Appendix E

Noise Impact Assessment

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HEGGIES

REPORT 30-2247-R1

Revision 1

National Ceramic Industries Australia Pty Ltd
Facility Expansion - Stages 5-8
Noise Impact Assessment

PREPARED FOR

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11 MARCH 2010

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National Ceramic Industries Australia Pty Ltd
Facility Expansion - Stages 5-8
Noise Impact Assessment

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EXECUTIVE SUMMARY

National Ceramic Industries Australia Pty Ltd (NCIA) proposes to undertake an expansion of their existing ceramic tile manufacturing facility (the Facility) at Rutherford, NSW. The proposal includes the construction and operation of a second factory building with four additional production lines on a parcel of land adjacent to the existing facility.

Heggies Pty Ltd (Heggies) has conducted a noise impact assessment for the proposed development with the objective being to assess the potential impacts of noise from construction, operation and traffic associated with the Facility at the nearest existing and proposed noise-sensitive receivers in the vicinity of the subject site.

Heggies conducted a background noise survey to measure ambient noise levels at locations representative of the nearest potentially affected receivers during the day, evening and night-time periods. The purpose of the noise survey was to enable the determination of project specific noise criteria for the proposed development in relation to operational, construction, and road traffic noise as well as criteria relevant to the potential for sleep disturbance.

Operational noise modelling was undertaken using SoundPLAN v6.4 software, developed by Braunstein and Berndt Gmbh in Germany. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Noise emission levels were predicted from the proposed development for a typical operational scenario. Noise contour maps, provided as **Appendix C**, show predicted noise levels from operation of the proposed NCIA development at surrounding areas for calm and prevailing meteorological conditions.

Operational noise levels are predicted to be significantly below the project specific noise criteria at all existing residential locations under calm and prevailing weather conditions.

It is noted that the Heritage Green residential subdivision is proposed immediately east and south of the subject site. Noise emission predictions from the NCIA development indicate that there are some areas of the Heritage Green site that may be noise affected. The degree of affectation will depend on the type of development proposed for different areas of the Heritage Green site.

The potential for sleep disturbance has also been assessed. Typical L_{Amax} noise levels were used as input to the noise model and predictions were made at the nearest residential areas under adverse weather conditions at night. The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event is likely to be less than the L_{Amax}. The highest L_{Amax} noise level at any existing residential area was predicted to be in the order of 40 dBA at Kenvil Close. This is significantly below the relevant criteria of 53 dBA. With regard to the proposed Heritage Green, there is potential for maximum noise levels from the NCIA site to be above the relevant sleep disturbance noise goal within approximately 70 m-190 m from the NCIA boundary.

An assessment of the potential for road traffic noise impacts has also been conducted. The nearest potentially affected residential receivers are located on the New England Highway approximately 15 m from the edge of the road as there are no residential properties located on Racecourse Road. It is predicted that the estimated increase in traffic as a result of the proposed development will generate a negligible increase in road traffic noise at the nearest potentially affected residential locations.

Predicted noise emission levels from construction activities at the subject site are significantly below the relevant construction noise goal. Furthermore, due to the relative separation distances, the level of vibration caused by construction activities at the subject site is extremely unlikely to be perceptible at any of the nearest residential premises and unlikely to have any impact on neighbouring industrial buildings.

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1 INTRODUCTION

National Ceramic Industries Australia Pty Ltd (NCIA) proposes to undertake an expansion of their existing ceramic tile manufacturing facility (the Facility) at Rutherford, NSW. The proposal includes the construction and operation of a second factory building with four additional production lines on a parcel of land adjacent to the existing facility.

NCIA intends to seek Project Approval for the proposed development under Part 3A of the *Environmental Planning and Assessment Act 1979*.

Heggies Pty Ltd (Heggies) has been commissioned by AECOM Australia Pty Ltd (AECOM) on behalf of NCIA to prepare a noise impact assessment for the proposed development. The objective of the noise impact assessment was to assess the potential impacts of noise from construction, operation and traffic associated with the Facility at the nearest existing and proposed noise-sensitive receivers in the vicinity of the subject site.

This noise assessment report has been prepared with reference to the following Department of Environment, Climate Change and Water (DECCW) policy documents:

- NSW Industrial Noise Policy (INP).
- Environmental Criteria for Road Traffic Noise (ECRTN).
- Environmental Noise Control Manual (ENCM).
- Interim Construction Noise Guideline.

2 PROJECT BACKGROUND AND DESCRIPTION

The NCIA facility produces high quality ceramic wall and floor tiles utilising a number of raw products including clay, feldspar and glazes.

The manufacturing process involves grinding and mixing of predominantly clay and feldspar, followed by a process of drying the mixture, adding dry glaze, roller pressing, additional dry glazing and decorating, additional pressing, cutting to size and firing in a kiln prior to packaging and dispatch.

NCIA has an existing approval for four (4) production lines (known as Stages One to Four) that allows production of up to 12.8 million square meters of tiles per annum when all four Stages are operational.

NCIA propose to extend their current facility located at Rutherford, NSW. The expansion proposal is seeking approval to operate an additional four production lines (known as Stages Five to Eight). Approval to operate Stages Five to Eight would increase the maximum annual production to approximately 25.6 million square meters of tiles.

The proposal would involve:

- Construction of a second factory building adjacent to the current building to accommodate the proposed four additional production lines (Stages Five to Eight).
- Development of associated infrastructure and services.

The proposed site layout including the existing facility is provided in **Figure 1**.

Figure 1 NCIA Site Location Map

The new building would be of similar scale and structure to that of the existing building and would be constructed close to the eastern boundary of the site. The building would be constructed in a north-south orientation with raw material storage and production beginning at the northern end and despatch occurring at the southern end.

Internal traffic would travel on a two way road network along the western and northern boundaries.

The manufacture of ceramic tiles involves numerous steps and a process flow diagram is provided in **Figure 2**. A brief description of the various steps is provided below.

Raw Materials

Raw materials that are used in the tile manufacturing process are predominantly clays and feldspars. These would be stored in a series of bunkers located at the northern end of the plant.

Batching and Mill Feeding

The raw materials are collected from the storage bunkers using a wheeled loader and are then placed into continuous weigh feeding hoppers. These ensure that the clay mill has a constant and consistent supply of raw materials. At the mill water and deflocculant are added to the milled material, also known as composite. Deflocculant is used to ensure that the composite does not combine during the milling process.

Slip Preparation, Drying and Pressing

Slip is the product of the wet clay milling process. The slip is kept in suspension using stirrers within the tanks. From the tanks the slip is pumped out and sprayed through fine ceramic nozzles into the spray drier.

The granulated composite that remains after the spray drying process contains approximately six percent water. Water vapour and fine particulates would be emitted from an emissions stack off the spray drier. From the spray drier, all remaining lumps of clay are removed by screens and are returned to the clay mill for further processing. The granulated composite is then transferred via a conveyor belt to storage silos. The granulated composite is left within the silos for approximately 12 hours, which allows for interaction between water and clay to take place. The slip preparation and drying process described above for Stages Five to Eight is identical to Stages One to Four. The storage silos feed onto a conveyer belt where a dry glaze is applied. This material then passes through a roller press that compacts the dry glaze into the unfired granulated composite. Following the roller press additional dry glazing and tile decorating (printing) can occur as required. The continuous length is then cut into large sheets and is re-pressed. The sheets are then trimmed if necessary and cut to the required tile size. The tiles may undergo a final application of wet glaze as the style of tile requires and dried in a tile drier.

Glazing

A dry glaze would be applied prior to being roller pressed and again prior to being cut and dried as described above. There would be limited wet glazing undertaken in Stages Five to Eight compared to Stages One to Four. Storage of dry glazes would take place in a number of storage silos that would be located in the northern section of the new factory, prior to the beginning of the production line conveyors. Seven dry glaze colours are required to manufacture the full range of tiles, however up to twenty four storage silos may be installed. Wet glaze application in Stages Five to Eight would be significantly reduced when compared to Stages One to Four. Many tile varieties would not require wet glaze application in Stages Five to Eight because of the use of dry glazes. Wet glaze preparation is undertaken as a batch process within the glaze preparation plant. Batches are prepared based on the particular glaze or effect that is required. The wet glazes are milled in batches, are stored as a liquid and are left to stand for 24 hours to allow for cooling and bubble removal. Wet glazes are applied to the tile on the glazing line after the tiles are cut to size and dried in the tile dryer. Wet glazes are applied using an airpower applicator, which is a pump attached to rotating spraying nozzles that ensure a consistent finish over the tile. Wet glazes would be used to further enhance or decorate tiles in ways not possible during the dry glazing process.

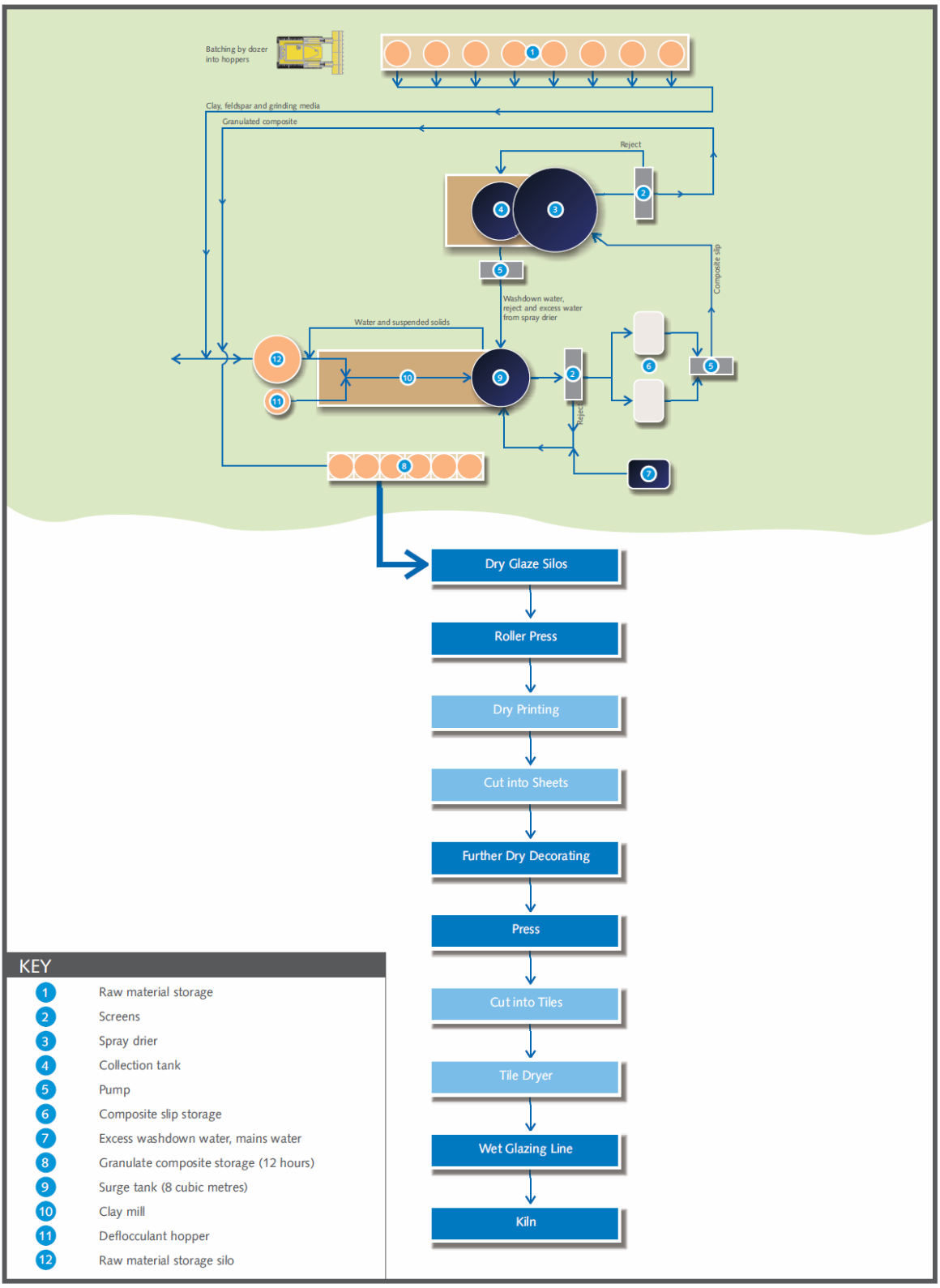
Firing

Tiles are fed through a pre-kiln which removes the moisture from the applied wet glaze. The tiles then pass through the kiln at 1,300 degrees centigrade. Once the tiles have cooled they are available for packaging and dispatch. Each kiln would generate gaseous emissions from the combustion of natural gas. These emissions would be released via one scrubbed stack per kiln.

Packaging and Dispatch

Prior to packaging the tiles are scanned for grading in line with NCIA's quality control procedures. Tiles are then boxed, palletised and shrink wrapped through an automated process. Once on the pallets, the tiles are stored, awaiting dispatch by road transport.

Figure 2 Tile Manufacture Process Flow Diagram



3 SITE DETAILS

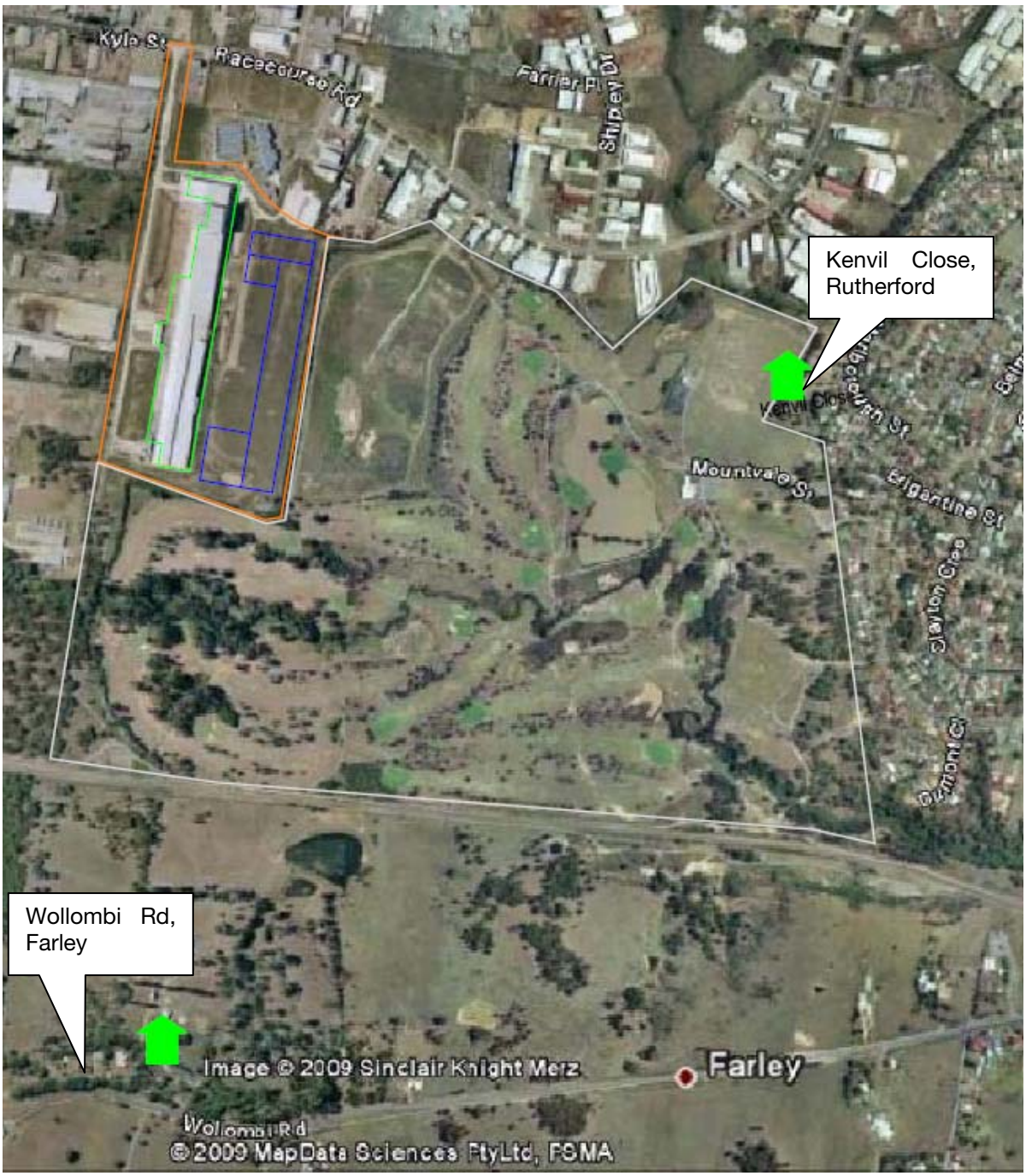
The proposed expansion is to be located adjacent to the existing operation, located on Lot 101 DP 1062820 Racecourse Road, Rutherford, within the local government area of Maitland. The existing Facility is located within the Rutherford Industrial Estate where land use is predominantly industrial. The property located adjacent to the southern and eastern boundaries of the Facility is a former golf course; currently being investigated for proposed residential development (Heritage Green). The northern and western neighbours of the existing Facility are industrial developments. The regional location of the subject site is shown in **Figure 3**.

