

Environmental Noise Assessment

Allawuna Landfill Environmental Noise






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1. INTRODUCTION

VIPAC Engineers & Scientists were engaged by Bowman & Associates Pty Ltd to conduct an environmental noise assessment for the proposed landfill development at lots 9926, 26934, 4869 & 5931 on the Great Southern Highway, St. Ronans, Shire of York, Western Australia. The proposed site is approximately 62 km from Perth CBD.

We understand that both the site itself and immediate surrounding premises is all zoned General Agriculture. The nearest noise sensitive receivers (NSR) are as follows:

- Residential unit to the North East of the proposed development (approximately 2 km away). The address is 2974 Great Southern Highway, St Ronans, Shire of York.
- Residential unit to the East of the proposed development (approximately 2.4 km away). The address is 3462 Great Southern Highway, St Ronans, Shire of York.
- Mount Observation Picnic area to the North West of the proposed development (approximately 2.5 km away). The address is 3060 Talbot West Road, Mount Observation, Shire of York.

This report presents the results of the noise impact assessment on nearby Noise Sensitive Receivers (NSR) due to the proposed construction and operation of the development. The location of the development and the noise sensitive receivers are shown on the map presented in **Figure A-1** in **Appendix A** of this report.

2. REFERENCES

- [1] Environmental Protection (Noise) Regulations 1997. Department of Environmental Protection, Government of Western Australia.
- [2] Shire of York - IntraMaps Town Planning Zoning Maps
- [3] Briefing Paper: Allawuna Landfill – Received from Bowman & Associates Pty Ltd by e-mail in August 2012.
- [4] Site Layout Drawings for Allawuna Landfill - Received from Bowman & Associates Pty Ltd by e-mail in August 2012.
- [5] AS 2436 1981 Guide to Noise Control On Construction, Maintenance And Demolition Sites
- [6] SoundPLAN Software Version 7.1 Acoustical Database.
- [7] SoundPLAN Software Manual Version 7.1. 2011
- [8] Weather data retrieved from <http://www.wunderground.com/>
- [9] Guidance for the Assessment of Environmental Factors: Environmental Noise (Draft) No. 8, May 2007 - Environment Protection Authority, Government of Western Australia.

3. CRITERIA

3.1. THE REGULATIONS

Environmental noise is governed in Western Australia by the Environmental Protection (Noise) Regulations 1997 (the Regulations) [1]. The Regulations [1] set noise limits to ensure that noise from other premises is kept to acceptable levels, thus reducing noise annoyance. These allowable noise limits are defined as ‘assigned noise levels’ at receiver points. Regulation 7 of the regs requires that “noise emitted from any premises when received at other premises must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind”.

The Regulations [1] do allow for special conditions, which have been made to allow for reasonable amounts of economic, cultural and social activity at levels that may exceed the assigned levels, but are within normal community expectations.

Noise from Construction activities is one such special condition that is not required to comply with the Assigned Noise Levels prescribed in the Regulations [1]; rather it sets out management practices which must be adhered to instead.

3.2. ASSIGNED NOISE LEVELS

The Environmental Protection (Noise) Regulations 1997 [1] sets out the maximum allowable noise levels based on the time of day and land use, applicable at noise sensitive premises in the vicinity of the development. The maximum allowable noise levels are determined based on the assigned noise levels (LA10, LA1, and LAmax) adjusted with the Influencing Factor (IF) calculated in accordance with the Regulations which takes into account the land zoning in the vicinity of the receiver location. **Table 3-1** shows the maximum assigned noise levels at various premises.

Type of premises receiving noise	Time of day	Assigned level (dB)		
		LA10	LA1	LA max
Noise sensitive premises at locations within 15 meters of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday and public holidays	40 + IF	50 + IF	65 + IF
	1900 to 22 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday, public holidays	35 + IF	45 + IF	55 + IF
Noise sensitive premises at locations further than 15 metres from a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

Table 3-1: Assigned noise levels depending on type of premises receiving noise [1]

Regulation 7 of EPNR 1997 [1] also requires that the noise character must be “free” of annoying characteristics, namely:

- Tonality, eg. Whining, droning;
- Modulation, eg. like a siren; and
- Impulsiveness, eg. Banging, thumping.

Regulation 9 of EPNR 1997 [1] sets out objective tests to assess whether the noise is taken to be “free” of these characteristics. If these characteristics cannot be reasonably and practicably removed, eg. in the case of an emission like music, then a series of adjustments to the measured levels are set out, and the adjusted level must comply with the assigned level. The adjustments are set out below in **Table 3-2** and are cumulative to a maximum of 15 dB.

Adjustment where noise emission is not music*			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where Impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB
*These adjustments are cumulative to a maximum of 15 dB.				

Table 3-2: Penalty assessment table

The area on which the NSR’s reside is predominately zoned as ‘Agriculture’ according to Shire of York zoning map [2]. VIPAC has assumed that the noise sensitive receiving areas have the same assigned noise levels as Residential for the purposes of the IF calculation. The zoning map used is presented in **Figure A-2** in **Appendix A** of this report.

The influencing factor has been calculated for these NSR’s, the calculation is summarised below in **Table 3-3**, taking into account the percentage of land zoned residential, commercial or industrial in both 100m and 450m radius circles, as well as the number of major and secondary roads in each circle.

100m Radius Circle			450m Radius Circle		
Residential	Commercial	Industrial	Residential	Commercial	Industrial
100%	0%	0%	100%	0%	0%
I					
0					
C					
0					
100m Radius Circle				450m Radius Circle	
No. of major roads		No. of secondary roads		No. of major roads	
0		0		0	
TF					
0					
IF (I+C+TF)					
0					

Table 3-3: EPNR 1997 Influencing Factor (IF) Calculation

The Environmental Protection Act (1986) assigned noise levels at the nearby Noise Sensitive Locations are therefore summarized in **Table 3-4** below and must be adhered to if the above conditions are not all met. These levels should be used as a guide level for noise emissions at all times at the boundary to ensure that absolute compliance is achieved. As the IF is calculated as zero for all NSR’s, the levels shown in **Table 3-4** shall apply.

