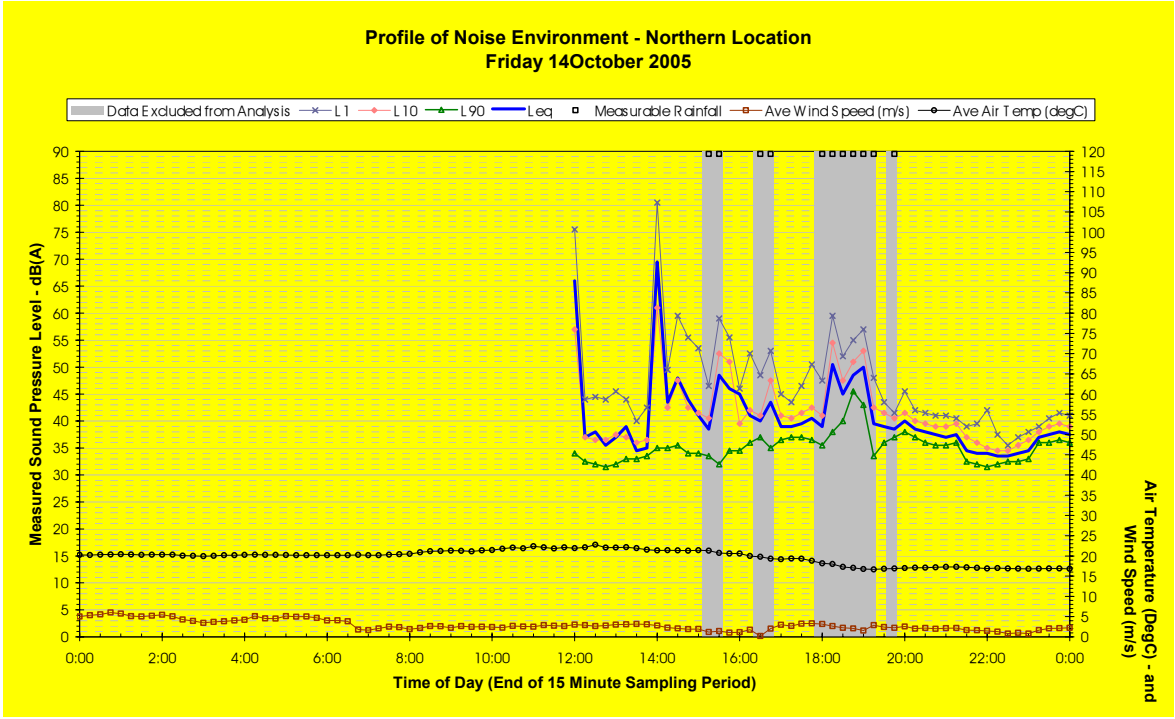
A.1 Northern LES Area

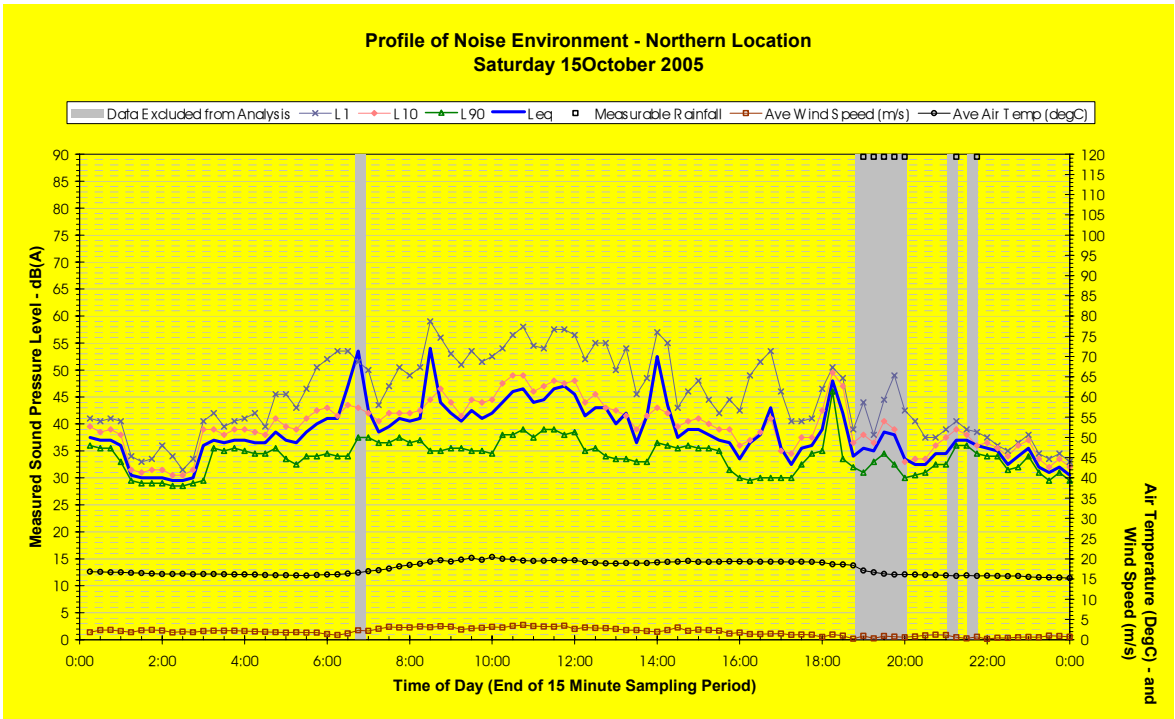
Profile of Noise Environment - Northern Location

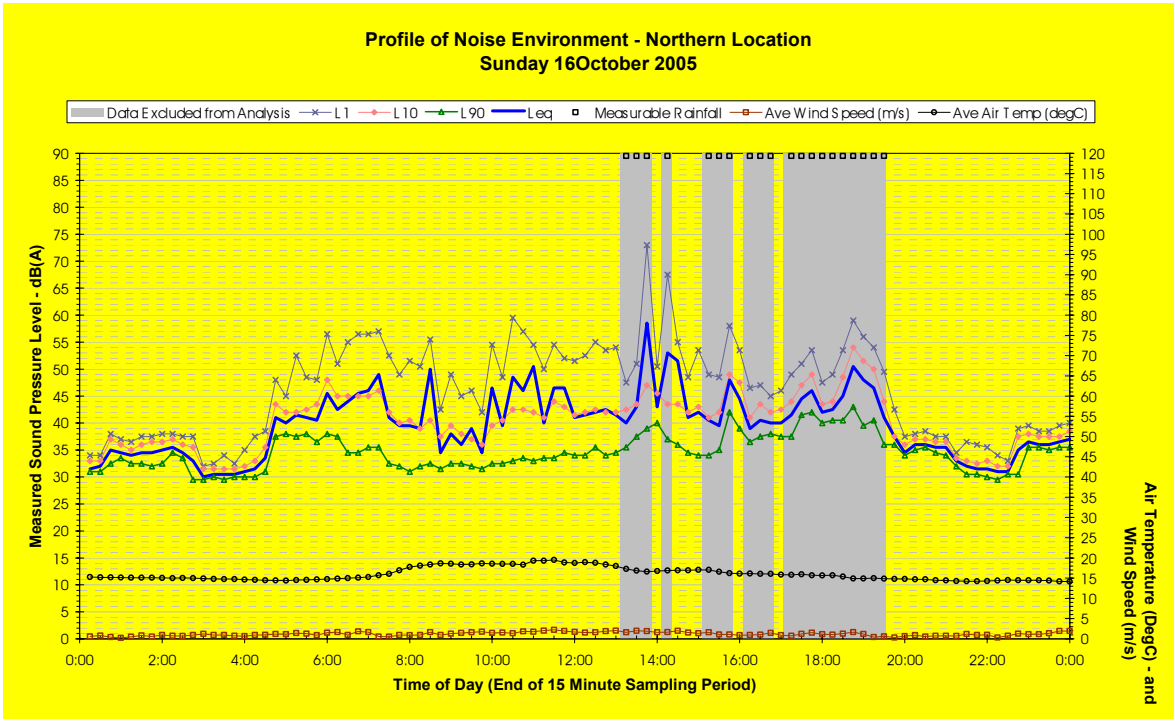
7:00:00 AM to 6:00:00 PM	Lmax (10th Percentile)	L1 (10th Percentile)	L5 (10th Percentile)	L10 (10th Percentile)	L50 (10th Percentile)	L90 (10th Percentile)	L95 (10th Percentile)	L99 (10th Percentile)	Lmin (10th Percentile)	Leq (10th Percentile)	Leq - over period
Friday 14October 2005	53.1	43.7	38.5	36.5	34.0	32.0	31.7	31.2	30.2	36.1	57.3
Saturday 15October 2005	51.6	42.7	38.8	37.5	32.3	30.0	29.5	29.5	28.5	36.2	43.9
Sunday 16October 2005	57.0	46.0	41.5	39.2	34.2	32.0	31.5	31.0	30.0	39.0	46.7
Monday 17October 2005	60.7	48.2	42.5	41.0	38.0	36.0	35.1	34.5	33.8	40.2	51.4
Tuesday 18October 2005	65.0	56.2	49.1	45.5	40.2	37.5	37.2	36.0	35.5	45.0	53.5
Wednesday 19October 2005	59.7	46.2	41.7	39.5	36.0	34.0	34.0	33.2	32.5	38.7	56.8
Thursday 20October 2005	58.2	46.0	41.2	40.0	36.8	34.0	33.2	32.7	31.7	39.0	59.2
Friday 21October 2005	56.8	46.8	41.3	39.5	35.7	33.5	33.0	32.2	31.3	38.5	48.1
Saturday 22October 2005	52.7	43.5	40.0	37.5	33.5	31.7	31.2	31.0	29.5	35.7	52.3
Sunday 23October 2005	56.7	44.5	41.2	39.5	36.0	34.0	33.5	32.5	31.5	37.5	48.0
Monday 24October 2005	61.5	50.0	45.5	43.9	40.0	38.4	37.9	37.4	36.0	41.5	50.0
Median	57.0	46.0	41.3	39.5	36.0	34.0	33.2	32.5	31.5	38.7	51.4