Figure 3 Regional Location of NCIA Site

The nearest potentially affected noise-sensitive receivers to the subject site are shown in **Figure 4** and are as follows:

- Existing residential properties located in the suburb of Rutherford east of the subject site. The nearest are located in Kenvil Close approximately 800 m from the NCIA site boundary.
- Proposed Heritage Green residential subdivision to be located immediately east and south of the subject site (grey line in **Figure 4** represents approximate site boundary). It is understood that this development may also include spaces for active recreation.
- Existing residential properties located in the suburb of Farley south of the railway line. The nearest are located approximately 860 m south of the NCIA site boundary.

Figure 4 Nearest Potentially Affected Noise Sensitive Receivers



4 IMPACT ASSESSMENT PROCEDURES

4.1 General Objectives

Responsibility for the control of noise emission in New South Wales is vested in Local Government and the Department of Environment, Climate Change and Water (DECCW). The Industrial Noise Policy (INP) was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the DECCW to regulate premises that are scheduled under the Protection of the Environment Operations Act, 1997.

The specific policy objectives are:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving project specific noise levels.
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.
- To outline a range of mitigation measures that could be used to minimise noise impacts.
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development.
- To carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the Act.

The INP provides two forms of noise criteria with the aim of achieving environmental noise objectives; one to account for intrusive noise which involves setting a noise goal relative to the existing acoustic environment and the other to protect the amenity of particular land uses.

4.2 Assessing Intrusiveness

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than five decibels above the measured background level (L_{A90}).

4.3 Assessing Amenity

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. For high-traffic areas there is a separate amenity criterion.

An extract from the INP that relates to the amenity criteria is given in **Table 1** and **Table 2**.

Table 1 Amenity Criteria - Recommended LAeq Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(Period)}$ Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface (for existing situations only)	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms - internal	All	Noisiest 1 hour period when in use	35	40
Hospital wards - internal	All	Noisiest 1 hour period	35	40
Hospital wards - external	All	Noisiest 1 hour period	50	55
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (eg National Park)	All	When in use	50	55
Active recreation area (eg school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am, On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Table 2 Modification to Acceptable Noise Level (ANL)* to Account for Existing Levels of Industrial Noise

Total Existing L_{Aeq} noise level from Industrial Noise Sources	**Maximum L_{Aeq} Noise Level for Noise from New Sources Alone, dBA**
≥ Acceptable noise level plus 2 dBA	If existing noise level is *likely to decrease* in future acceptable noise level minus 10 dBA If existing noise level is *unlikely to decrease* in future existing noise level minus 10 dBA
Acceptable noise level plus 1 dBA	Acceptable noise level minus 8 dBA
Acceptable noise level	Acceptable noise level minus 8 dBA
Acceptable noise level minus 1 dBA	Acceptable noise level minus 6 dBA
Acceptable noise level minus 2 dBA	Acceptable noise level minus 4 dBA
Acceptable noise level minus 3 dBA	Acceptable noise level minus 3 dBA
Acceptable noise level minus 4 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 5 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 6 dBA	Acceptable noise level minus 1 dBA
< Acceptable noise level minus 6 dBA	Acceptable noise level

* ANL = recommended acceptable L_{Aeq} noise level for the specific receiver, area and time of day from **Table 1**

4.4 Assessing Sleep Disturbance

The DECCW has acknowledged that the relationship between maximum noise levels and sleep disturbance is not currently well defined. Criteria for assessing sleep disturbance has not been identified under the INP and hence, sleep arousal has been assessed using the guidelines set out in the ENCM Chapter 19-3.

To avoid the likelihood of sleep disturbance the ENCM recommends that the $L_{A1(1minute)}$ noise level of the source under consideration should not exceed the background noise level (L_{A90}) by more than 15 dBA when measured outside the bedroom window of the receiver during the night-time hours (10.00 pm to 7.00 am).

4.5 Road Traffic Noise

The DECCW released the "*Environmental Criteria for Road Traffic Noise*" in May 1999. The policy sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts.

4.6 Construction Noise

The DECCW released the Interim Construction Noise Guideline in July 2009. The guideline sets out noise management levels, in relation to construction type activities, for residential and other sensitive receivers and how they are to be applied. The guideline suggests restriction to the hours of construction that apply to activities that generate noise at noise-sensitive receivers above the 'highly affected' noise management level. A summary of the noise management levels from the Guideline is contained in **Table 3** and **Table 4**.

Table 3 Interim Construction Noise Guideline (Residences)

Time of day	Management level $L_{Aeq(15minute)}$	How to apply
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays	Noise Affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise Affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

Table 4 Interim Construction Noise Guideline at Sensitive Land Uses (other than residences)

Land Use	Management Level, $L_{Aeq(15minute)}$ (applies when properties are being used)
Active recreation areas[1]	External noise level 65dBA

1. Characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.

5 EXISTING ACOUSTICAL AND METEOROLOGICAL ENVIRONMENT

5.1 General Methodology

All acoustic instrumentation employed throughout the monitoring programme carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

5.2 Unattended Continuous Noise Monitoring

Background noise levels were monitored by Heggies. The objective of the background noise survey was to measure $L_{A90(period)}$ and $L_{Aeq(15minute)}$ noise levels at locations representative of the nearest potentially affected receivers during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the proposed development.

Background noise levels were monitored at four (4) separate locations, three (3) of which were considered to be representative of the nearest potentially affected receivers, from Friday 5 June to Monday 15 June 2009, inclusive. The fourth location, on the southern boundary of the proposed development site, was utilised to determine noise emission levels from the existing development on the subject site. Details of monitoring locations are provided in **Table 5** and are shown in **Figure 5**.

Table 5 Ambient Noise Monitoring Locations

Location	Details	Logger Serial Number
1	3 Mountvale Street, Rutherford	194637
2	115 Regiment Road, Rutherford	16-203-509
3	256 Wollombi Road, Farley	16-302-482
4	Southern boundary of NCIA site	16-306-039

Figure 5 Noise Logger Locations

ARL Type EL215 and EL316 noise loggers were used to monitor the ambient noise levels at each location. The noise loggers were programmed to record statistical noise level indices continuously in 15 minute intervals, including L_{Amax}, L_{A1}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and L_{Aeq}. Precautions were taken to minimise influences from extraneous noise sources and reflections from adjacent buildings.

Weather data for the survey period was obtained from the nearest Bureau of Meteorology station located at Tocal, approximately 12 km north-east of the subject site. Noise data corresponding to periods of rainfall and/or wind speeds in excess of 5 m/s (approximately 9 knots) were discarded in accordance with INP data exclusion methodology. A summary of the results of the background surveys is given in **Table 6**. Results are displayed graphically in **Appendix A** for details.

Table 6 Summary of Existing Ambient Noise Levels

Location	Period	Background L_{A90} Noise Level	Measured $L_{Aeq(Period)}$ (dBA)	Estimated Existing Industrial Contribution $L_{Aeq(Period)}$ (dBA)
		Rating Background Level (dBA)		
1 3 Mountvale St, Rutherford	Day	43	55	41
	Evening	43	50	41
	Night	38	48	41
2 115 Regiment Rd, Rutherford	Day	42	57	33
	Evening	39	53	33
	Night	36	49	33
3 256 Wollombi Rd, Farley	Day	38	55	39
	Evening	38	51	39
	Night	37	51	39
4 Southern boundary of NCIA site	Day	45	54	45
	Evening	45	50	45
	Night	45	49	45

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am
The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
L_{Aeq} - The equivalent continuous noise level is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period

5.3 Operator Attended Noise Monitoring

Operator attended noise measurements were conducted during the daytime period at each monitoring location. Each measurement was conducted over a 15 minute period using a Brüel & Kjær 2250 one third octave band integrating sound level meter (S/N 2600507). The results of the operator attended noise measurements are given in **Table 7**. Ambient noise levels given in the table include all noise sources such as traffic, insects, birds, as well as any other industrial operations.

Table 7 Operator Attended Noise Survey Results

Location	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 μPa)					Description of Noise Emission, Typical Maximum Levels L_{Amax} (dBA) and Estimated Existing L_{Aeq} Contribution
		L_{Amax}	L_{A1}	L_{A10}	L_{A90}	L_{Aeq}	
1 3 Mountvale St, Rutherford	5/6/2009 1250 Day W=1 m/s WNW Temp=25°C	71	62	55	43	52	Resident 48 - 58 Birds 48 - 71 Wind ~ 43 Local traffic 50-61 Excavator at golf course (sewage upgrade) 50-54 Existing industry ~ 41
2 115 Regiment Rd, Rutherford	5/6/2009 1320 Day W=1 m/s WNW Temp=26°C	79	71	58	41	57	Train up to 48 Wind 40-48 Dog barking 58-65 Local traffic 68-79 Industrial noise just audible in lulls ~33
3 256 Wollombi Rd, Farley	5/6/2009 1402 Day W=2 m/s WNW Temp=27°C	80	75	67	42	63	Traffic 68-74 Train 46-54 Birds 56 Frogs 43 Operator 80 Industrial noise just audible in lulls ~39
4 Southern boundary of NCIA site	5/6/2009 1210 Day W=2 m/s WNW Temp=26°C	74	56	51	46	49	Tile factory ~ 45 Wind in trees 45-51 Train horn 64 Operator noise 64 Tiles dropped / broken 52 Plane 47-52

Results of the operator attended noise surveys indicate that road and rail traffic, local community activity and existing industry are all significant contributors to ambient noise levels at each noise logger location.

5.4 Effects of Meteorology on Noise Levels

5.4.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration. Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Weather data, including wind speed, wind direction, temperature and an estimation of the stability class, was provided by AECOM for the area surrounding the subject site. AECOM provided the following information in relation to this data:

The meteorological data were sourced from the CSIRO TAPM prognostic model for the year 2004 with input data used to 'nudge' the TAPM predictions toward actual observed data. Measured data were sourced from nearby Bureau of Meteorology (BOM) Stations at Cessnock (approximately 18 km southwest of the Facility) and Paterson (located approximately 13 km to the southeast) and data provided by Hydro Aluminium from their weather station at Loxford (approximately 8 km south-southwest). Wind speed and direction data were entered into TAPM to predict meteorological data for the area surrounding the subject site.

In order to determine whether the TAPM meteorological output was representative of long term average meteorological conditions and expected regional behaviour, selected long term meteorological parameters recorded at the Paterson weather station were compared with the same parameters from the meteorological data set generated by TAPM. The TAPM-generated data were considered to be acceptable for modelling purposes.

This data was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night in each season. A summary of the most frequently occurring winds is contained within **Table 8**, **Table 9** and **Table 10**. The percentage occurrence figures provided in bold text exceed the 30% threshold.

Table 8 Seasonal Frequency of Occurrence of Wind Speed Intervals - Daytime

Period	Calm	Wind Direction	0.5 - 2 m/s	2 - 3 m/s	0.5 - 3 m/s
Summer	2.1%	ESE±45°	6.0%	7.9%	13.9%
Autumn	2.0%	SE±45°	9.0%	8.9%	17.9%
Winter	1.8%	W±45°	14.0%	10.3%	24.3%
Spring	2.1%	WNW±45°	5.1%	6.1%	11.2%

Table 9 Seasonal Frequency of Occurrence of Wind Speed Intervals - Evening

Period	Calm	Wind Direction	0.5 - 2 m/s	2 - 3 m/s	0.5 - 3 m/s
Summer	1.4%	ESE±45°	10.4%	22.3%	**32.7%**
Autumn	0.8%	E±45°	16.3%	18.6%	**34.9%**
		ESE±45°	21.1%	21.9%	**42.9%**
		SE±45°	20.9%	20.7%	**41.6%**
		SSE±45°	17.3%	15.6%	**32.9%**
Winter	2.2%	W±45°	11.8%	17.8%	29.6%
Spring	1.9%	ESE±45°	12.9%	23.6%	**36.5%**
		SE±45°	13.2%	22.5%	**35.7%**

Table 10 Seasonal Frequency of Occurrence of Wind Speed Intervals - Night

Period	Calm	Wind Direction	0.5 - 2 m/s	2 - 3 m/s	0.5 - 3 m/s
Summer	1.1%	SE±45°	9.6%	20.3%	29.9%
Autumn	0.1%	ESE±45°	9.4%	13.4%	22.8%
Winter	0.7%	W±45°	16.4%	19.3%	**35.7%**
		WNW±45°	18.4%	18.5%	**36.9%**
		NW±45°	16.9%	14.5%	**31.4%**
Spring	1.7%	ESE±45°	7.8%	12.5%	20.3%

Seasonal wind records indicate that certain winds are a feature of the area. The frequency of winds up to 3 m/s is above the 30% threshold during several seasons and periods; generally from the SE quadrant during the evening and generally from the NW during the night-time period. Modelling under prevailing wind was therefore conducted as part of this investigation.

5.4.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week.

Analysis of the meteorological data provided by AECOM determined that Class F temperature inversions (1.5°C/100m - 4°C/100m) and Class G (>4°C/100m) are likely to occur for approximately 56% and 0%, respectively, during the winter evening and night-time periods. Thus, temperature inversions have been considered as part of this investigation.

6 PROJECT SPECIFIC NOISE CRITERIA

6.1 Operational Noise Design Criteria

The noise emission design criteria for the proposed NCIA development have been established with reference to the INP outlined in **Section 4** of this report.

The existing L_{Aeq} noise levels in the vicinity of the subject site are dominated by road and rail traffic, local community activity and existing industry. The amenity criteria have been established using the results of operator-attended ambient noise measurements. Where it was found that existing industrial noise contributed to ambient noise levels at potentially affected areas in the vicinity of the subject site appropriate adjustments[1] have been made to the amenity criteria (as per **Table 2**) for these locations.

The acoustical environment typifies an urban environment, with residences near existing industrial districts. Therefore, the residences in the general area have been assessed as "urban" receiver types as defined in the INP.