Type of premises receiving noise	Time of day	Assigned level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises at locations within 15 metres of a building directly associated with a noise sensitive use. This is level allowed at (outside) noise sensitive receiver (NSR).	07.00 to 19.00 hours Monday to Saturday	45	55	65
	09.00 to 19.00 hours Sunday and Public Holidays	40	50	65
	19.00 to 22.00 hours all days	40	50	55
	22.00 hours on any day to 07.00 hours Monday to Saturday and 22 to 09.00 hours Sunday and Public Holidays	35	45	55
Commercial Premises	Anytime of the day and week	60	75	80
Industrial and utility premises	Anytime of the day and week	65	80	90

Table: 3-4: Assigned noise levels depending on type of premises receiving noise

We note that in addition to the criteria outlined above, if the far field sound pressure level produced by the source may exhibit tonality, modulation, or contains an impulsive component, the predicted noise level would incur a 5dB(A) penalty for tones and modulation and a 10dB(A) penalty for impulsiveness [2], to a maximum cumulative penalty of 15dB(A) as stipulated in the EPNR 1997 [1].

For construction work carried out between 7am and 7pm on any day which is not a Sunday or public holiday –

- The construction work must be carried out in accordance with control of noise practices set out in section six of *Australian Standard 2436-1981 "Guidelines to Noise Control on Construction, Maintenance and Demolition Sites"*,
- The equipment used for construction work must be the quietest reasonably available, and
- The chief executive officer may request that a noise management plan be submitted for the construction work at any time.

4. SITE DESCRIPTION AND EQUIPMENT SCHEDULE

We have conducted our noise assessment (acoustic modelling) for Allawuna Landfill both during Construction and Operational Phase based on the following information provided by Bowman & Associates.

The proposed development will be in operation between 0700 and 1700 hrs Monday to Saturday during both construction and operation phases. Since there is no planned equipment schedule at this stage of development, it is assumed (for acoustic modelling of a worst case scenario) that all the equipments are being operated throughout the whole operational hours (both at construction and operational phase). The list of equipments and their locations during construction and operational phase are listed in **Table 4-1** and **Table 4-2** below.

The noise emission levels from the proposed development are evaluated at the nearest noise sensitive receivers (location 1 to location 3 shown in **Figure A-1** in **Appendix A**). The proposed development shall meet the Environmental Noise Criteria [1] provided the noise levels predicted at these locations are within the specified limits.

Equipment Details	Number of Equipments	Location of deployment
Wheel Tractor Scraper	1	Access Road
Loader	1	
Articulated Dump Truck	1	
Smooth Drum Roller	1	
Grader	1	
Water Cart	1	
Car	40	
30 tonne excavator	2	Landfill Footprint, Leachate Dam and Stormwater Dam
Loader	1	
Dozer	1	
Articulated Dump Truck	2	
Pad Foot Roller	1	
Grader	1	
Water Cart	1	

Table 4-1: Equipments proposed for use during construction phase of the development

Equipment Details	Number of Equipments	Location of deployment
Semi trailer road train	30*	Access Road
30t Compactor	1	Landfill Footprint
50t Compactor	1	
Dozer	1	
Dump Truck	1	
Water Cart	1	
Grader	1	
* 1 road train in and out per 20 minutes during operating hours		

Table 4-1: Equipments proposed for use during operational phase of the development

5. NOISE SURVEY

An environmental noise survey was carried out at the proposed site between 23rd August and 31st August 2012 inclusive. A noise logger was installed on site for the week-long measurement. Measurement was carried out at the northwestern boundary of the proposed development (near the Mount Observation picnic area). The equipment used for the measurement is shown in **Table 5-1** below. The measured noise data are presented in **Figure B-1** in **Appendix B** of this report.

Equipment	Manufacturer	Model	Serial Number
Type 2 Sound Level Meter (noise logger)	Larson Davis	720	0173

Table 5-1: Equipment used during environmental noise survey

Weather conditions have been logged by a nearby weather station located in Wundowie in Northam, WA [8]. For the purpose of this assessment the weather conditions are taken to be representative of site conditions. Where there was an occurrence of winds of 19km/h and above or precipitation, data

has been excluded from the assessment. The weather data during the period of measurement is presented **Figure B-2** in **Appendix B** of this report.

Measured daily average background noise levels on site are graphically presented in **Figure 5-1** below.

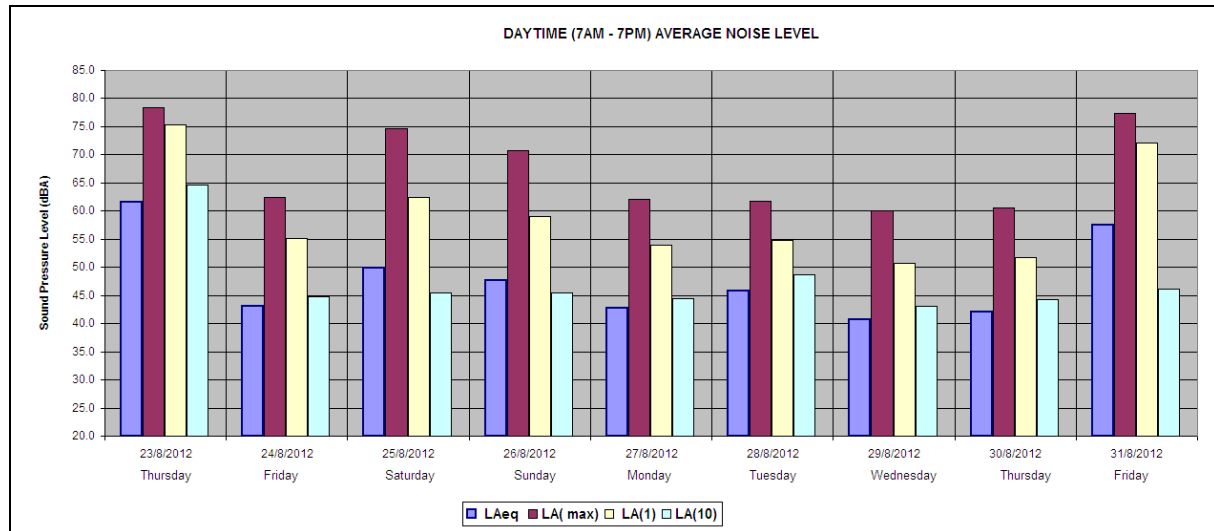


Figure 5-1: Measured daily average background noise levels

Site observations showed that the dominant source of noise at the proposed development is traffic noise from Great Southern Highway. The results of the environmental noise survey (free field measurements) have been summarised in **Table 5-2** below.