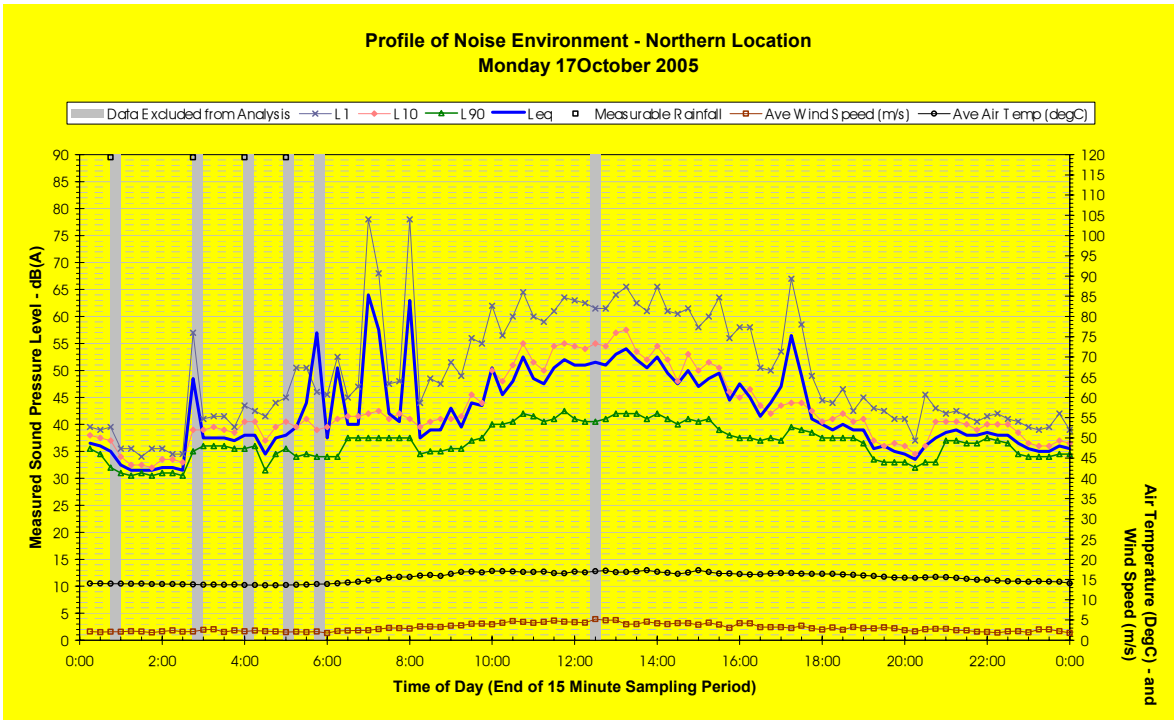
6:00:00 PM to 10:00:00 PM	Lmax (10th Percentile)	L1 (10th Percentile)	L5 (10th Percentile)	L10 (10th Percentile)	L50 (10th Percentile)	L90 (10th Percentile)	L95 (10th Percentile)	L99 (10th Percentile)	Lmin (10th Percentile)	Leq (10th Percentile)	Leq - over period
Friday 14October 2005	43.6	40.0	37.3	36.5	33.8	32.3	31.8	31.3	30.8	34.3	43.6
Saturday 15October 2005	44.0	37.5	34.3	33.5	32.0	30.8	30.3	29.8	29.3	33.0	39.1
Sunday 16October 2005	45.3	35.8	33.8	33.0	31.8	30.5	30.0	29.5	29.5	31.8	42.9
Monday 17October 2005	44.5	40.8	37.5	36.0	34.0	33.0	32.5	32.3	31.3	34.8	37.7
Tuesday 18October 2005	44.8	41.8	40.5	39.5	37.8	36.0	36.0	35.3	34.3	38.0	41.1
Wednesday 19October 2005	41.8	38.8	38.0	37.8	36.0	34.3	34.3	33.5	32.5	36.0	39.8
Thursday 20October 2005	47.0	42.0	40.0	39.5	37.5	36.5	36.0	35.5	34.8	37.8	39.6
Friday 21October 2005	47.3	43.0	41.0	40.3	38.5	37.5	37.3	36.5	36.0	39.0	42.9
Saturday 22October 2005	40.3	38.3	37.5	37.3	36.0	34.5	34.5	33.8	32.8	35.8	40.1
Sunday 23October 2005	51.3	43.0	41.3	40.8	39.5	38.5	38.0	37.5	36.5	39.5	43.2
Monday 24October 2005											
Median	44.6	40.4	37.8	37.5	36.0	34.4	34.4	33.6	32.6	35.9	40.6

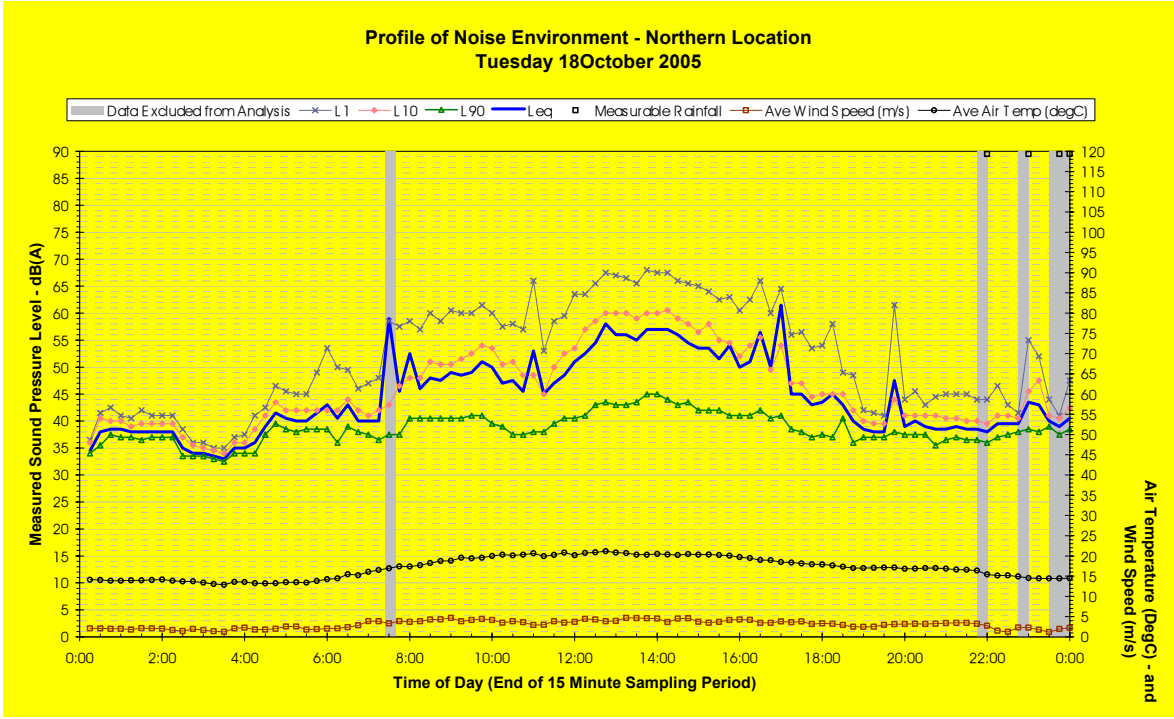
10:00:00 PM to 7:00:00 AM	Lmax (10th Percentile)	L1 (10th Percentile)	L5 (10th Percentile)	L10 (10th Percentile)	L50 (10th Percentile)	L90 (10th Percentile)	L95 (10th Percentile)	L99 (10th Percentile)	Lmin (10th Percentile)	Leq (10th Percentile)	Leq - over period
Friday 14October 2005	39.3	33.8	32.0	31.5	30.0	29.0	29.0	28.5	28.0	30.0	40.9
Saturday 15October 2005	39.0	33.3	32.0	31.8	31.0	29.5	29.5	29.3	29.0	30.5	38.7
Sunday 16October 2005	43.8	34.5	33.0	32.5	31.3	30.5	30.0	29.5	29.5	31.5	49.7
Monday 17October 2005	39.0	36.3	35.8	35.8	34.3	33.5	33.3	32.8	32.0	34.3	38.4
Tuesday 18October 2005	49.5	41.0	40.3	39.8	38.0	36.0	36.0	35.5	34.5	38.8	45.7
Wednesday 19October 2005	45.0	39.8	37.8	37.5	33.8	32.3	32.3	31.5	31.0	35.8	45.8
Thursday 20October 2005	47.3	43.5	41.5	40.5	38.0	35.5	34.8	34.0	33.0	39.0	45.4
Friday 21October 2005	44.0	41.3	40.3	39.5	38.3	37.3	36.8	36.3	35.5	38.5	41.8
Saturday 22October 2005	44.8	42.5	41.3	40.5	38.8	36.8	36.3	35.5	34.0	39.0	44.8
Sunday 23October 2005	46.5	41.8	39.8	38.8	36.3	34.5	34.3	33.8	33.0	37.0	46.9
Monday 24October 2005											
Median	44.4	40.4	38.8	38.1	35.3	34.0	33.8	33.3	32.5	36.4	45.1