Heggies has assumed that ambient noise levels measured at Location 1 (Mountvale St) are typical of those at the proposed residential locations west of the current Rutherford residential estate (Heritage Green). This is due to their close proximity to the existing industrial estate and hence, their similar acoustic environment.

Table 11 NCIA Project Specific Noise Criteria

Location	Period	Intrusiveness Criteria $L_{Aeq(15minute)}$	Amenity Criteria $L_{Aeq(Period)}$	Project Specific Noise Criteria $L_{Aeq(15minute)}$
Heritage Green	Day	48 dBA	60 dBA	48 dBA
	Evening	48 dBA	50 dBA	48 dBA
	Night	43 dBA	43 dBA	43 dBA
Existing Rutherford residences (west of NCIA)	Day	47 dBA	60 dBA	47 dBA
	Evening	44 dBA	50 dBA	44 dBA
	Night	41 dBA	45 dBA	41 dBA
Farley residences (south of NCIA)	Day	43 dBA	60 dBA	43 dBA
	Evening	43 dBA	50 dBA	43 dBA
	Night	42 dBA	44 dBA	42 dBA
Proposed Active Recreation Area	When in use	N/A	Acceptable 55 dBA Recommend Max. 60 dBA	55 dBA 60 dBA max.

Daytime 7.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night 10.00 pm - 7.00 am
Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night 10.00 pm - 8.00 am

The INP states that these criteria have been selected to protect at least 90% of the population, living in the vicinity of industrial noise sources, from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

[1] Eg: The night-time amenity noise goal for location 1 has been adjusted by -2 dBA since the measured existing contribution from industrial sources was 41 dBA (refer **Table 7**). The Acceptable Amenity noise goal during the night is 45 dBA (without adjustment) so the existing industrial noise contribution at this location is the Acceptable Amenity level minus 4dBA. As per **Table 2** the Acceptable Amenity noise goal as been adjusted by -2 dBA.

6.2 Sleep Disturbance Noise Goals

The relevant sleep disturbance noise goals for each residential area are provided in **Table 12**.

Table 12 Sleep Disturbance Noise Goals

Location	Period	Measured Background Noise Level (L_{A90})	Sleep Disturbance Noise Goal $L_{A1(1minute)}$
Heritage Green	Night	38 dBA	53 dBA
Existing Rutherford residences (west of NCIA)		36 dBA	51 dBA
Farley residences (south of NCIA)		37 dBA	52 dBA

6.3 Road Traffic Noise Design Criteria

Road traffic noise criteria are set out in the ECRTN. The criteria recommended in the policy document are based on the functional categories of the subject roads, as applied by the RTA.

All raw material deliveries and product despatches will utilise Racecourse Road and the New England Highway. The nearest potentially affected residential receivers are located on the New England Highway approximately 15 m from the edge of the road as there are no residential properties located on Racecourse Road. The New England Highway is classified as an arterial road which, by definition, carries predominantly through-traffic from one region to another, forming a principal avenue of communication for urban traffic movements.

The relevant road traffic noise criteria for the subject development are provided in **Table 13**.

Table 13 Road Traffic Noise Criteria

Type of Development	Criteria		
	Day 7.00 am - 10.00 pm	**Night 10.00 pm - 7.00 am**	**Where Criteria are Already Exceeded**
Land use developments with potential to create additional traffic on existing freeways/ arterials	$L_{Aeq(15hour)}$ 60 dBA	$L_{Aeq(9hour)}$ 55 dBA	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

The ECRTN also draws the following conclusions with regard to maximum noise levels and the likelihood of sleep disturbance:

- Maximum internal noise levels below 50-55 dBA are unlikely to cause awakening reactions.
- One or two noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly.

6.4 Construction Noise Goals

The relevant construction noise goals have been developed with reference to the Interim Construction Noise Guideline outlined in **Section 4.6** and are contained in **Table 14**.

It should be noted that the Noise Affected level for daytime is determined as background noise plus 10 dBA. The Noise Affected level for evening and night (ie outside recommended hours) is determined as background noise plus 5 dBA. The Highly Noise Affected level is defined in the Interim Construction Noise Guideline. It should be noted that a Highly Noise Affected level is not defined for the evening or night periods. A strong justification would typically be required for works outside the recommended standard hours. It is noted that construction activity for the proposed NCIA development will not occur during the evening or night-time periods.

Table 14 Construction Noise Goals

Location	Period	Noise Goal $L_{Aeq(15minute)}$	
		Noise Affected (dBA)	Highly Noise Affected (dBA)
Heritage Green	Day	53	75
	Evening	48	n/a
	Night	43	n/a
Existing Rutherford residences (west of NCIA)	Day	52	75
	Evening	44	n/a
	Night	41	n/a
Farley residences (south of NCIA)	Day	48	75
	Evening	43	n/a
	Night	42	n/a

For Monday to Saturday, Daytime 7.00 am - 6.00pm; Evening 6.00pm - 10.00pm; Night-time 10.00pm - 7.00am.
On Sundays and Public Holidays, Daytime 8.00am - 6.00pm; Evening 6.00pm - 10.0 pm; Night-time 10.0 pm - 8.00am.

7 ASSESSMENT OF NOISE IMPACTS

7.1 Operational Noise Modelling

7.1.1 Operational Noise Modelling Parameters

Operational noise modelling was undertaken using SoundPLAN v6.4 software, developed by Braunstein and Berndt Gmbh in Germany. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Topographic contours and drawings of the proposed site were supplied by AECOM and utilised for the purpose of modelling noise from the proposed development.

The operational scenario considered is essentially a duplication of the approved operations, that is, four additional production lines creating eight (8) production lines in total (Stages 1-8). The exception is that laser guided forklifts transport final product from the proposed factory building to the existing building for despatch. Noise source data has been determined from both on-site measurements of the current operations and a Heggies database of similar equipment. A noise model of the existing operations was developed and calibrated to measured levels at the subject site. Noise emission contours of the existing operations are provided in **Appendix B**.

Prediction of noise under calm and prevailing atmospheric conditions (temperature inversion and prevailing winds) was conducted. Atmospheric parameters under which noise predictions were made are given in **Table 15**.

Table 15 Meteorological Parameters for Noise Predictions

	Temperature	**Humidity**	**Wind Speed**	**Wind Direction** (degrees from north)	**Temperature Gradient**
Calm (All periods)	20°C	65%	N/A	N/A	N/A
Temperature Inversion (Night only)	10°C	90%	N/A	N/A	3°C/100 m
SE Wind (Evening and Night)	10°C	90%	3 m/s	135°	N/A
NW Wind (Night only)	20°C	65%	2 m/s	315°	N/A

The modelled wind directions were chosen such that they provide a worst-case meteorological scenario to the nearest potentially affected receivers and are consistent with the determined prevailing conditions in the vicinity of the site.

Other assumptions made in modelling the proposed development include the following:

- All acoustically significant plant and equipment operates simultaneously.
- Construction of the proposed and existing factory buildings is majority steel sheeting with a maximum of 5% translucent sheeting to allow for natural lighting.
- Mobile noise sources, such as delivery and product despatch trucks, were modelled at typical locations and assumed to operate in repetitive cycles.
- All mitigation measures described in **Section 7.1.2** are implemented.

7.1.2 Noise Management and Mitigation

Noise mitigation and management procedures that have been incorporated into the model with the aim of reducing operational noise emissions are as follows:

- No truck deliveries of raw products or final product despatch will occur during the night-time period.
- Electric, laser guided forklifts are utilised to transport final product from the proposed factory building to the product despatch area of the existing building.
- The transport route for both forklifts and delivery/product despatch truck has been designed to minimise the need for reversing and, as such, the use of reversing alarms.
- The bag-houses of the proposed kiln stacks will be located inside the proposed factory building.
- The proposed dust extraction unit, located on the southern end of the eastern wall of the proposed factory building, will be enclosed to reduce noise emission to the east and south.

7.1.3 Operational Noise Modelling Results and Discussion

Noise emission levels were predicted from the proposed development for a typical operational scenario. Noise contour maps, provided as **Appendix C**, show predicted noise levels from operation of the proposed NCIA development at surrounding areas for calm and prevailing meteorological conditions.

Operational noise levels are predicted to be significantly below the project specific noise criteria at all existing residential locations under calm and prevailing weather conditions.

It is noted that the Heritage Green residential subdivision is proposed immediately east and south of the subject site. Noise emission predictions from the NCIA development indicate that there are some areas of the Heritage Green site that may be noise affected.

The degree of affectation would depend on the type of development proposed for different areas of the proposed Heritage Green (i.e. the site layout and orientation). Other important factors influencing affectation include the implementation of proposed noise attenuation measures identified in the 2006 Heritage Green Statement of Environmental Effects (SEE), to mitigate the acknowledged industrial noise across parts of the Heritage Green site. These measures included noise barriers, buffer distances and the design of residential building envelope.

7.1.4 Cumulative Noise Assessment

The proposed development site is situated within a developed industrial area in Rutherford, NSW. Existing industrial properties are located to the west and north of the subject site.

Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise *amenity* levels for residences. Therefore, the cumulative impact of the proposed development with existing industrial noise sources has been assessed in the determination of the amenity levels at surrounding potentially noise sensitive areas.

7.2 Sleep Disturbance Analysis

In the interests of minimising sleep disturbance impacts the mitigation measures described in **Section 7.1.2** will be implemented during the night-time period. Notwithstanding this, some typical activities that may cause maximum noise events during the night-time period have been considered as part of this noise assessment. Typical maximum noise events that have been considered are:

- Forklifts loading/unloading pallets - maximum sound power level 122 dBA.
- Reversing alarms - maximum sound power level 109 dBA (including +5 dBA to account for tonality in accordance with INP methodology).
- Front-end loader operation - maximum sound power level 117 dBA.

In assessing the potential for sleep disturbance, these typical L_{Amax} noise levels were used as input to the noise model and predictions were made at the nearest residential areas in Rutherford and Farley under adverse weather conditions at night. The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event is likely to be less than the L_{Amax}.

The highest L_{Amax} noise level at any existing residential area is predicted to be in the order of 40 dBA at Kenvil Close under the effects of a temperature inversion. This is significantly below the relevant criteria of 53 dBA.

As stated in **Section 7.1.3**, the degree of affectation at the proposed Heritage Green would depend on the type of development proposed for different areas and the implementation of proposed noise attenuation measures. Notwithstanding this, Heggies has considered a worst-case scenario for the proposed Heritage Green development where no further mitigation measures have been included as part of the proposed residential development. Based on this assumption, depending on the location and the degree of shielding provided by the existing earth bund adjacent to the NCIA boundary, the potential area of affection within the proposed residential development could be approximately 70 m-190 m from the NCIA boundary. That is, within 70 m-190 m from the NCIA boundary there is potential for maximum noise levels from the NCIA site to be above the relevant sleep disturbance noise goal.

7.3 Road Traffic Noise Assessment

The estimated traffic movements generated by the existing development and the project will be in the order of 228 vehicle trips per day including approximately 88 truck trips per day. All raw material deliveries and product despatches will utilise Racecourse Road and the New England Highway. The nearest potentially affected residential receivers are located on the New England Highway approximately 15 m from the edge of the road as there are no residential properties located on Racecourse Road.

Annual Average Daily Traffic (AADT) data published by the RTA stated that 36,326 vehicles travelled the New England Highway at Rutherford in 2004. It has been assumed that vehicle movements on this section of the Highway would have significantly increased since 2004 however, based on this daily average, the proposed NCIA development will generate an increase in traffic flow along the Highway of less than 1% and thus an increase in noise level of less than 0.5 dBA. This increase in road traffic noise will not be noticeable at the nearest residential locations adjacent to the New England Highway and is significantly below the 2 dBA allowance provided in the ECRTN (refer Column 4 of **Table 13**).

7.4 Construction Noise Assessment

7.4.1 Construction Noise Modelling Parameters

It is anticipated that the construction schedule and equipment used for the proposed development will be similar to those used for the construction of the existing factory. Earthmoving plant would initially be required to excavate foundations, level the site and construct drainage channels, etc. Construction of the factory building would commence after most of the earthworks are complete although some overlap may occur. It has also been assumed that construction of the NCIA factory will occur prior to development of Heritage Green. Thus, construction noise has not been assessed at Heritage Green.

Plant and equipment considered in assessing noise from construction of the proposed development are provided, with the associated sound power levels, in **Table 16**. Sound power levels of construction equipment were obtained from a Heggies database.

Table 16 Proposed Construction Plant and Equipment

Plant and Equipment	Sound Power Level (L_{Aeq})
Earthworks	
D6 Dozer	110 dBA
30 tonne Excavator	111 dBA
20 tonne Excavator	110 dBA
25t Articulated Off-road Dump Trucks (x6)	111 dBA
12t Padfoot Roller (x2)	110 dBA
Water Cart	112 dBA
963 Traxcavator	111 dBA
Building Construction and Fitout	
Drill rigs (3 for 3 weeks each)	105 dBA
Cranes (2 for 4 months each)	105 dBA
Bobcats (2 for 3 months each)	102 dBA
Backhoes (3 for 3 months each)	104 dBA
3t or 4t Excavators (3 for 3 months)	104 dBA
Concrete Truck (1500 deliveries over 3 months)	103 dBA
Truck deliveries of supplies (approx. 10 per day)	76 dBA

7.4.2 Construction Noise Modelling Results and Discussion

It is noted that construction activity for the proposed NCIA development will not occur during the evening or night-time periods. Hence, predicted noise emission levels from construction activity have been compared to the relevant daytime criteria for each existing residential area.

The results of construction noise predictions are provided in **Table 17** for the nearest residential areas.

Table 17 Predicted Construction Noise Levels LAeq(15minute) (dBA)

Location	Period	Predicted Construction Noise Emission Level		Noise Affected Level
		Earthworks	Building Construction & Fitout	
1* 3 Mountvale St, Rutherford	Day	42	35	53
2** 115 Regiment Rd, Rutherford		38	30	52
3*** 256 Wollombi Rd, Farley		38	31	48

Predicted noise emission levels from construction activities at the subject site are significantly below the relevant construction noise goal (or Noise Affected Level).

7.4.3 Construction Vibration

The major vibration generating activities will occur during the earthworks in preparing the site; activities such as excavation and the use of vibratory rollers. The nearest residential premises to such construction activity is approximately 870 m. Due to the large separation distance to this and other residences, the level of vibration caused by construction activities at the subject site is extremely unlikely to be perceptible at any of the nearest residential premises.

The nearest industrial building to potential vibration generating activities is situated approximately 60 m from such potential construction activities. This magnitude of separation is expected to ensure that construction activities at the Rutherford site will have no impact on neighbouring industrial buildings.

8 CONCLUSION

Heggies Pty Ltd (Heggies) has conducted a noise impact assessment for the proposed NCIA development. The objective of the noise impact assessment was to assess the potential impacts of noise from construction, operation and traffic associated with the Facility at the nearest existing and proposed noise-sensitive receivers in the vicinity of the subject site.

Noise emission levels were predicted from the proposed development for a typical operational scenario. Noise contour maps, provided as **Appendix C**, show predicted noise levels from operation of the proposed NCIA development at surrounding areas for calm and prevailing meteorological conditions. Operational noise levels are predicted to be significantly below the project specific noise criteria at all existing residential locations under calm and prevailing weather conditions.

It is noted that the Heritage Green residential subdivision is proposed immediately east and south of the subject site. Noise emission predictions from the NCIA development indicate that there are some areas of the Heritage Green site that may be noise affected. The degree of affectation will depend on the type of development proposed for different areas of the Heritage Green site.