	Measured Average Day Time (7am – 7 pm) Noise Levels (dB)					
	L _{Aeq}	L _{A(max)}	L _{A(1)}	L _{A(10)}	L _{A(50)}	L _{A(90)}
Overall Average	50	70	65	46	40	38

Table 5-2: ENS Results – Measured background noise levels at the proposed site

The measured noise data demonstrate that the background noise level at the proposed site is in exceedance of the environmental noise criteria [1] as presented in **Table 3-4**.

6. ACOUSTIC MODELLING OF THE PROPOSED FACILITY

6.1. SOFTWARE TOOL AND PREDICTION STANDARDS

VIPAC used the widely used commercial software package ‘SoundPLAN’ for the acoustic modeling and simulation of Allawuna Landfill for both the construction and operation phases.

SoundPLAN is specialised in acoustical modelling and simulation. Noise modelling within SoundPLAN encompasses traffic noise, occupational noise - indoors and outdoors, general industrial noise and aircraft noise. More than 50 calculation standards are implemented to satisfy the needs of noise control engineers. The software has been tested worldwide on actual projects to ensure that the predicted data are in agreement with measured noise levels. SoundPLAN is used throughout Australia for numerous acoustical projects. Industrial and outdoor noise propagation for the proposed development has been modelled using ISO 9613-2:1996 [7].

6.2. MODELLING ASSUMPTIONS

The following assumptions have been made for the acoustical modelling:

- The ground surface is developed based on the contour map provided by Bowman & Associates Pty Ltd [4]. The ground is assumed absorptive in nature.
- The Meteorological Conditions within the SoundPLAN are set as follows:

Parameters	Day between 0700-1900
Wind Speed	4 m/s
Temperature inversion lapse rate (Pasquill Stability)	E
Temperature	20 ⁰ C
Relative humidity	50%

Table 6-2-1: Meteorological Conditions for acoustic modelling [9]

- Noises from nearby public roads are not considered within the model since noise emissions from vehicles on public roads are exempt from the requirements of EPNR 1997.

6.3. SOUND POWER LEVELS OF EQUIPMENT

The sound power levels of the equipments used during the construction and operation phases of the development are based on the database provided in the Australian Standard AS 2436 1981 Guide to Noise Control On Construction, Maintenance And Demolition Sites [5]. The sound power levels of the equipments are listed in **Table 6-3-1** below.

Equipment Details	Sound Power Level (dBA)
Wheel Tractor Scraper	117
Loader	120
Articulated Dump Truck	107
Smooth Drum Roller	106
Grader	118
Water Cart	108
Car	98
Excavator	118
Dozer	119
Semi trailer road train	120
30t Compactor	124

Table 6-3-1: Sound power level of equipments used for the development [5]

6.4. PREDICTED RESULTS

6.5. NOISE LEVELS AT THE NOISE SENSITIVE RECEIVERS

Noise levels due to both construction and facility operation are modelled and predicted at 3 locations in the vicinity of the proposed development. These single point receiver locations are shown in **Figure A-1** in **Appendix A** of this report. The predicted noise levels are compared with the EPNR [1] criteria and presented in **Table 6-4-1** and **Table 6-4-2** below. The noise levels shown in the following tables (L_{A10} , L_{A1} and L_{Amax}) are computed based on the predicted noise level (L_{Aeq}) in SoundPLAN and the relationships between noise parameters established from measured data.

Location of Noise Sensitive Receivers	Predicted Average Noise Levels, L_{eq} (dBA)	Computed Noise Levels (dBA)		
		L_{A10}	L_{A1}	L_{Amax}
1 (3060 Talbot West Road, Mount Observation Picnic Area)	31	32	30	35
2 (2974 Great Southern Highway, St Ronans)	36	41	37	45
3 (3462 Great Southern Highway, St Ronans)	35	40	36	43

Table 6-4-1: Predicted Noise Levels at the Noise Sensitive Receivers – Construction Phase

As noise from construction activities is a special condition that is not required to comply with the Assigned Noise Levels prescribed in the Regulations [1], the computed noise levels at the noise sensitive receivers are not compared against the EPNR criteria.

The predicted noise levels for the operational phase are compared with the EPNR 1997 [1] criteria in **Table 6-4-3** below. It is assumed that tonality effects are unlikely to have any influence at such a long distance (over 2 km) from the work area. Tonality effects have therefore been discounted from the modelling. It is however strongly suggested that the landfill operator should procure equipment that is free from tonal noise.

Locations of Noise Sensitive Receivers	Predicted Average Noise Levels, L_{eq} (dBA)	Computed Noise Levels (dBA)		
		L_{A10}	L_{A1}	L_{Amax}
1 (3060 Talbot West Road, Mount Observation)	33	36	33	39
2 (2974 Great Southern Highway, St Ronans)	38	45	40	49
3 (3462 Great Southern Highway, St Ronans)	36	41	37	45

Table 6-4-2: Predicted Noise Levels at the Noise Sensitive Receivers – Operational Phase

Location 1 - 3060 Talbot West Road, Mount Observation Picnic Area			
	Noise Levels (dBA)		
	L _{A10}	L _{A1}	L _{Amax}
Computed Levels	36	33	39
Background Levels	46	65	70
EPNR [1] Criteria 07.00 to 19.00 hours Monday to Saturday	45	55	65
EPNR Criteria Met?	Yes	Yes	Yes
Location 2 - 2974 Great Southern Highway, St Ronans			
	Noise Levels (dBA)		
	L _{A10}	L _{A1}	L _{Amax}
Computed Levels	45	40	49
Background Levels	46	65	70
EPNR [1] Criteria 07.00 to 19.00 hours Monday to Saturday	45	55	65
EPNR Criteria Met?	Yes	Yes	Yes
Location 3 - 3462 Great Southern Highway, St Ronans			
	Noise Levels (dBA)		
	L _{A10}	L _{A1}	L _{Amax}
Rated Levels	41	37	45
Background Levels	46	65	70
EPNR [1] Criteria 07.00 to 19.00 hours Monday to Saturday	45	55	65
EPNR Criteria Met?	Yes	Yes	Yes

Table 6-4-3: Noise levels at the Noise Sensitive Receivers are compared against the EPNR Criteria [1]

Based on **Table 6-4-3**, it can be summarized that the noise levels generated (at the Noise Sensitive Receivers) due to the operation of Allawuna Landfill are within the EPNR 1997 [1] criteria.