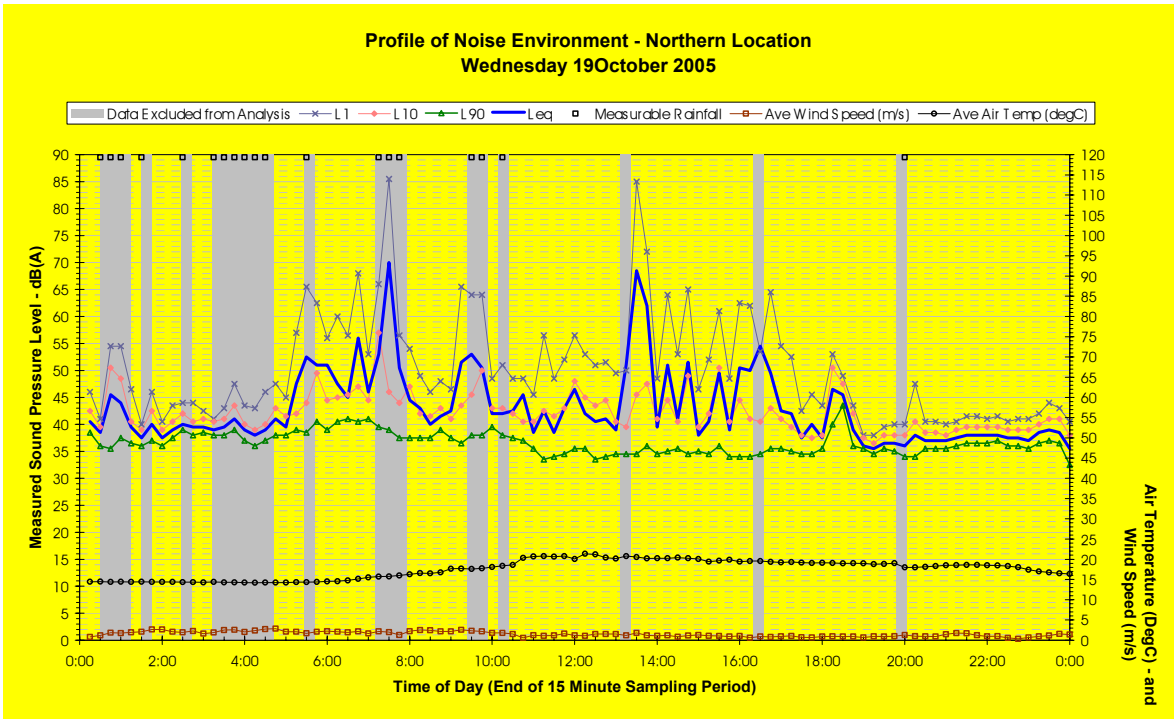

Profile of Noise Environment - Northern Location
Friday 14October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

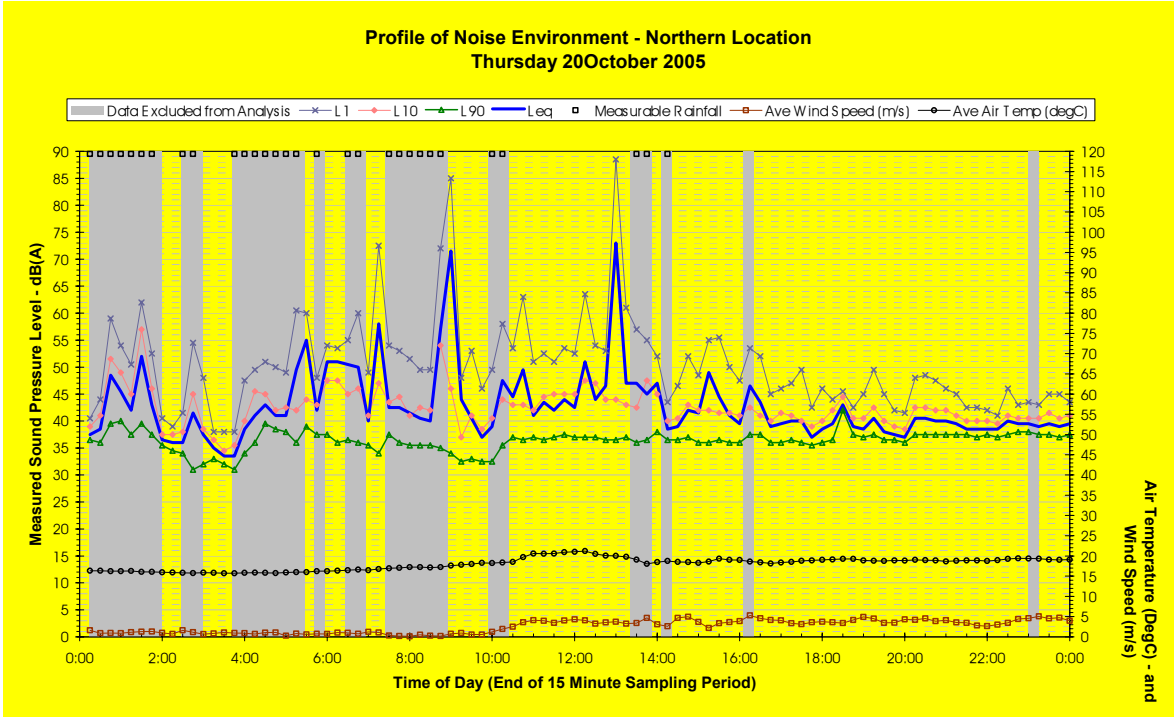

Profile of Noise Environment - Northern Location
Saturday 15October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

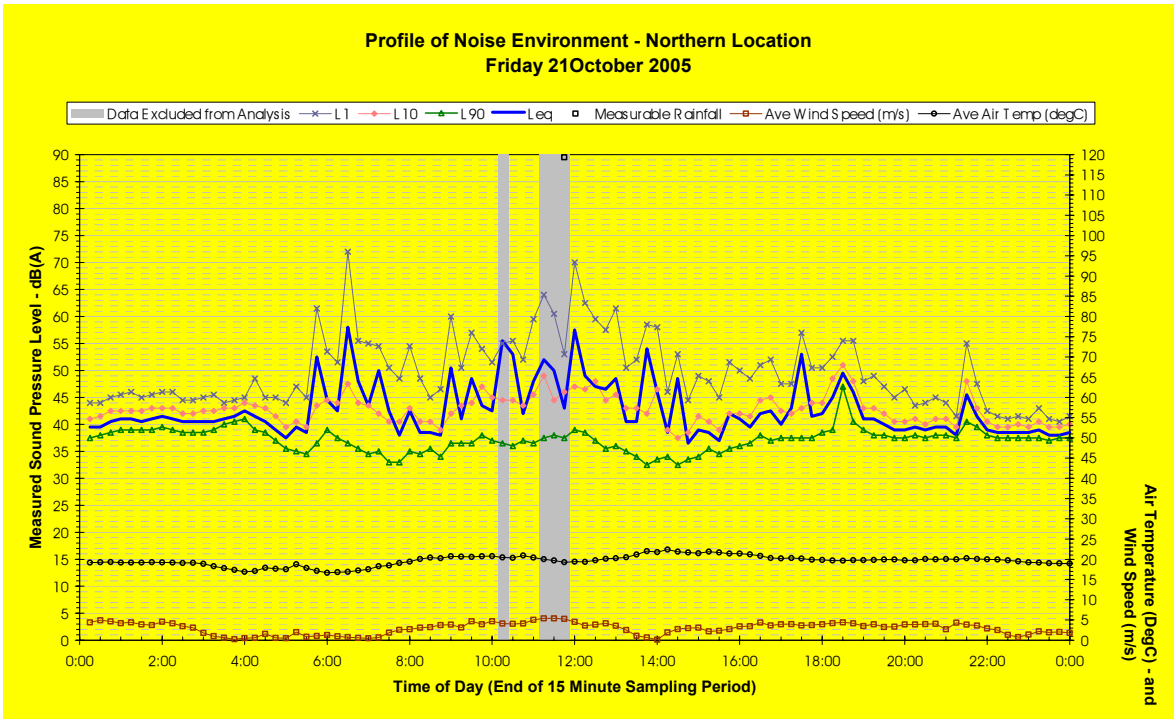

Profile of Noise Environment - Northern Location
Sunday 16October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