The potential for sleep disturbance has also been assessed. Typical L_{Amax} noise levels were used as input to the noise model and predictions were made at the nearest residential areas in Rutherford and Farley under adverse weather conditions at night. The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event is likely to be less than the L_{Amax}. The highest L_{Amax} noise level at any existing residential area is predicted to be in the order of 40 dBA at Kenvil Close. This is significantly below the relevant criteria of 53 dBA. With regard to the proposed Heritage Green residential development, there is potential for maximum noise levels from the NCIA site to be above the relevant sleep disturbance noise goal within approximately 70 m-190 m from the NCIA boundary.

An assessment of the potential for road traffic noise impacts has also been conducted. All raw material deliveries and product despatches will utilise Racecourse Road and the New England Highway. The nearest potentially affected residential receivers are located on the New England Highway approximately 15 m from the edge of the road as there are no residential properties located on Racecourse Road. Based on AADT data published by the RTA it is predicted that the estimated increase in traffic as a result of the proposed development will generate a negligible increase in road traffic noise at the nearest residential locations adjacent to the New England Highway.

Predicted noise emission levels from construction activities at the subject site are significantly below the relevant construction noise goal. Furthermore, due to the relative separation distances, the level of vibration caused by construction activities at the subject site is extremely unlikely to be perceptible at any of the nearest residential premises and unlikely to have any impact on neighbouring industrial buildings.

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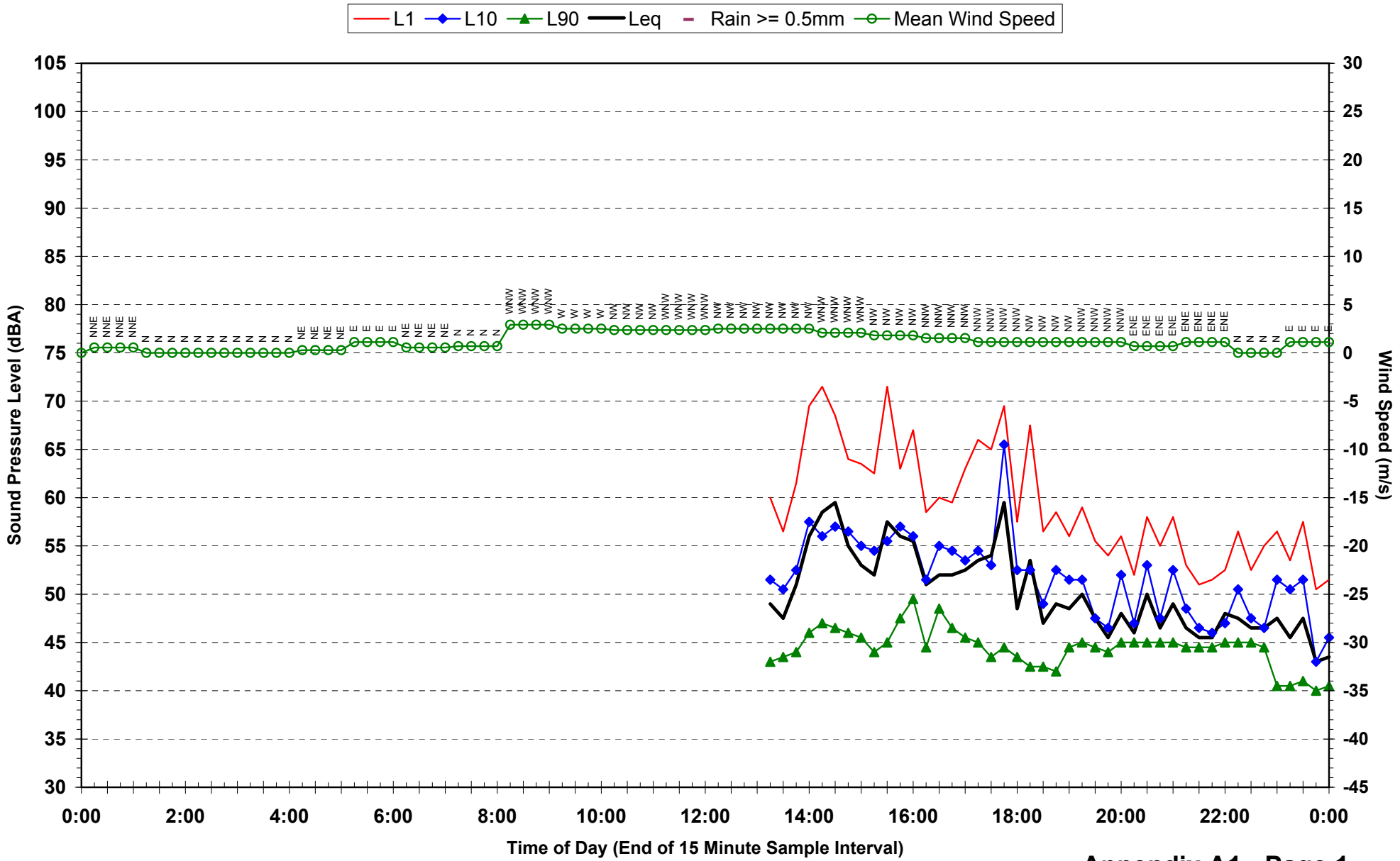
Statistical Ambient Noise Levels
30-2247 Mountvale St, Rutherford - Friday 5 June 2009



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Statistical Ambient Noise Levels
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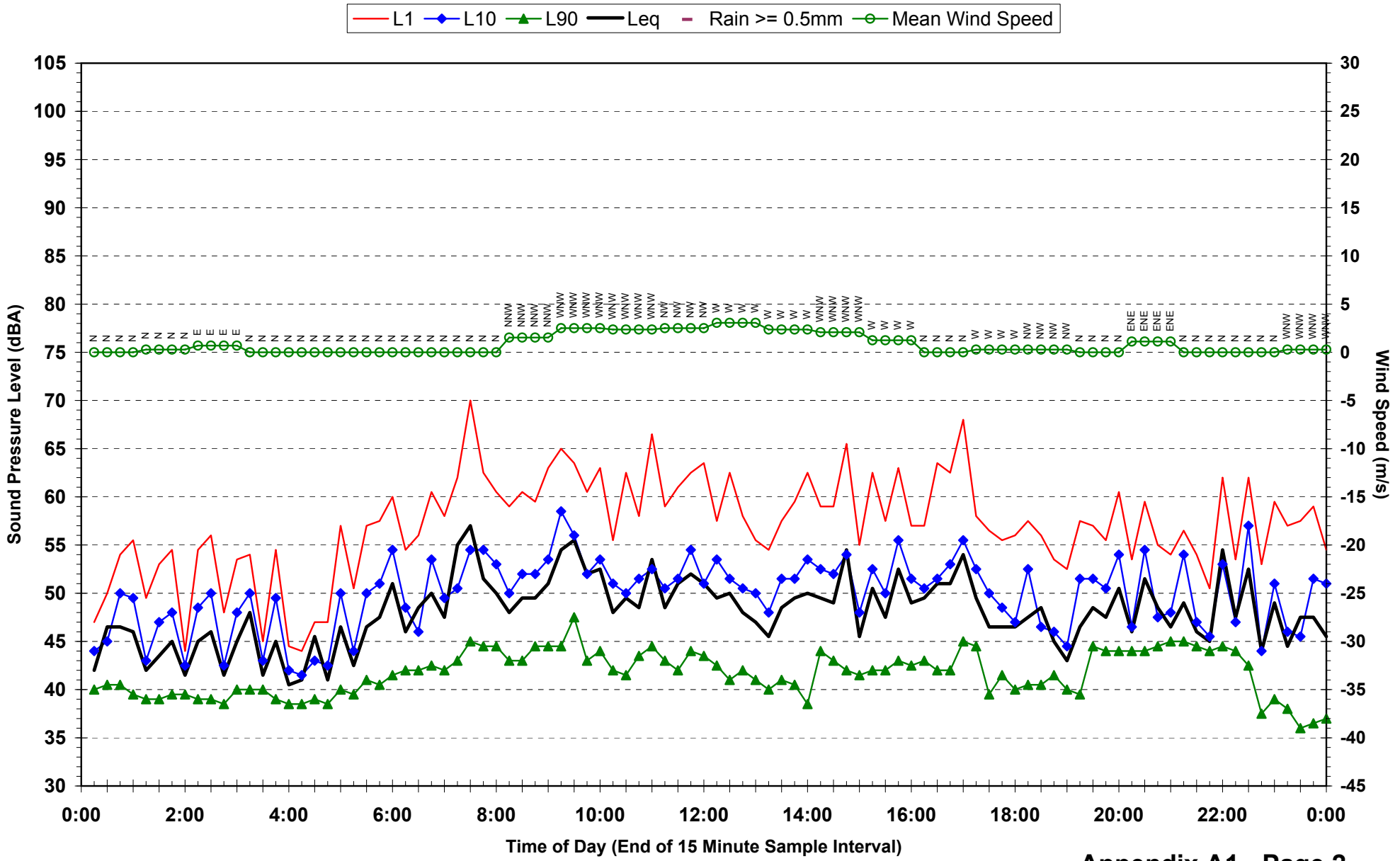

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Statistical Ambient Noise Levels
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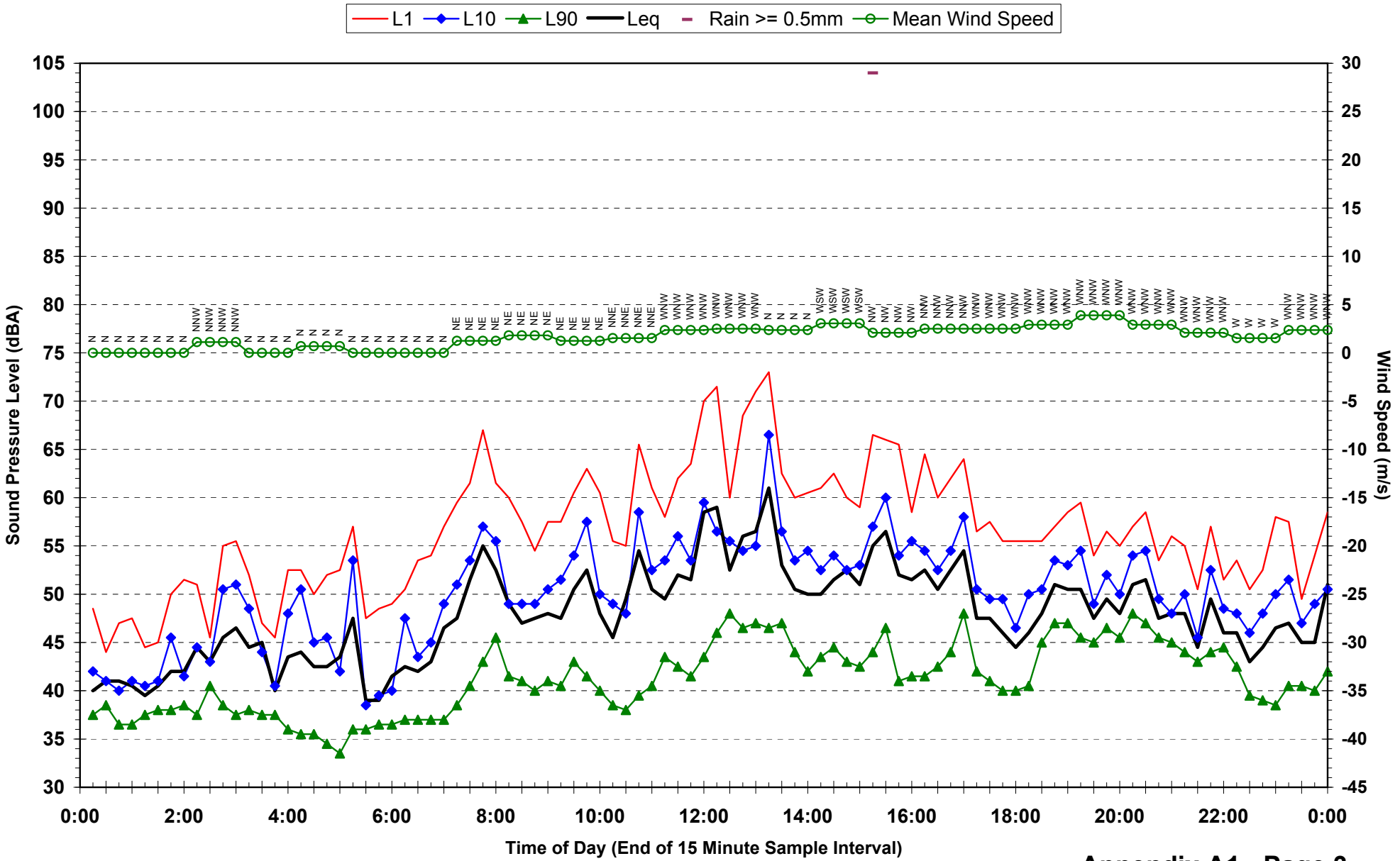

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Statistical Ambient Noise Levels
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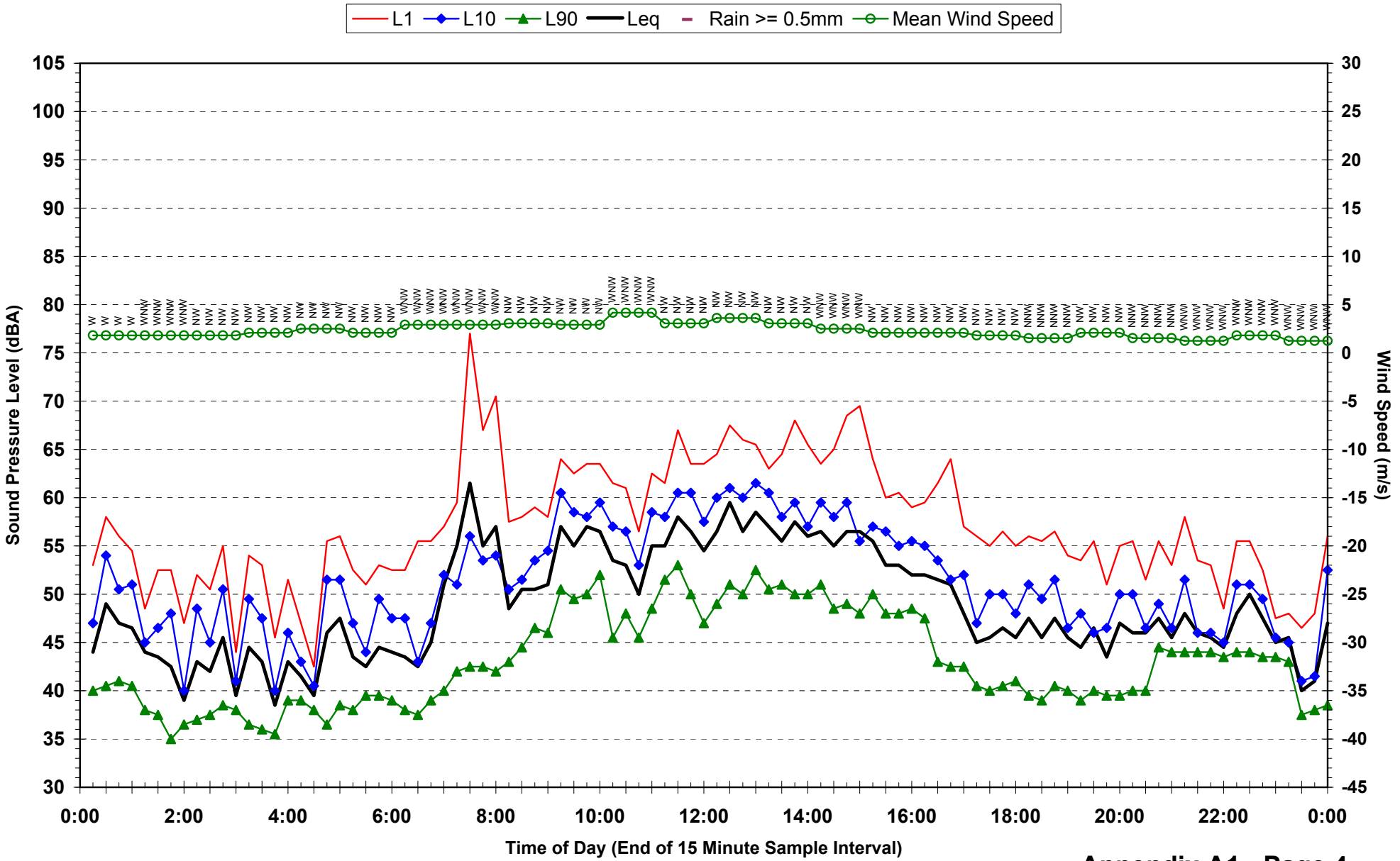