6.6. GRID NOISE MAP

Noise contour maps are generated in SoundPLAN for both the construction and operational phases of the development. The following figures presents the ground noise levels (1.5m above ground) in all outdoor areas of the proposed development.

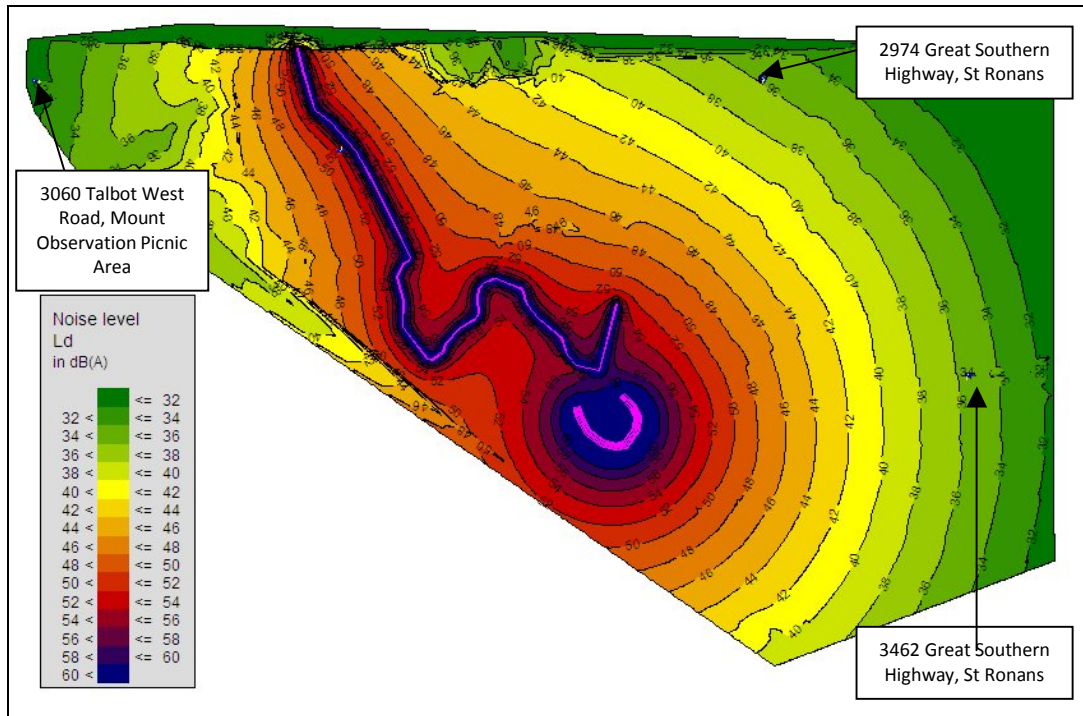


Figure 6-6-1: 2D Grid Noise Map – Construction Phase

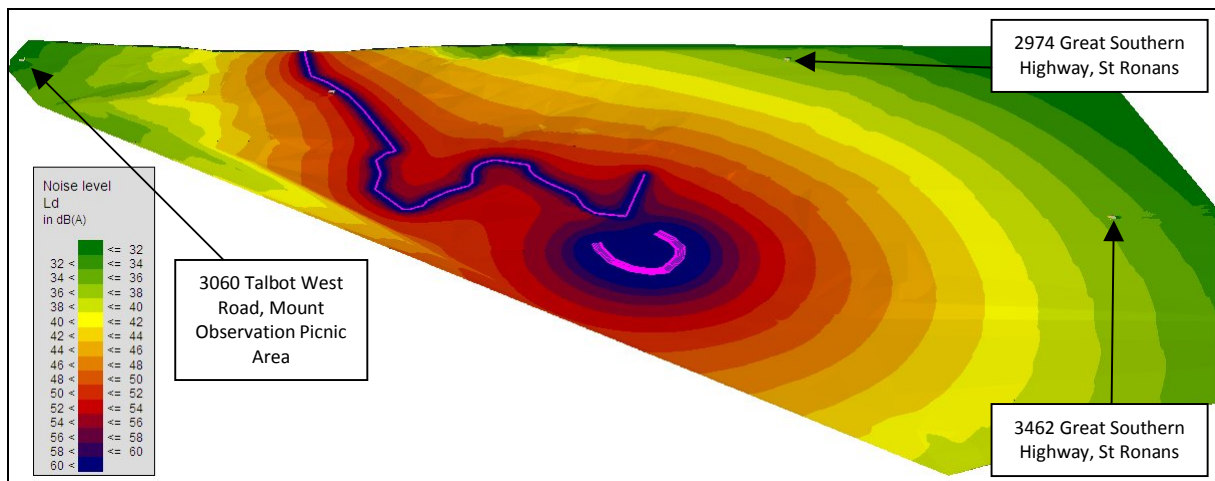


Figure 6-6-2: 3D Grid Noise Map – Construction Phase

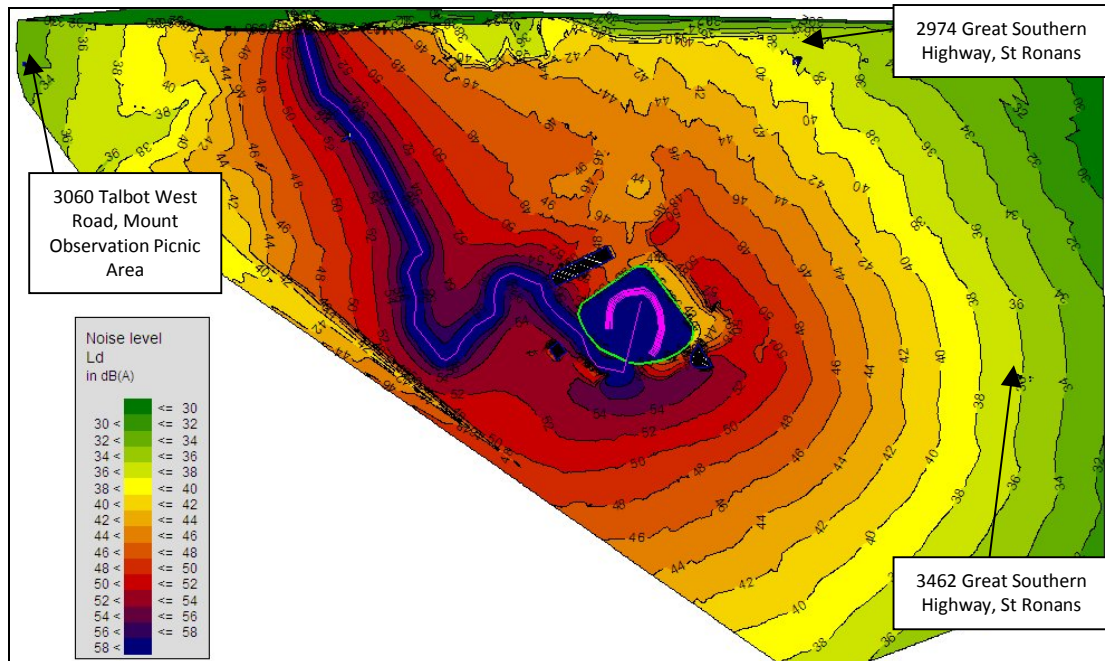


Figure 6-6-3: 2D Grid Noise Map – Operational Phase

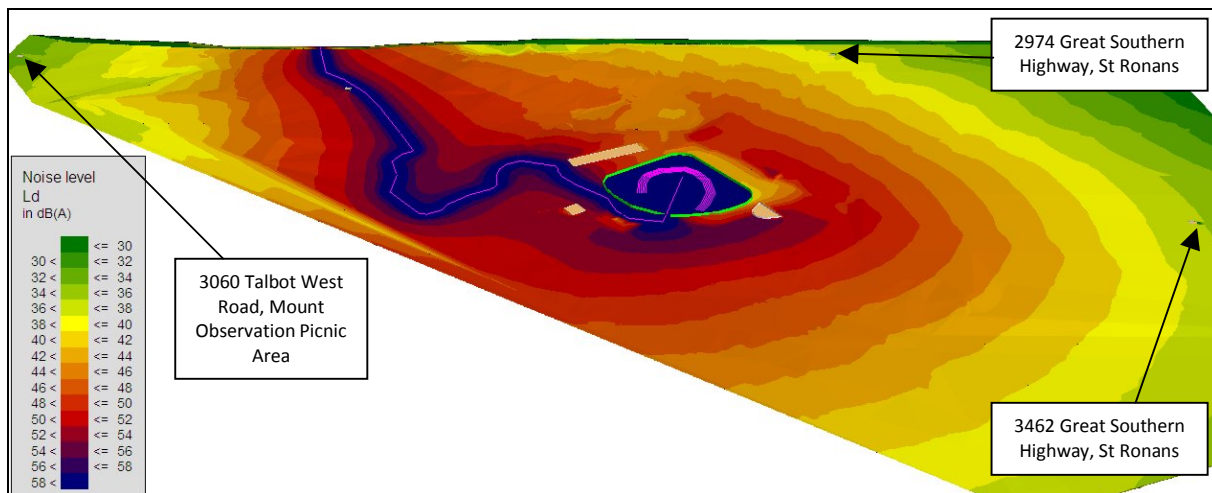


Figure 6-6-4: 3D Grid Noise Map – Operational Phase

7. CONCLUSION

VIPAC Engineers & Scientists were engaged by Bowman & Associates Pty Ltd to conduct an environmental noise assessment for the proposed landfill development at lots 9926, 26934, 4869 & 5931 on the Great Southern Highway, St. Ronans, Shire of York, Western Australia.

Acoustical modelling has been carried out for the proposed facility in SoundPLAN acoustical software. It is found that the predicted noise levels at the nearest noise sensitive receivers of the proposed facility are within the specified EPNR 1997 [1] criteria and thus meet the environmental noise criteria.