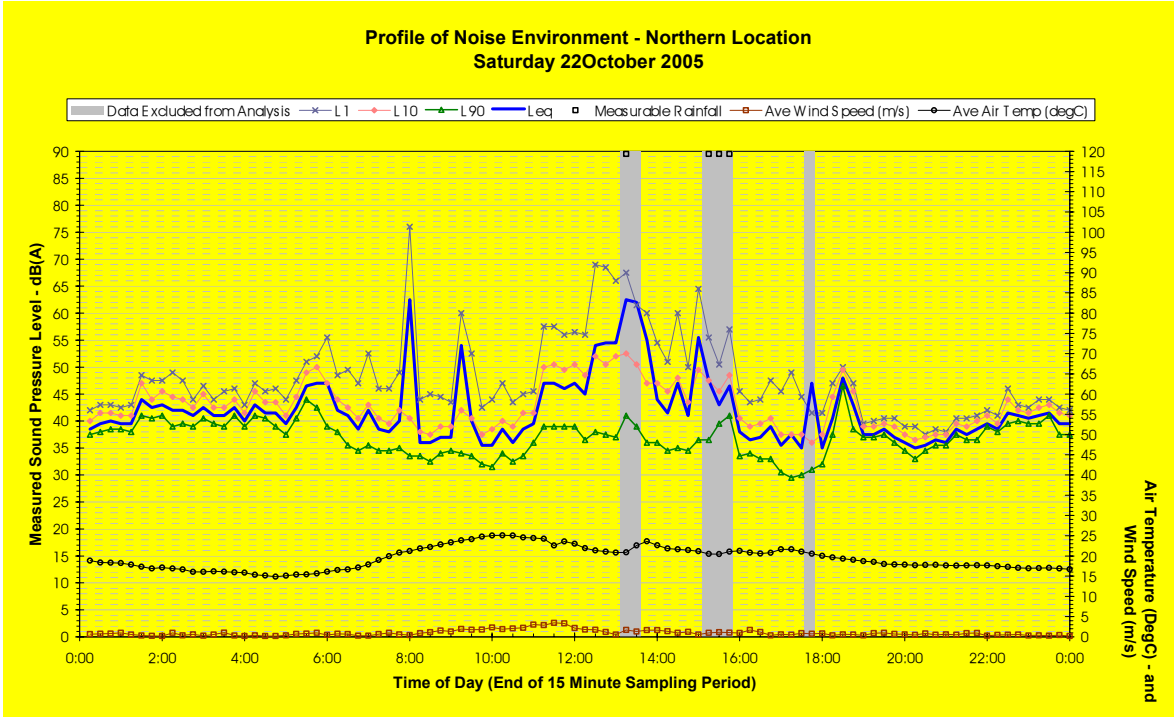

Profile of Noise Environment - Northern Location
Monday 17October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

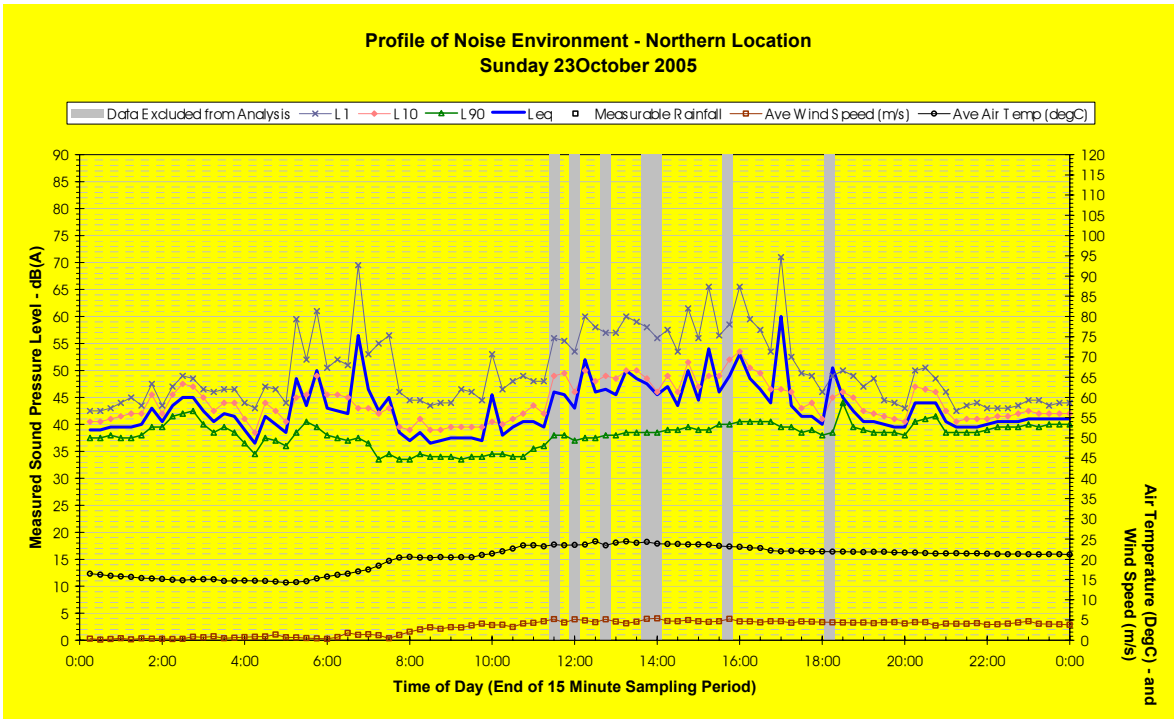

Profile of Noise Environment - Northern Location
Tuesday 18October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

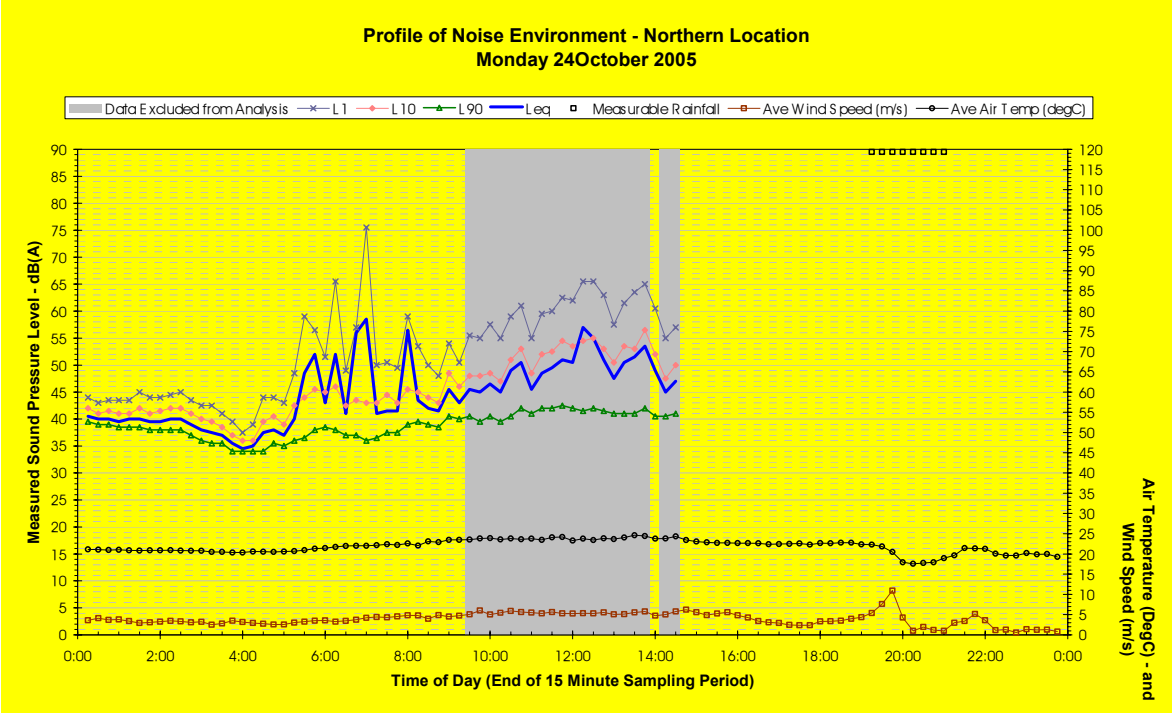

Profile of Noise Environment - Northern Location
Wednesday 19October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Northern Location
Thursday 20October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Northern Location
Friday 21October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Northern Location
Saturday 22October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Northern Location
Sunday 23October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Northern Location
Monday 24October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