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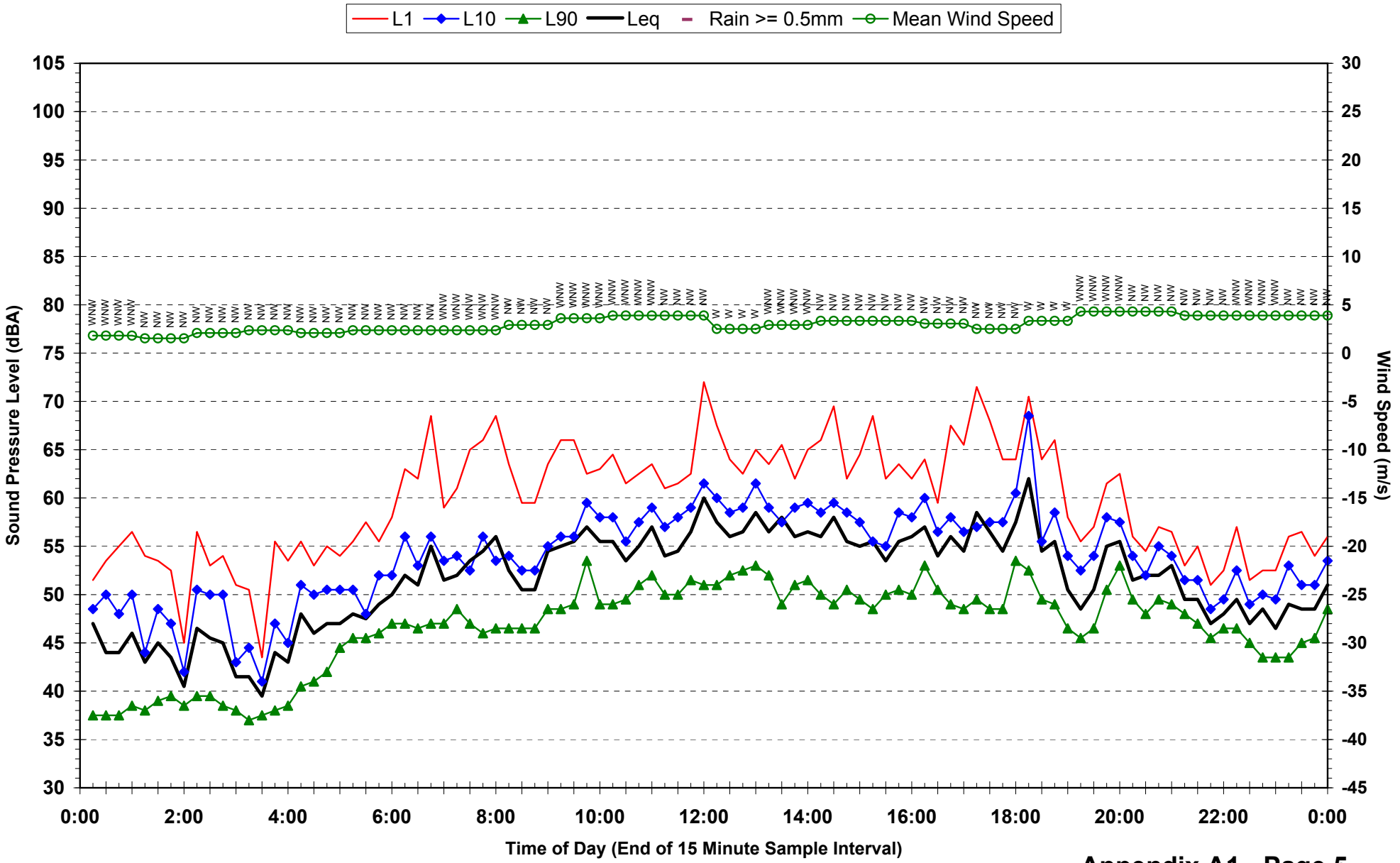

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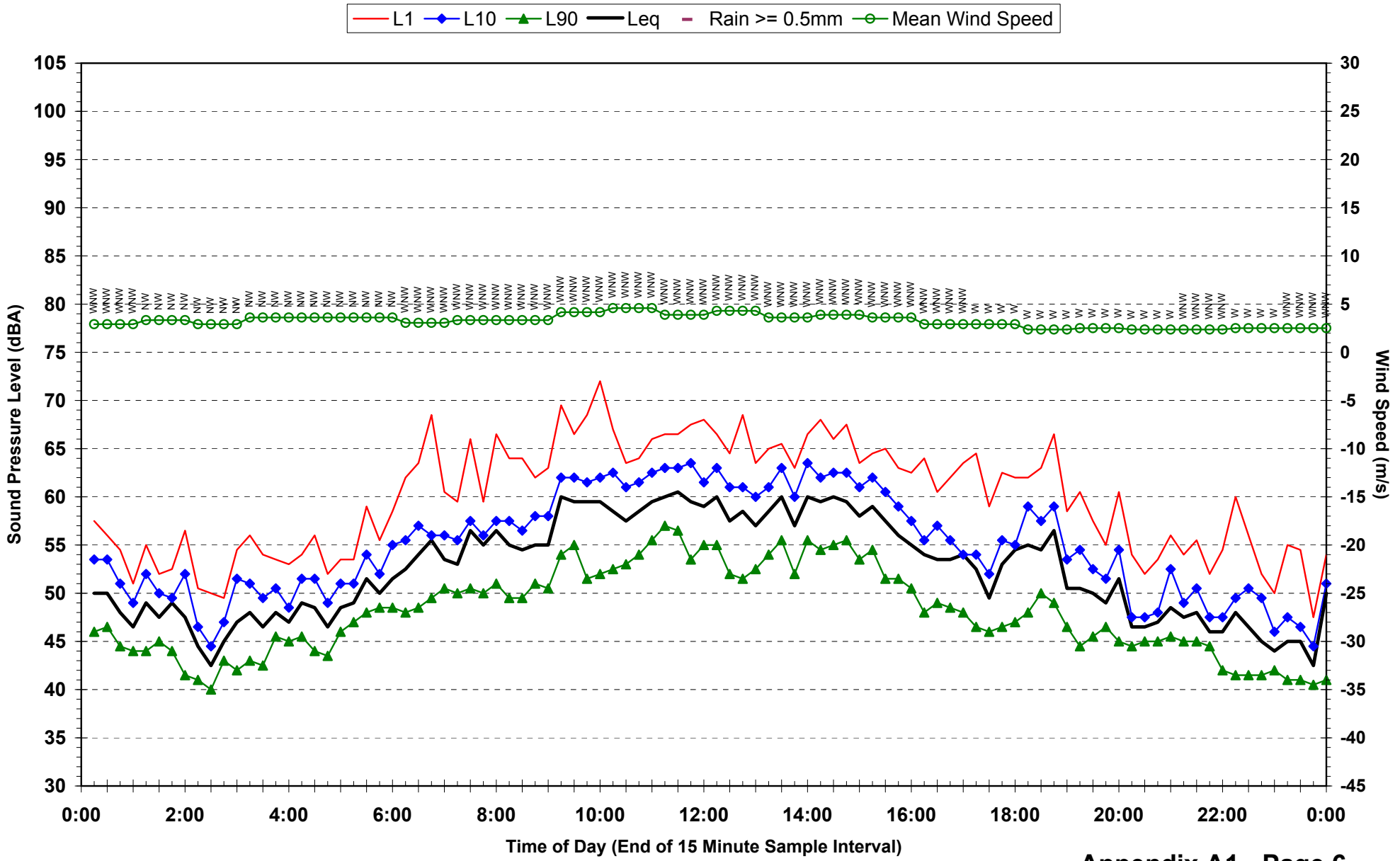

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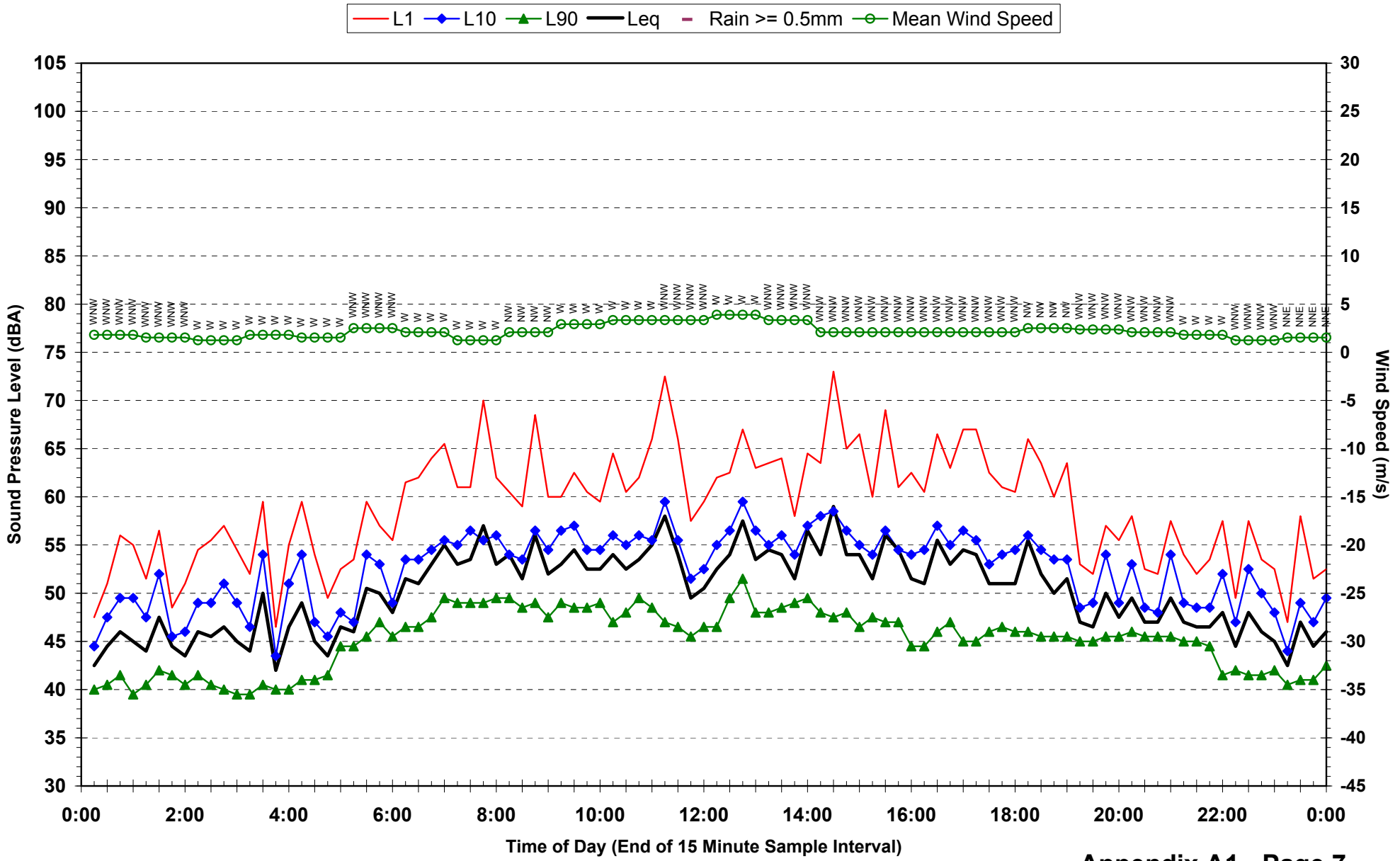

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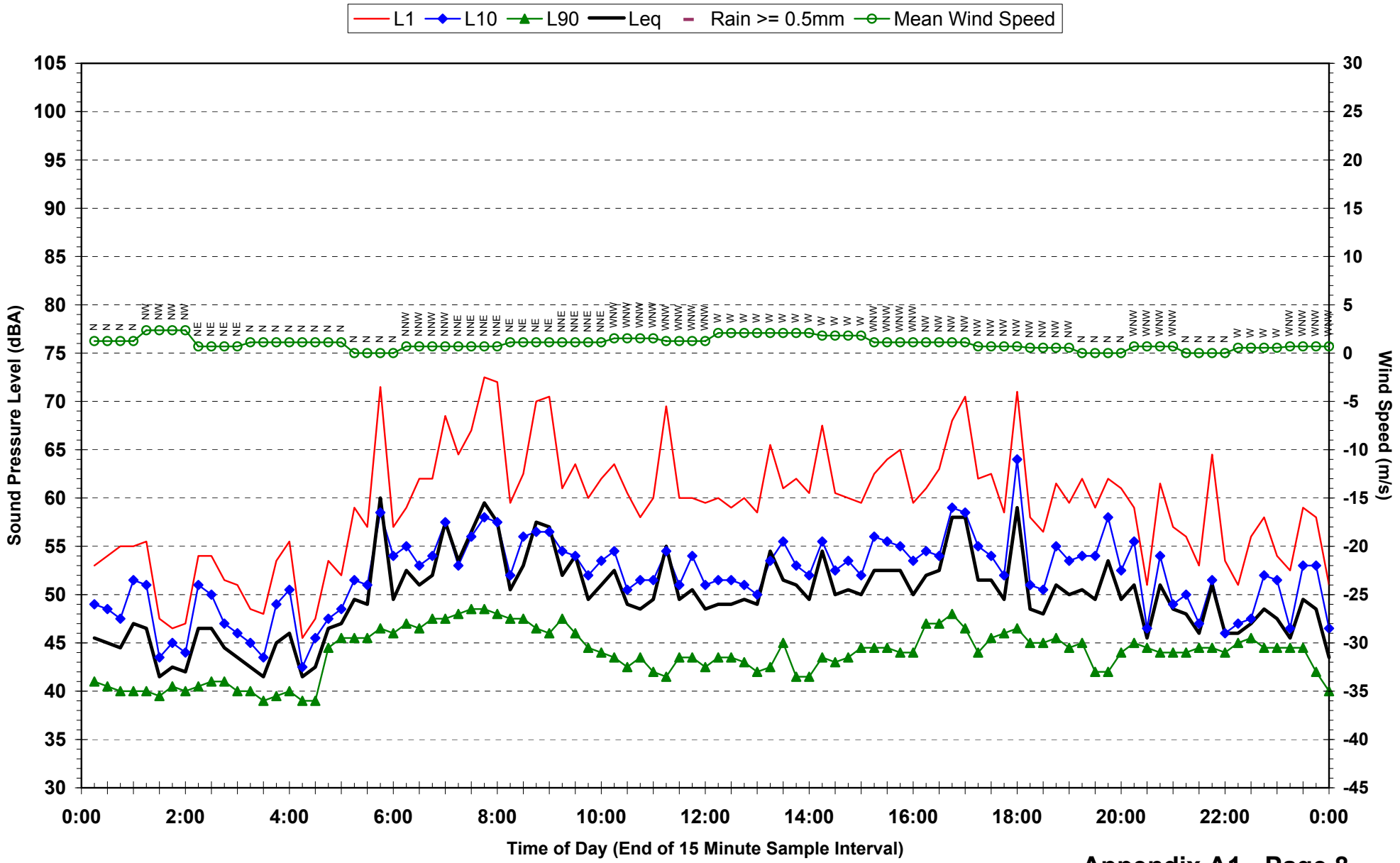