Appendix A. Site Maps and Drawings

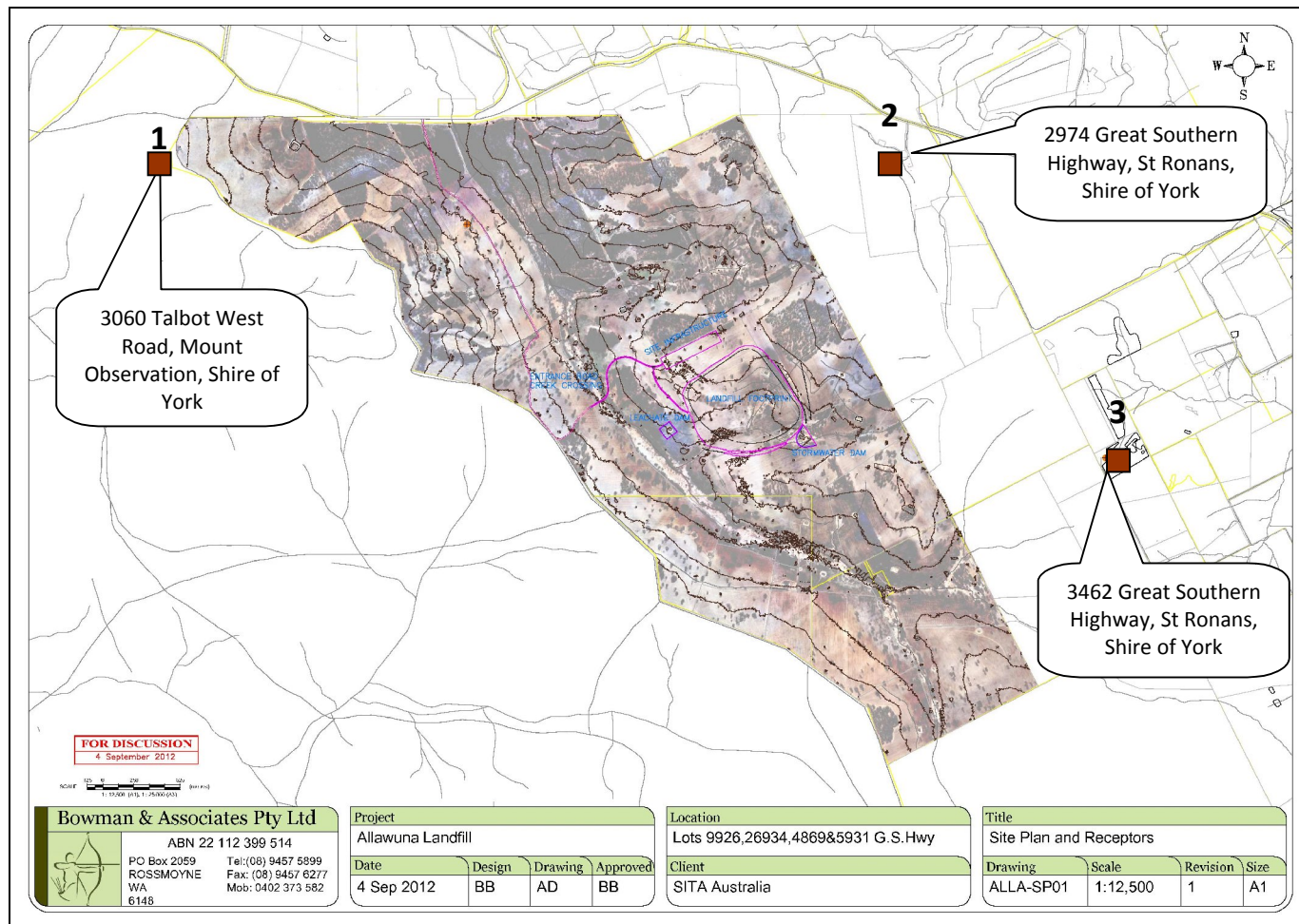


Figure A-1 Site map of the proposed development

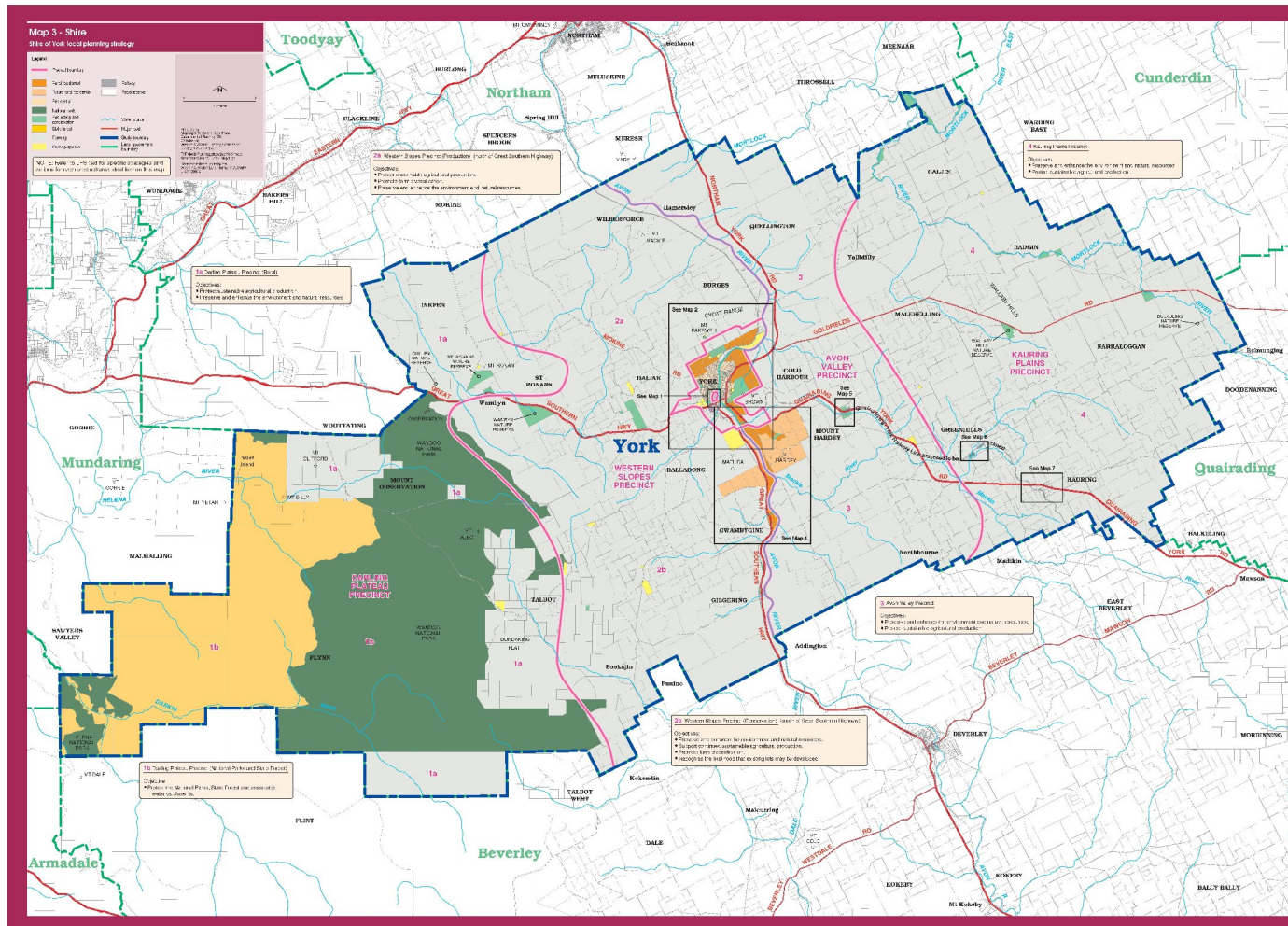