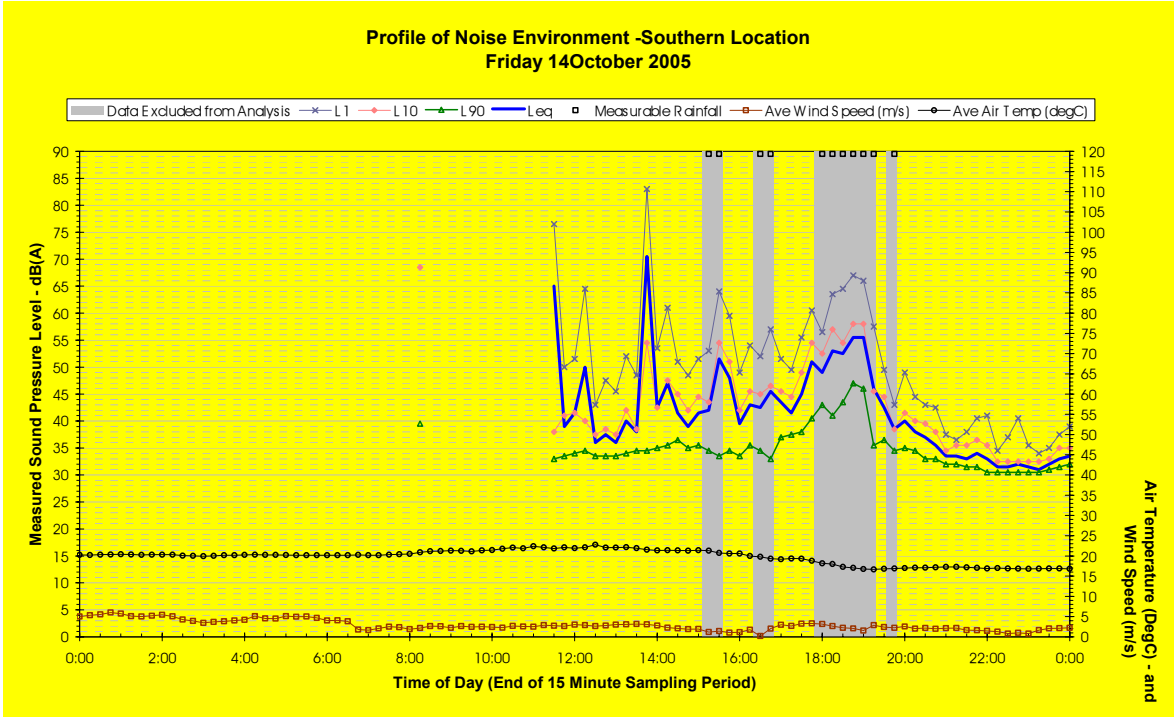
A.2 Southern LES Area

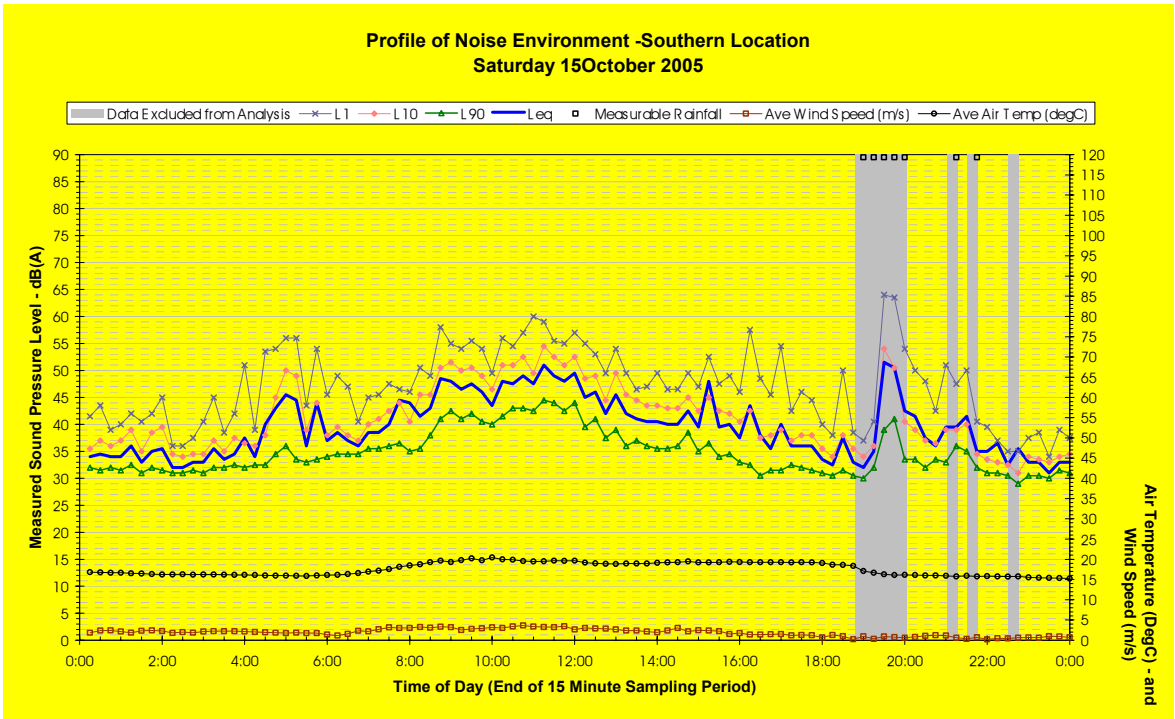
Profile of Noise Environment -Southern Location

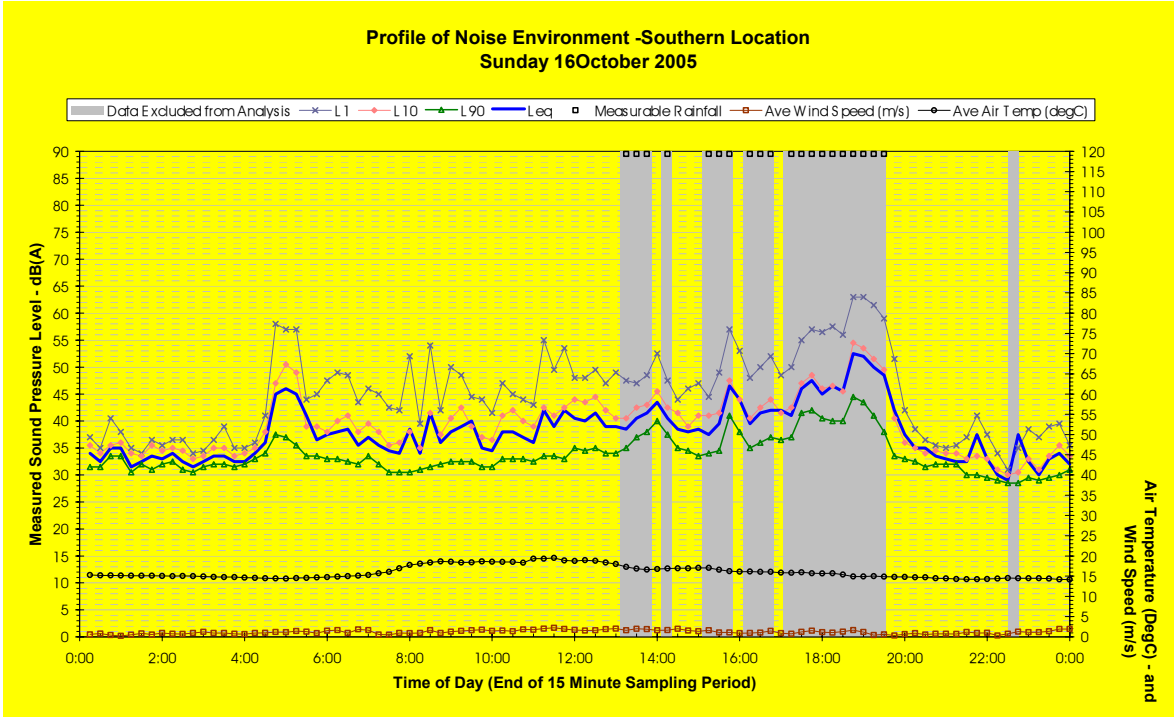
7:00:00 AM to 6:00:00 PM	Lmax (10th Percentile)	L1 (10th Percentile)	L5 (10th Percentile)	L10 (10th Percentile)	L50 (10th Percentile)	L90 (10th Percentile)	L95 (10th Percentile)	L99 (10th Percentile)	Lmin (10th Percentile)	Leq (10th Percentile)	Leq - over period
Friday 14October 2005	53.5	45.7	40.5	38.0	33.7	31.7	31.2	30.5	29.5	36.5	45.0
Saturday 15October 2005	50.9	42.7	38.8	37.2	33.2	31.5	31.0	30.7	30.0	35.2	40.9
Sunday 16October 2005	57.5	51.5	48.2	46.5	41.5	38.5	38.0	37.2	36.2	44.0	51.3
Monday 17October 2005	60.8	55.3	52.3	50.8	46.5	43.0	42.2	41.0	40.0	47.8	52.7
Tuesday 18October 2005	60.2	54.7	53.0	51.7	49.7	48.5	47.7	46.3	45.2	50.5	53.0
Wednesday 19October 2005	62.1	58.0	55.8	55.2	52.2	50.2	50.0	49.5	48.5	53.3	56.3
Thursday 20October 2005	59.7	56.0	54.2	53.2	50.2	48.5	48.0	47.5	46.0	50.7	54.2
Friday 21October 2005	62.0	59.0	57.5	56.7	55.5	54.5	54.2	54.0	53.0	55.7	60.4
Saturday 22October 2005	62.0	59.5	58.2	57.7	57.0	56.0	55.5	55.0	54.2	56.7	67.4
Sunday 23October 2005	62.5	58.5	57.5	57.0	56.0	55.0	55.0	54.5	54.0	56.0	57.8
Monday 24October 2005											
Median	60.5	55.7	53.6	52.4	49.9	48.5	47.8	46.9	45.6	50.6	53.6