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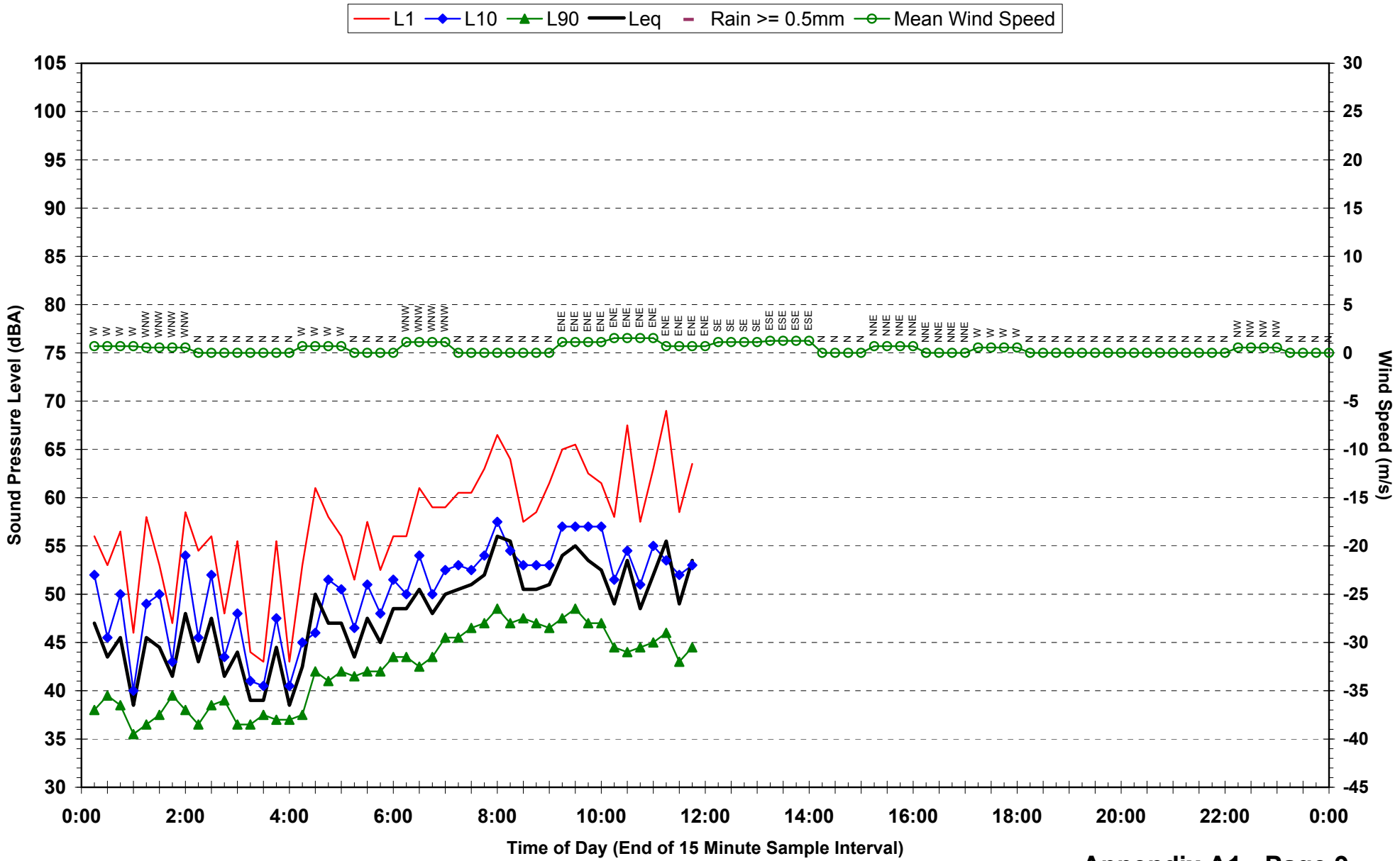

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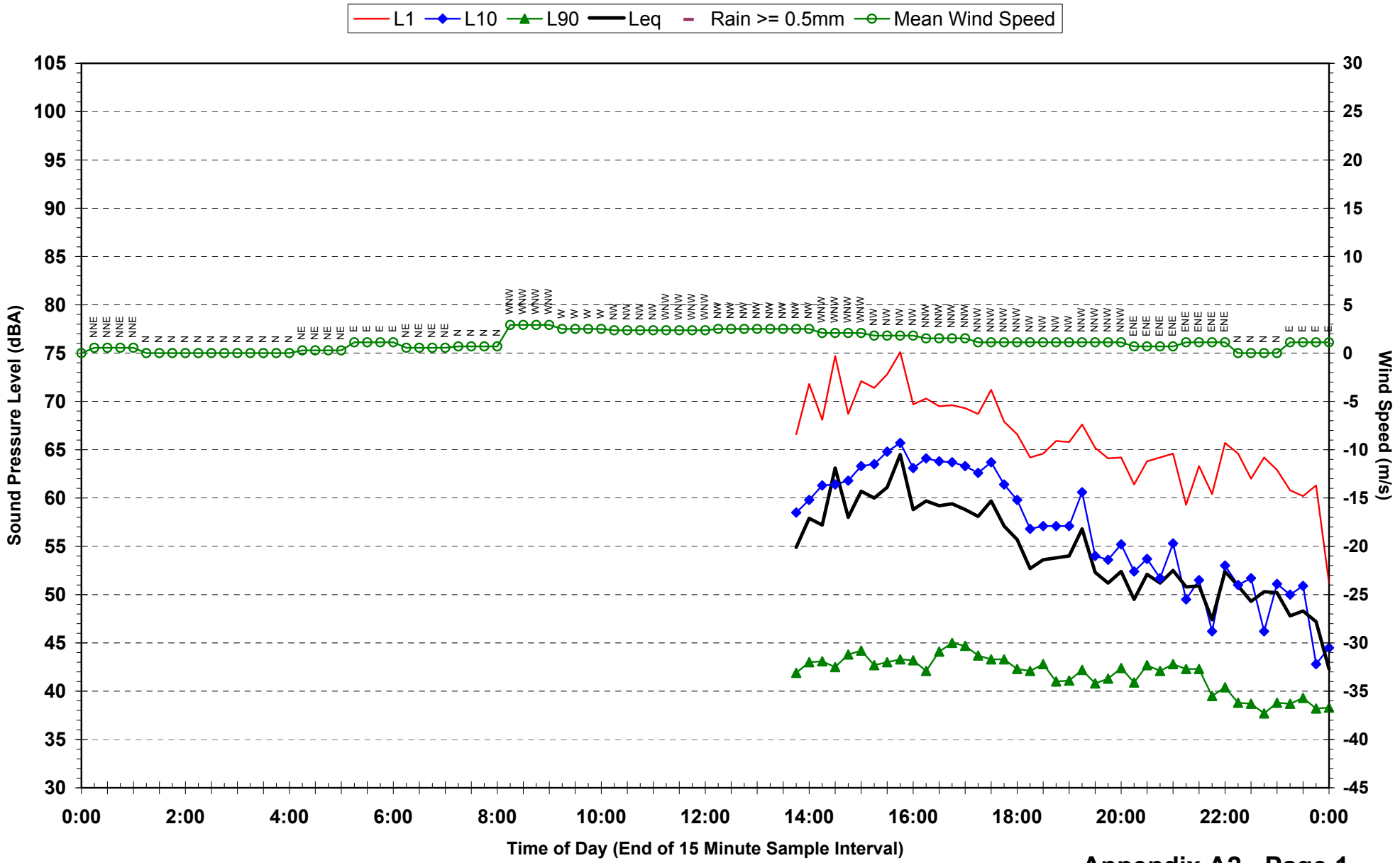
Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Friday 5 June 2009



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Statistical Ambient Noise Levels
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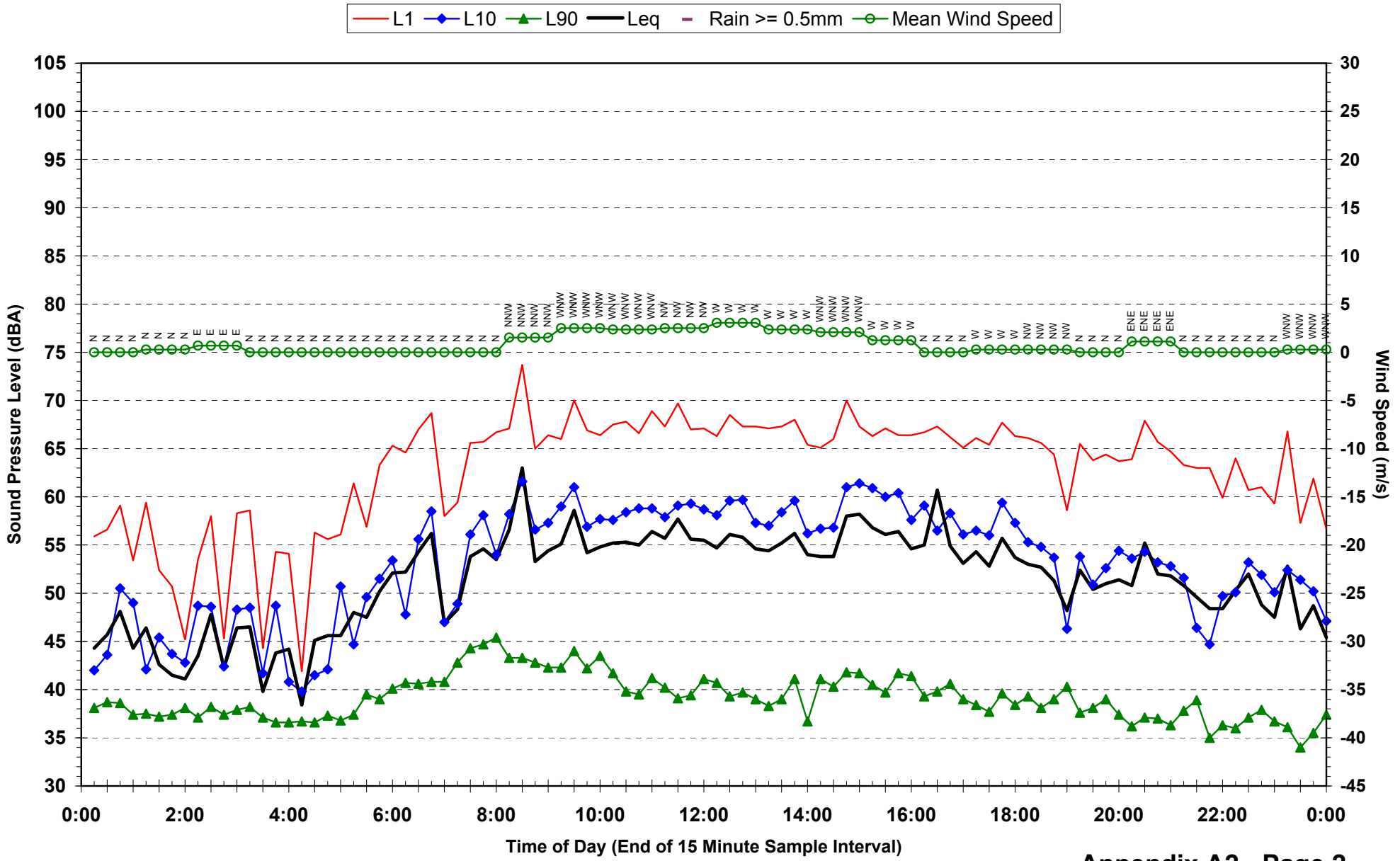

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Statistical Ambient Noise Levels
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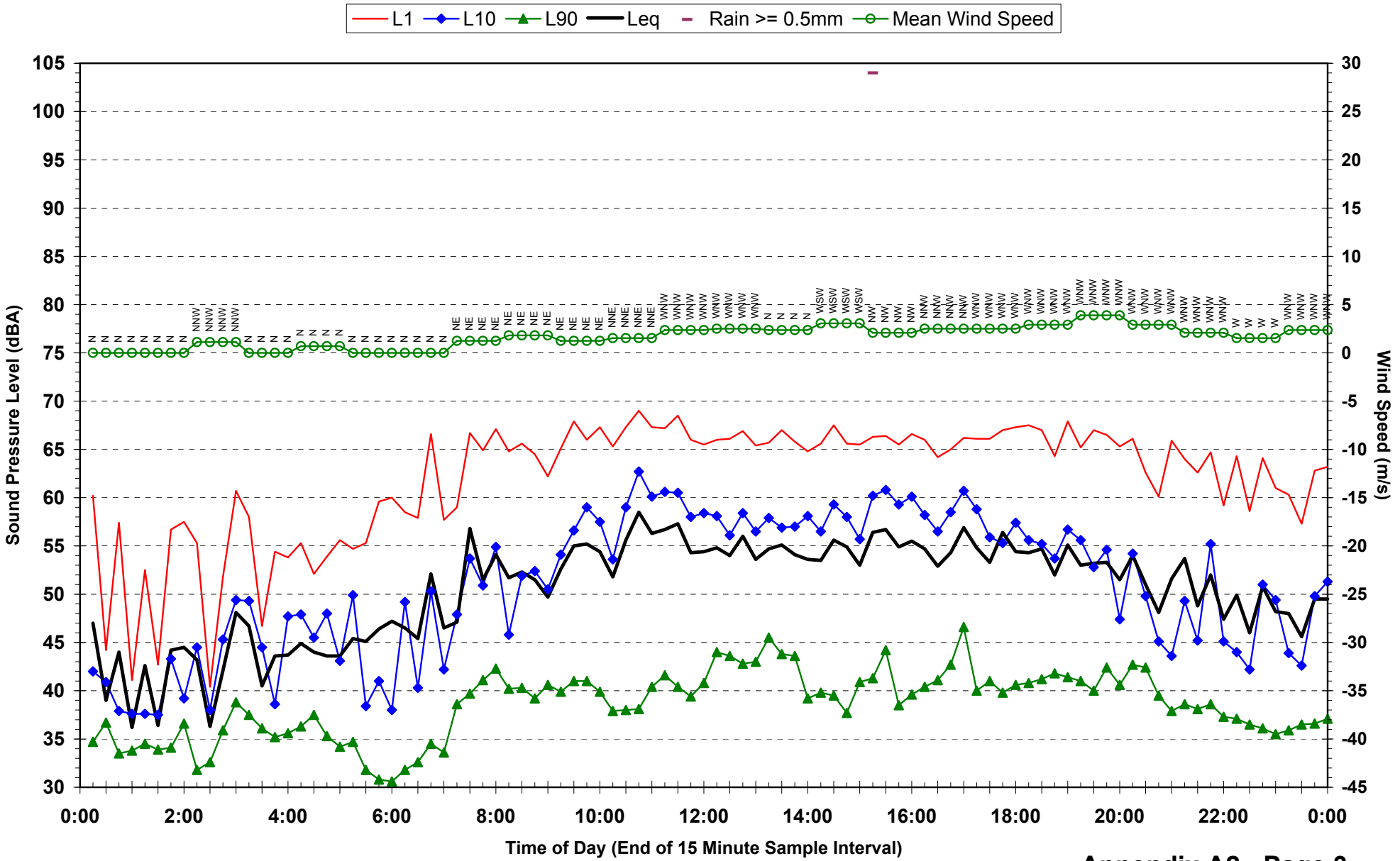