Figure A-2: Zoning map showing the proposed development area

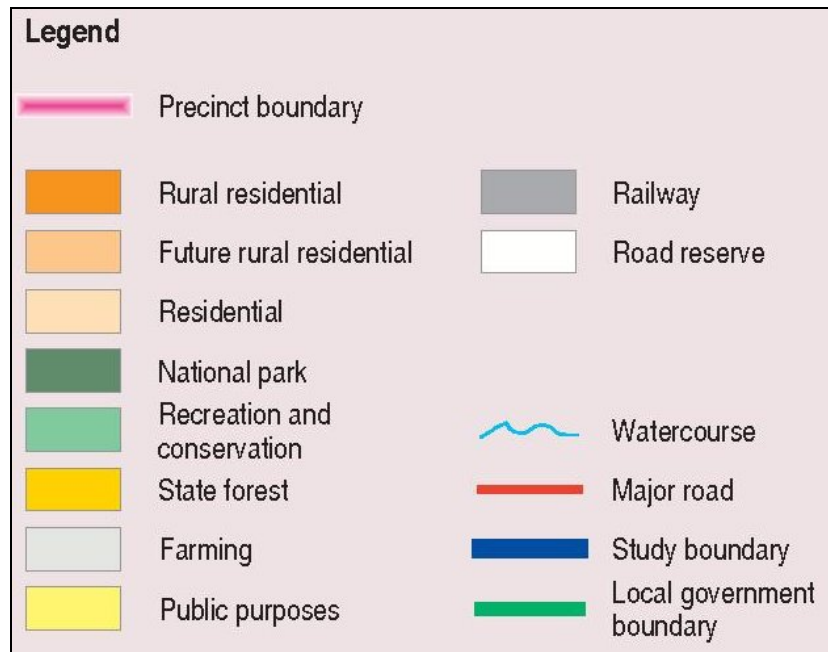
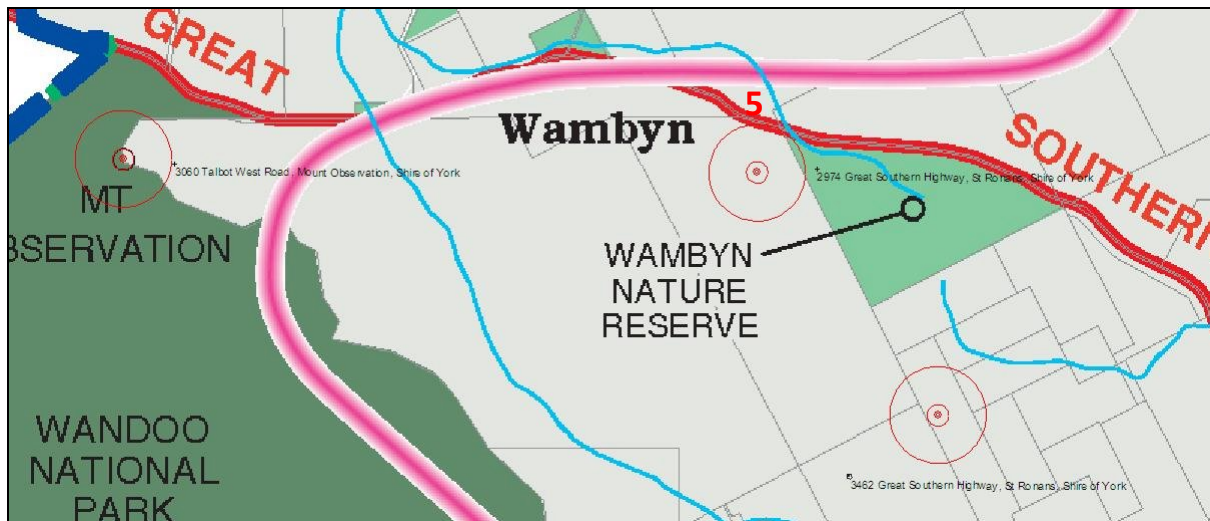