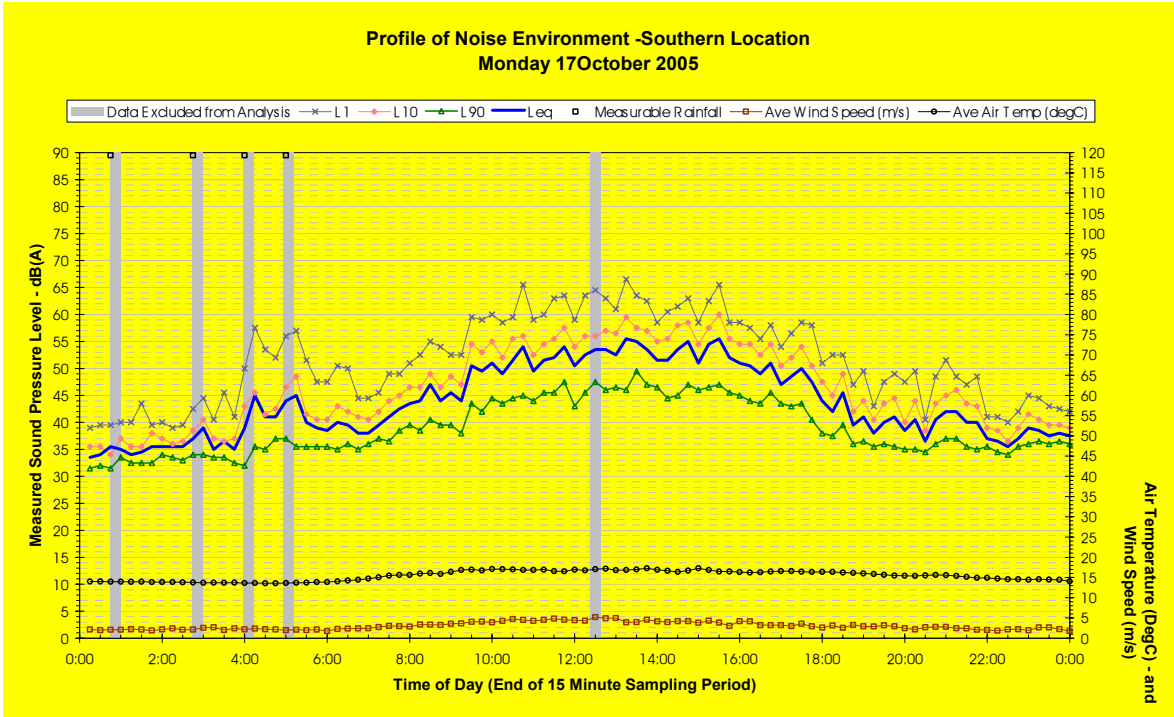
6:00:00 PM to 10:00:00 PM	Lmax (10th Percentile)	L1 (10th Percentile)	L5 (10th Percentile)	L10 (10th Percentile)	L50 (10th Percentile)	L90 (10th Percentile)	L95 (10th Percentile)	L99 (10th Percentile)	Lmin (10th Percentile)	Leq (10th Percentile)	Leq - over period
Friday 14October 2005	48.3	37.8	36.0	35.5	33.0	31.5	31.0	30.5	30.0	33.3	46.7
Saturday 15October 2005	45.3	38.3	35.3	34.0	32.0	30.5	30.0	29.8	29.0	32.8	43.4
Sunday 16October 2005	57.8	35.5	34.3	33.3	31.3	30.0	29.8	29.5	29.0	32.8	46.0
Monday 17October 2005	46.8	42.0	40.8	39.5	36.8	35.0	34.5	34.0	33.3	37.5	40.8
Tuesday 18October 2005	49.0	45.0	43.0	41.3	37.5	36.0	35.8	35.3	34.5	39.0	45.5
Wednesday 19October 2005	58.3	55.0	53.5	52.5	51.0	49.5	49.3	48.5	47.8	51.0	52.4
Thursday 20October 2005	62.5	60.3	58.8	58.3	56.0	54.5	54.0	53.3	52.0	56.3	57.5
Friday 21October 2005	64.0	60.8	59.8	59.3	58.0	56.5	56.0	55.3	54.5	57.8	59.2
Saturday 22October 2005	60.5	58.5	56.5	55.8	54.3	53.3	53.0	52.8	52.3	54.5	58.7
Sunday 23October 2005	59.5	53.3	51.8	51.0	49.0	47.0	46.5	46.0	45.0	49.3	60.9
Monday 24October 2005											
Median	58.0	49.1	47.4	46.1	43.3	41.5	41.1	40.6	39.8	44.1	50.5

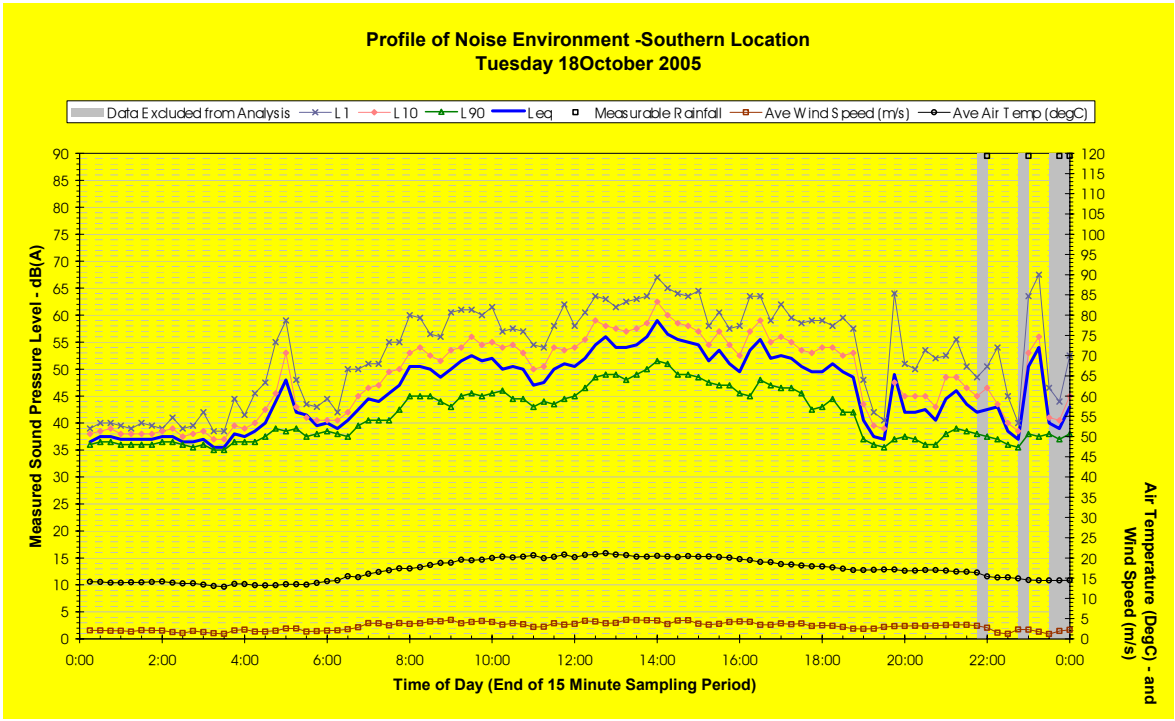
10:00:00 PM to 7:00:00 AM	Lmax (10th Percentile)	L1 (10th Percentile)	L5 (10th Percentile)	L10 (10th Percentile)	L50 (10th Percentile)	L90 (10th Percentile)	L95 (10th Percentile)	L99 (10th Percentile)	Lmin (10th Percentile)	Leq (10th Percentile)	Leq - over period
Friday 14October 2005	39.8	35.8	33.5	32.5	31.5	30.5	30.5	30.0	29.5	31.8	37.7
Saturday 15October 2005	38.0	34.8	33.5	33.0	31.5	30.5	30.0	29.8	29.0	32.5	37.6
Sunday 16October 2005	46.8	36.3	33.0	32.0	30.3	29.3	29.0	28.5	28.0	32.3	38.4
Monday 17October 2005	41.5	39.0	38.0	37.8	36.3	35.3	34.8	34.5	33.5	36.5	39.8
Tuesday 18October 2005	54.5	43.5	41.3	40.5	38.8	36.8	36.5	36.0	35.0	39.3	46.7
Wednesday 19October 2005	61.0	58.0	56.0	55.3	52.8	51.5	50.8	49.8	48.3	53.3	55.9
Thursday 20October 2005	62.8	60.0	58.5	58.0	55.8	54.5	54.0	53.5	52.8	56.0	57.7
Friday 21October 2005	65.0	60.3	58.0	57.3	55.5	54.3	54.0	53.5	52.5	56.0	61.7
Saturday 22October 2005	66.5	63.3	62.0	61.5	59.5	58.0	57.5	57.0	55.8	59.8	64.1
Sunday 23October 2005	66.5	63.5	62.5	62.0	60.3	59.0	58.5	58.0	57.0	60.5	67.6
Monday 24October 2005											
Median	57.8	50.8	48.6	47.9	45.8	44.1	43.6	42.9	41.6	46.3	51.3