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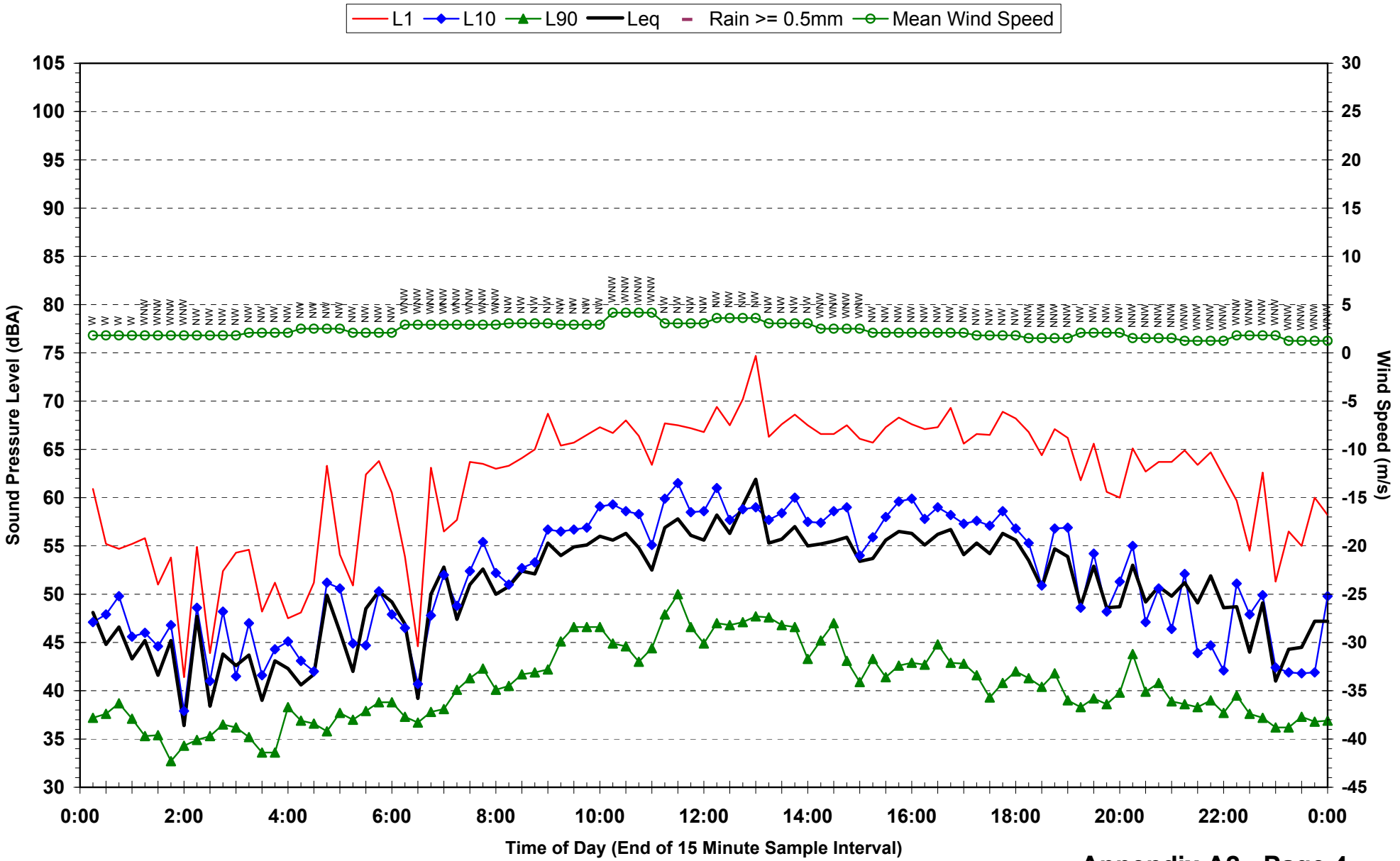
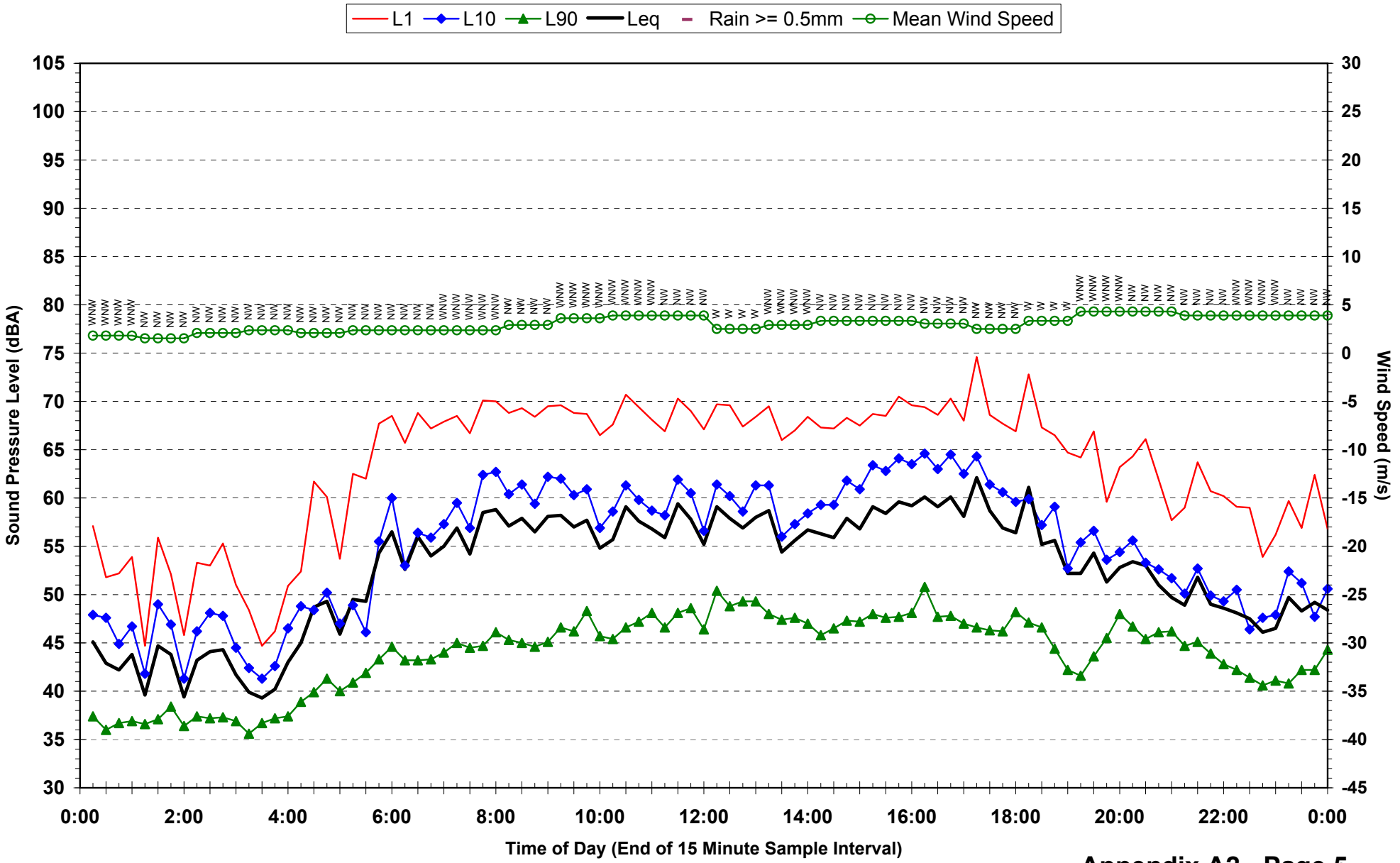
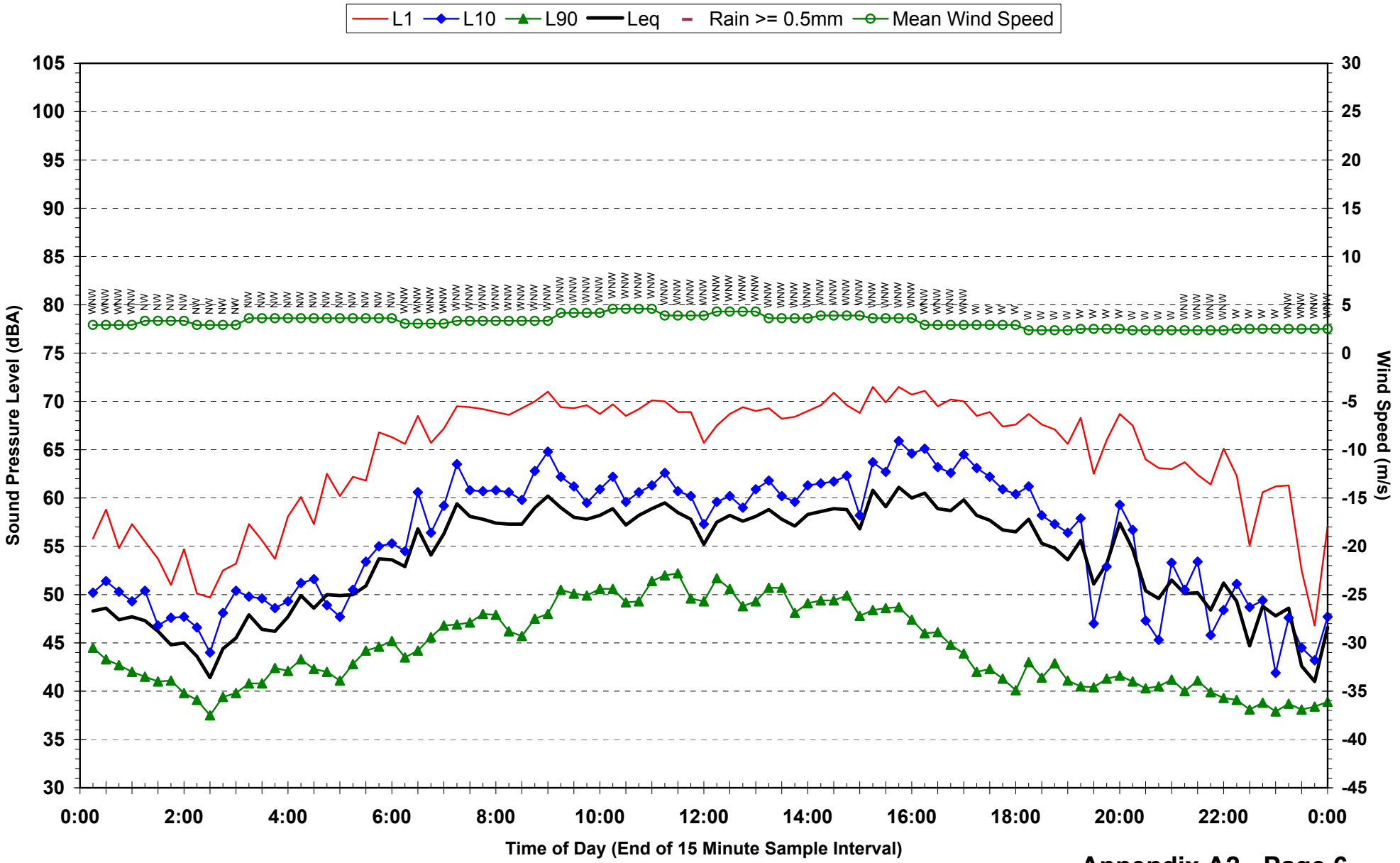
Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Monday 8 June 2009



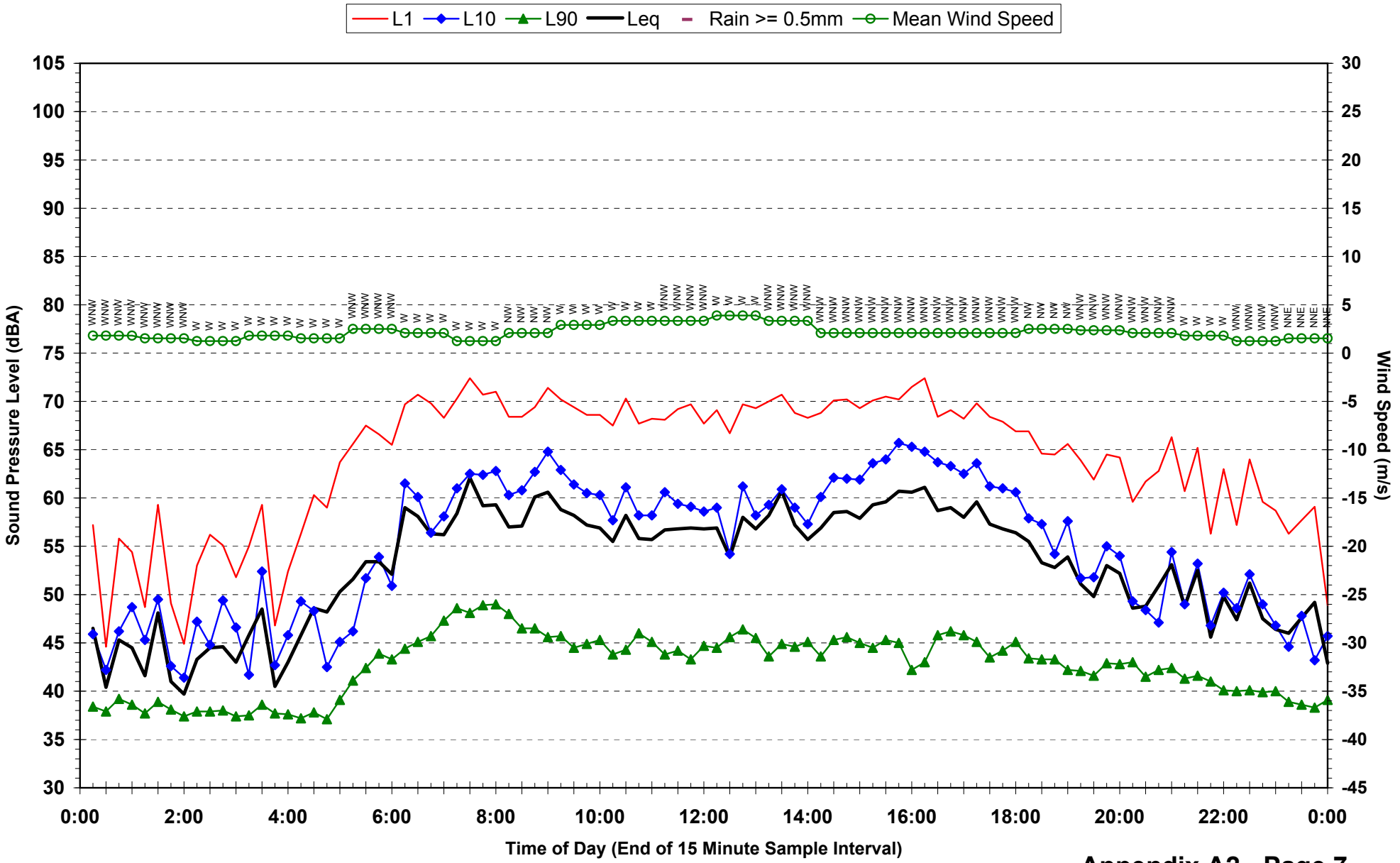
Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Tuesday 9 June 2009