Figure A-3: Zoning Map showing 100m and 450m circles for EPNR IF calculation

Appendix B. Noise Survey and Weather Data

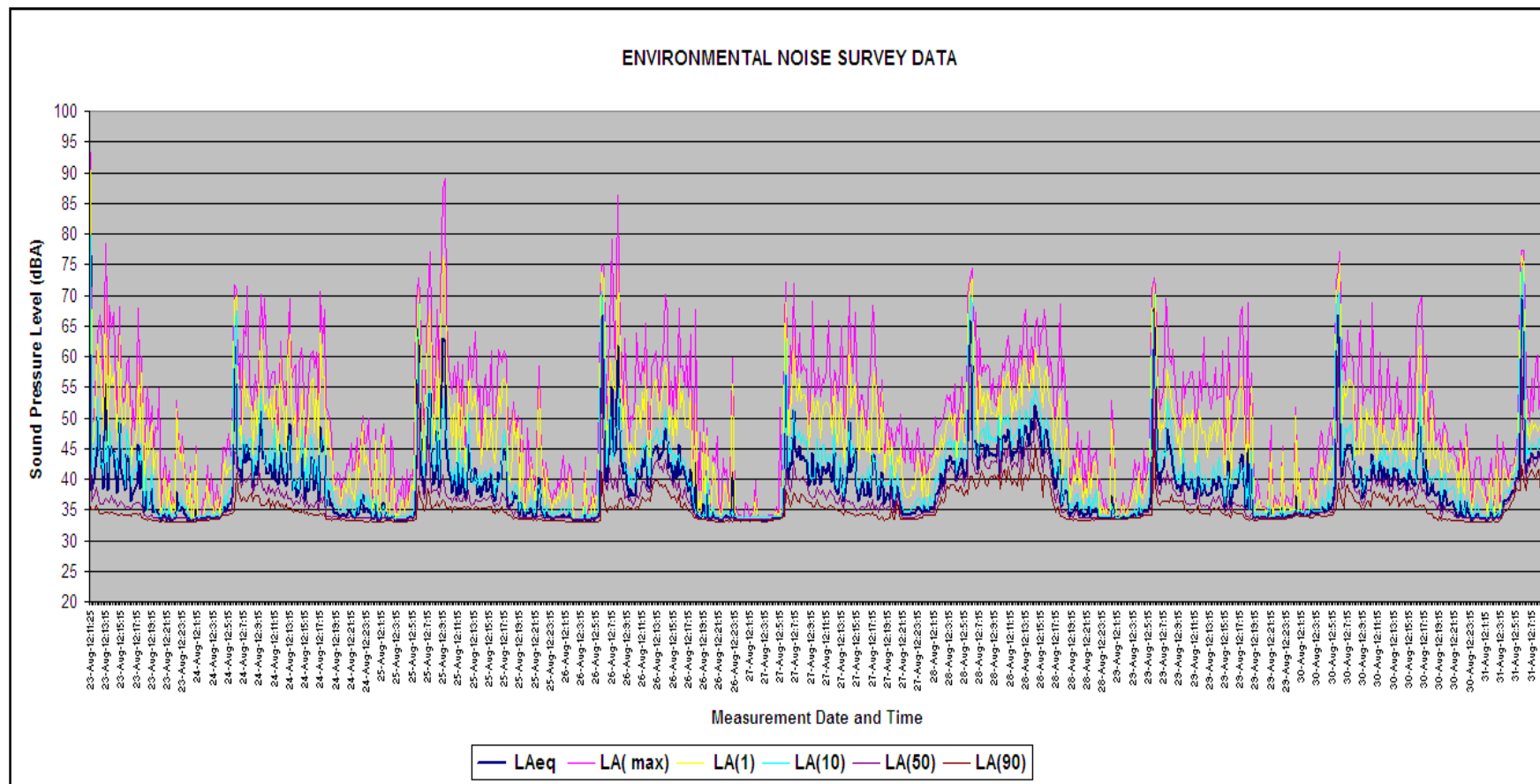


Figure B-1: Measured background noise levels at the proposed development

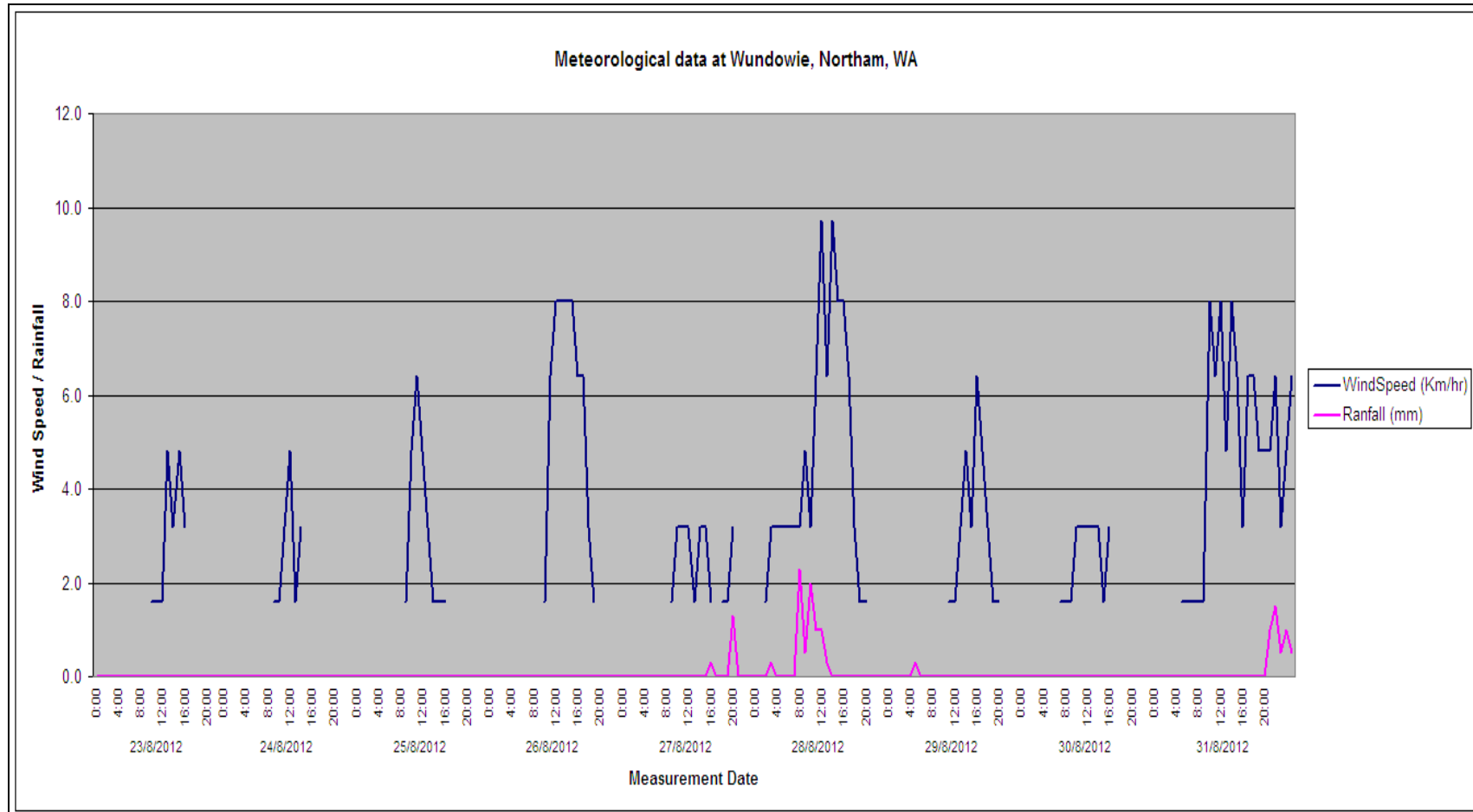


Figure B-2: Representative site weather data during noise measurement period [8]