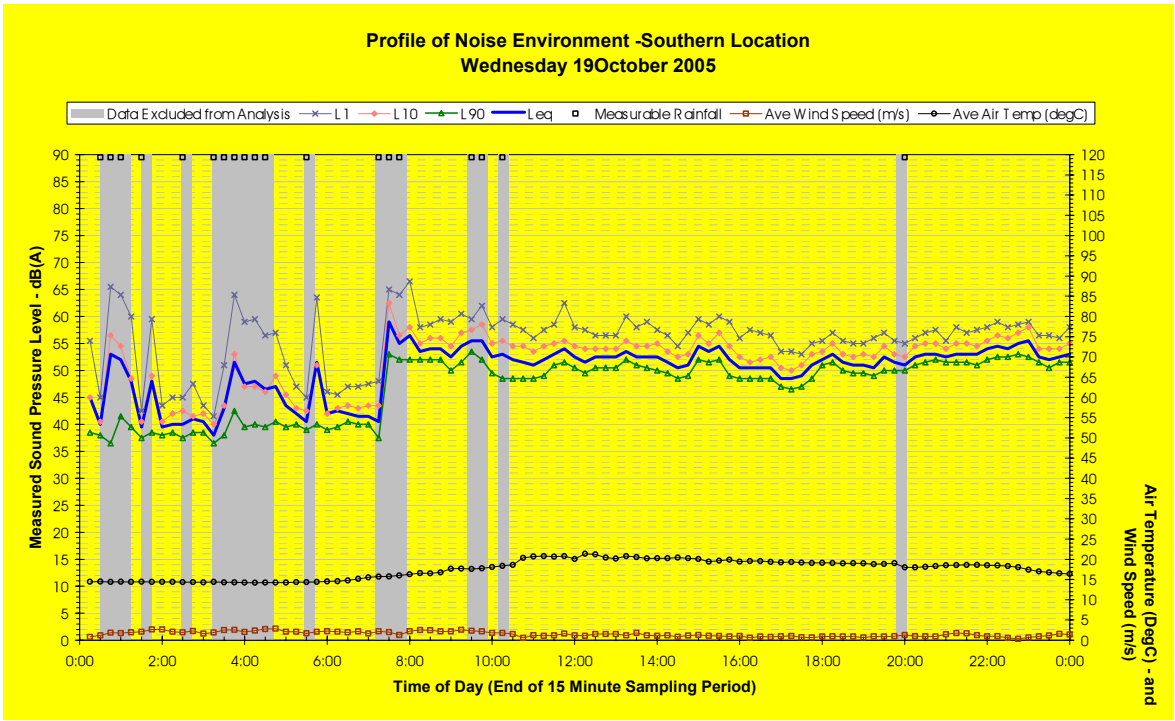

Profile of Noise Environment -Southern Location
Friday 14October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

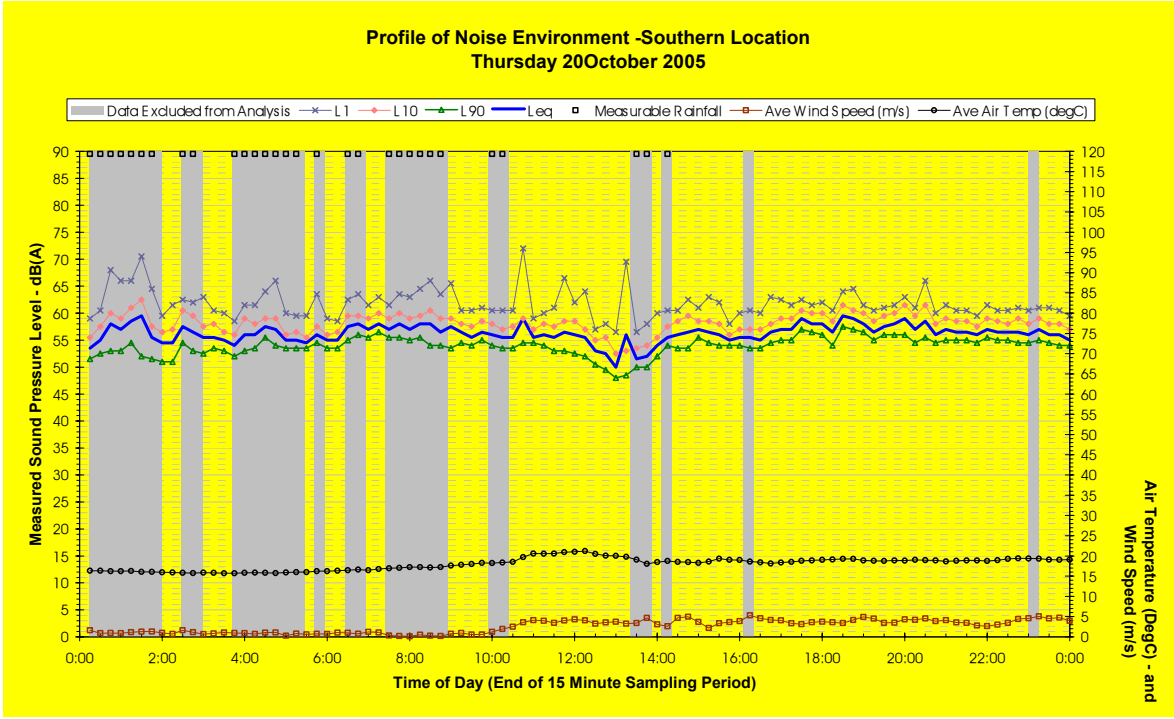

Profile of Noise Environment -Southern Location
Saturday 15October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

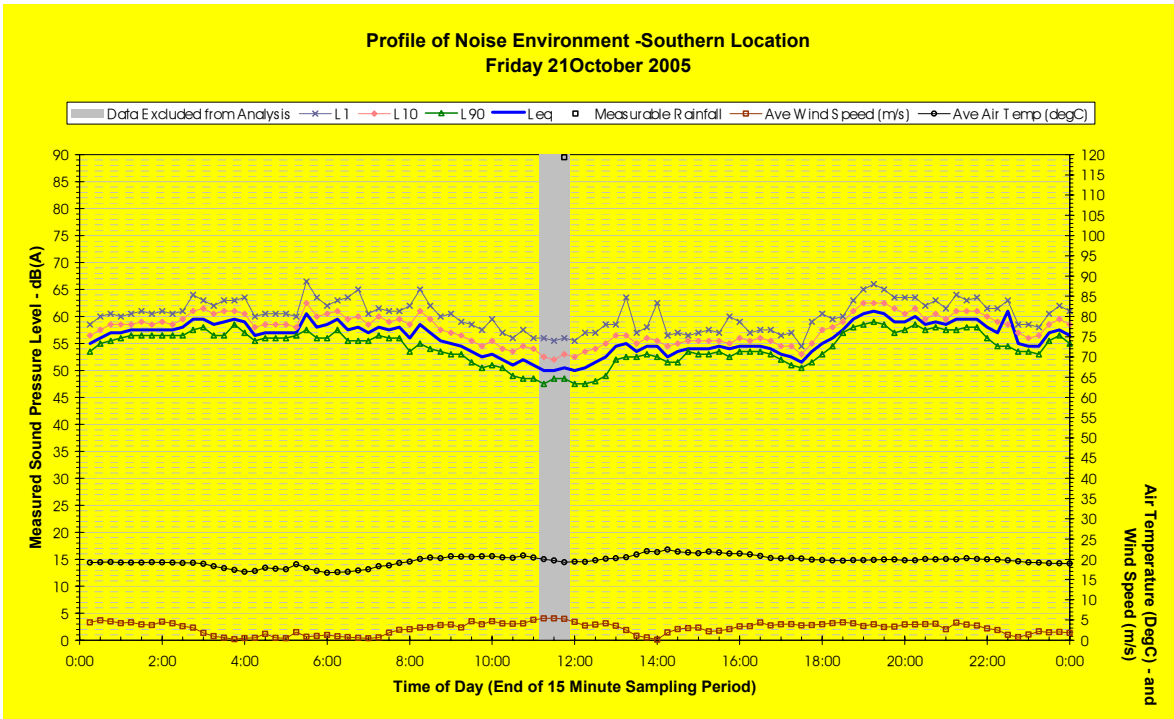

Profile of Noise Environment -Southern Location
Sunday 16October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

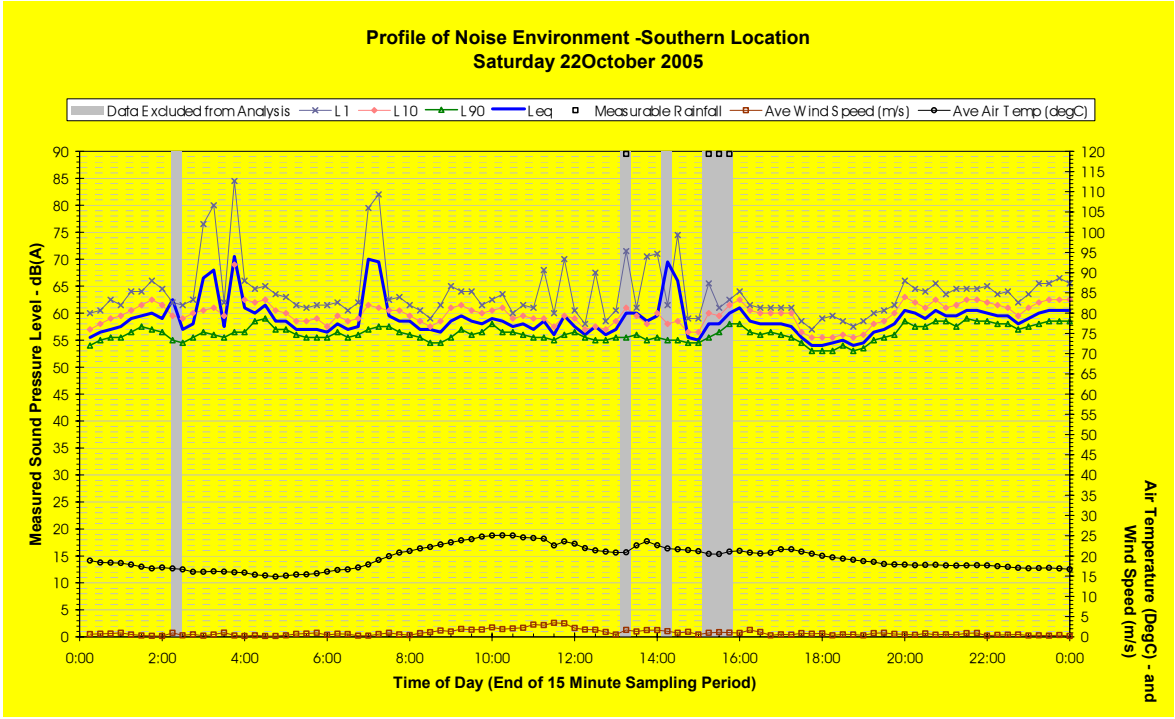

Profile of Noise Environment -Southern Location
Monday 17October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

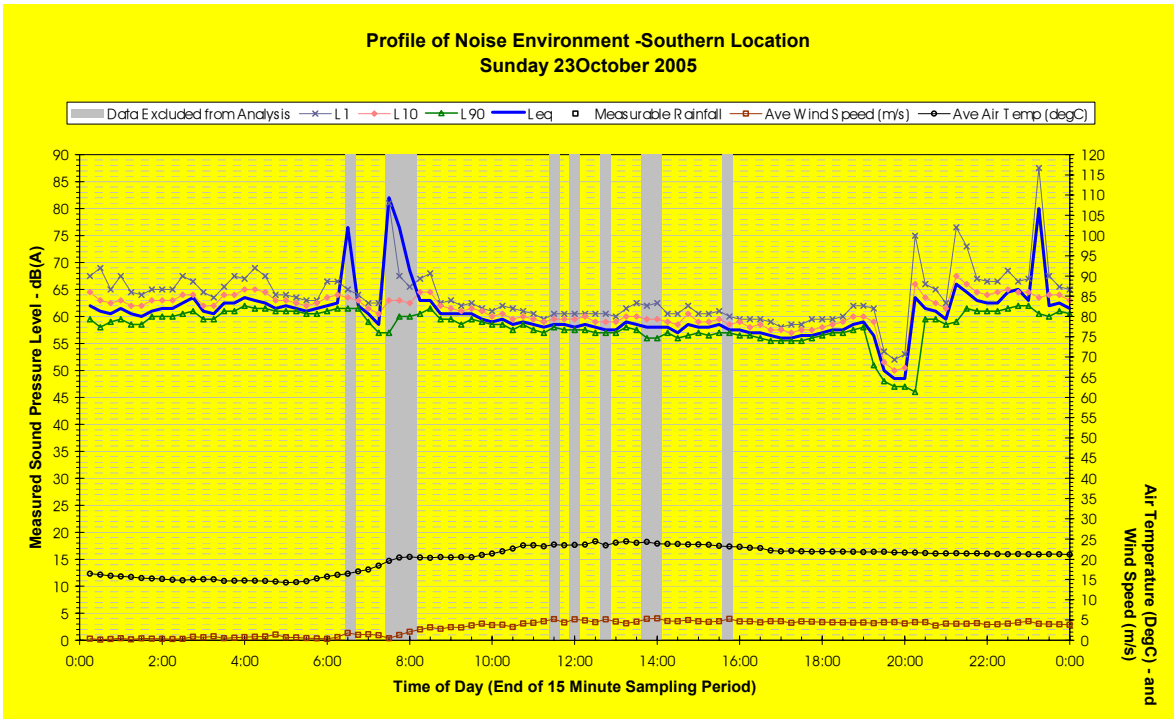

Profile of Noise Environment -Southern Location
Tuesday 18October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)

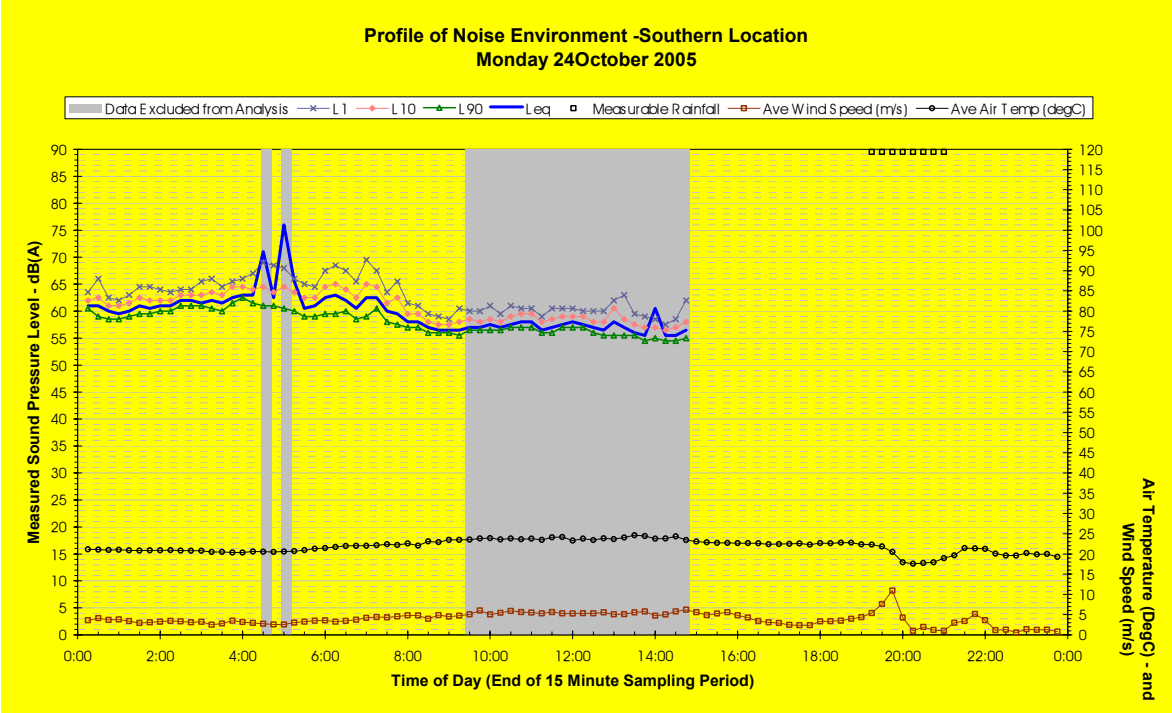

Profile of Noise Environment -Southern Location
Wednesday 19October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment -Southern Location
Thursday 20October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment -Southern Location
Friday 21October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment -Southern Location
Saturday 22October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment -Southern Location
Sunday 23October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment -Southern Location
Monday 24October 2005
Data Excluded from Analysis
L1
L10
L90
Leq
Measurable Rainfall
Ave Wind Speed (m/s)
Ave Air Temp (degC)
Measured Sound Pressure Level - dB(A)
Air Temperature (DegC) - and Wind Speed (m/s)
Time of Day (End of 15 Minute Sampling Period)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00