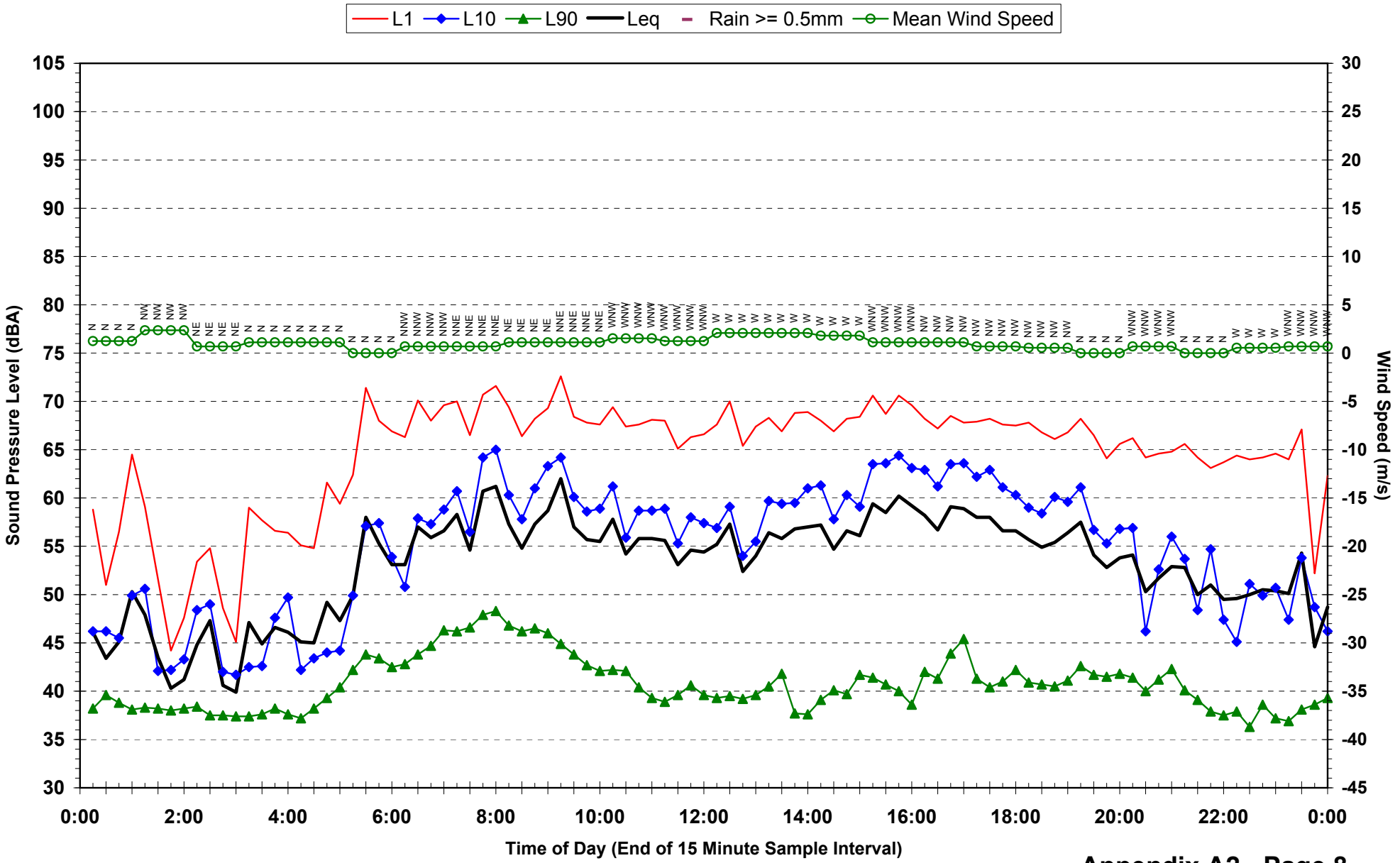
Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Wednesday 10 June 2009



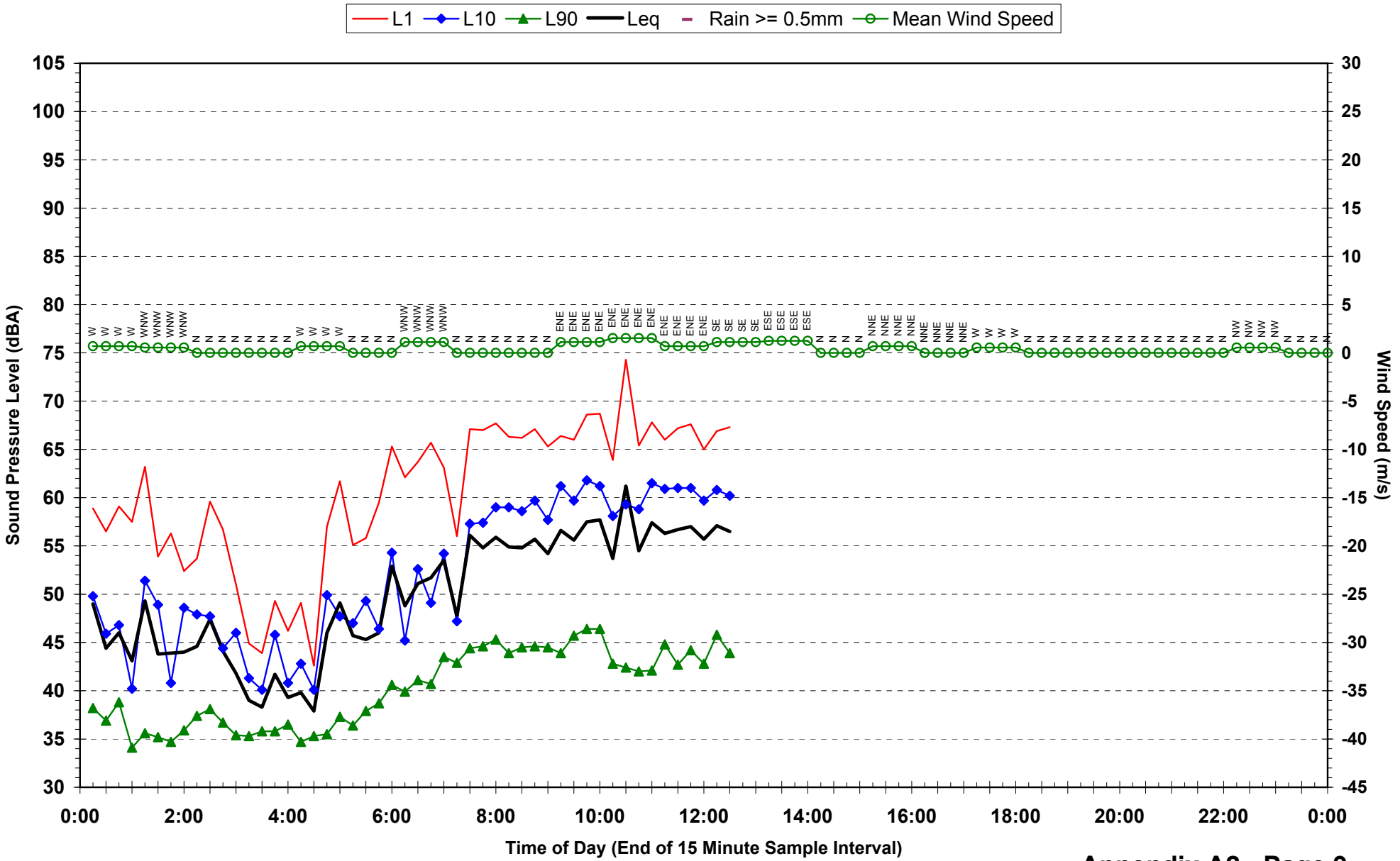
Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Thursday 11 June 2009



Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Friday 12 June 2009



Statistical Ambient Noise Levels
30-2247 115 Regiment Rd, Rutherford - Saturday 13 June 2009



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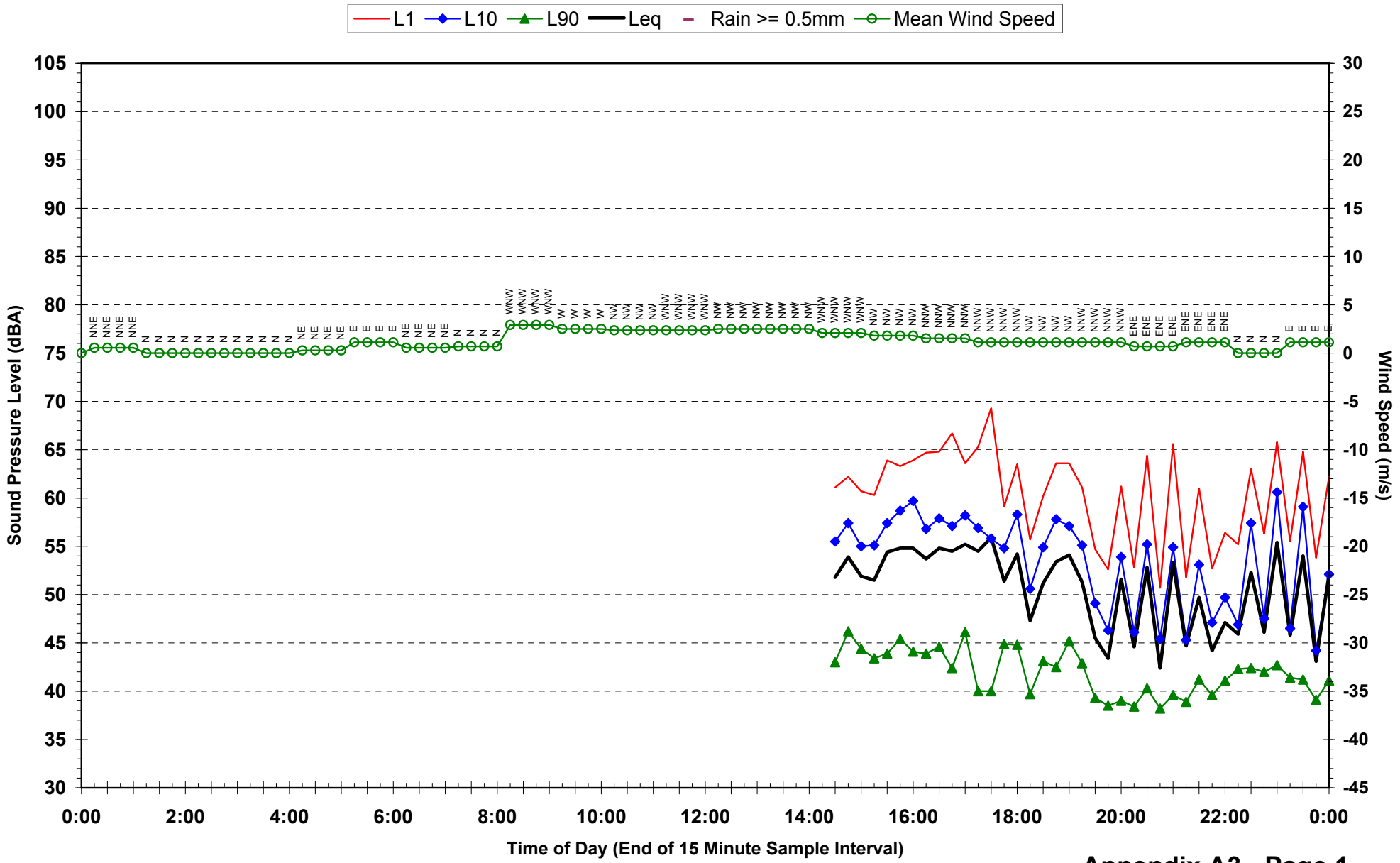
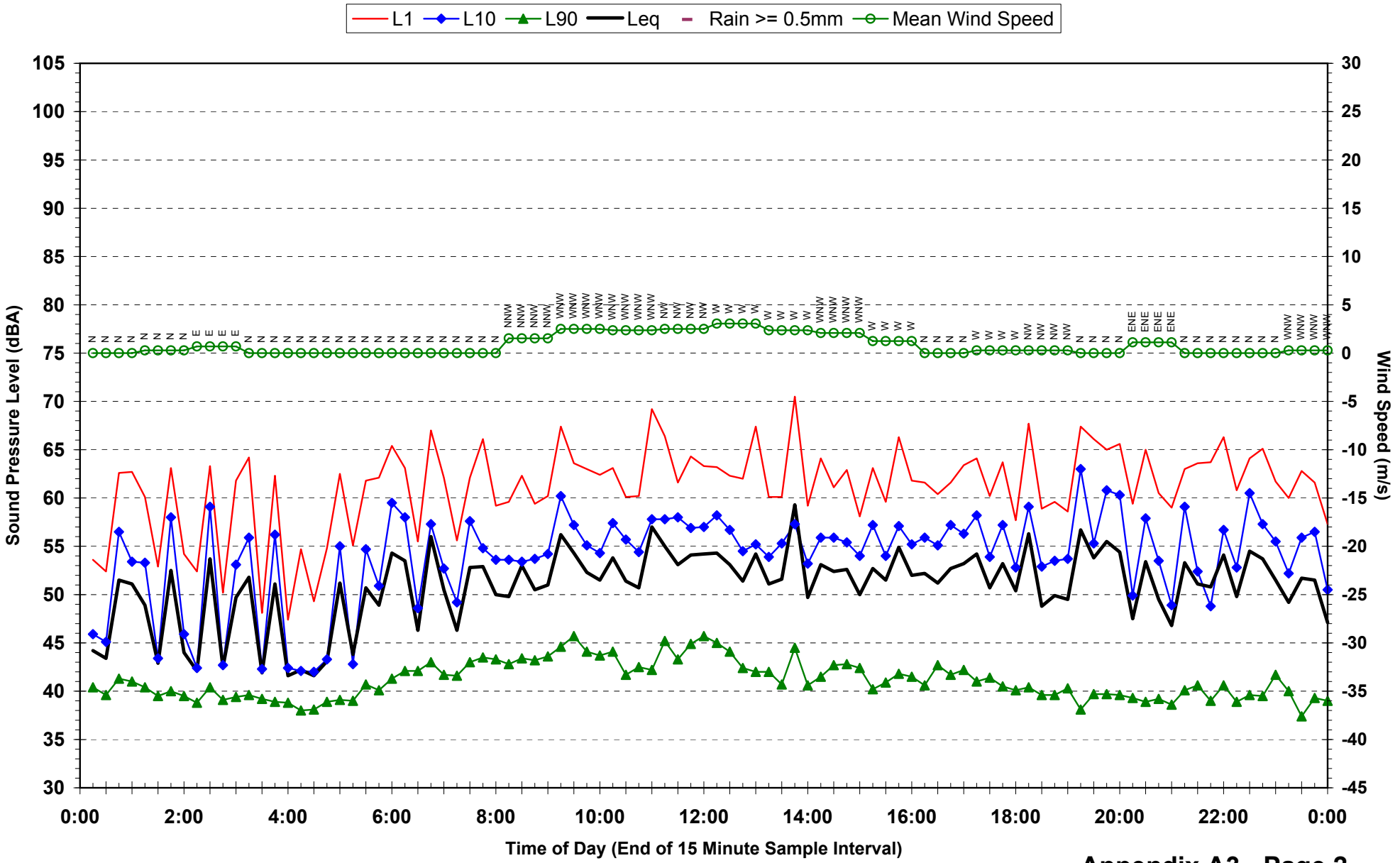
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Friday 5 June 2009



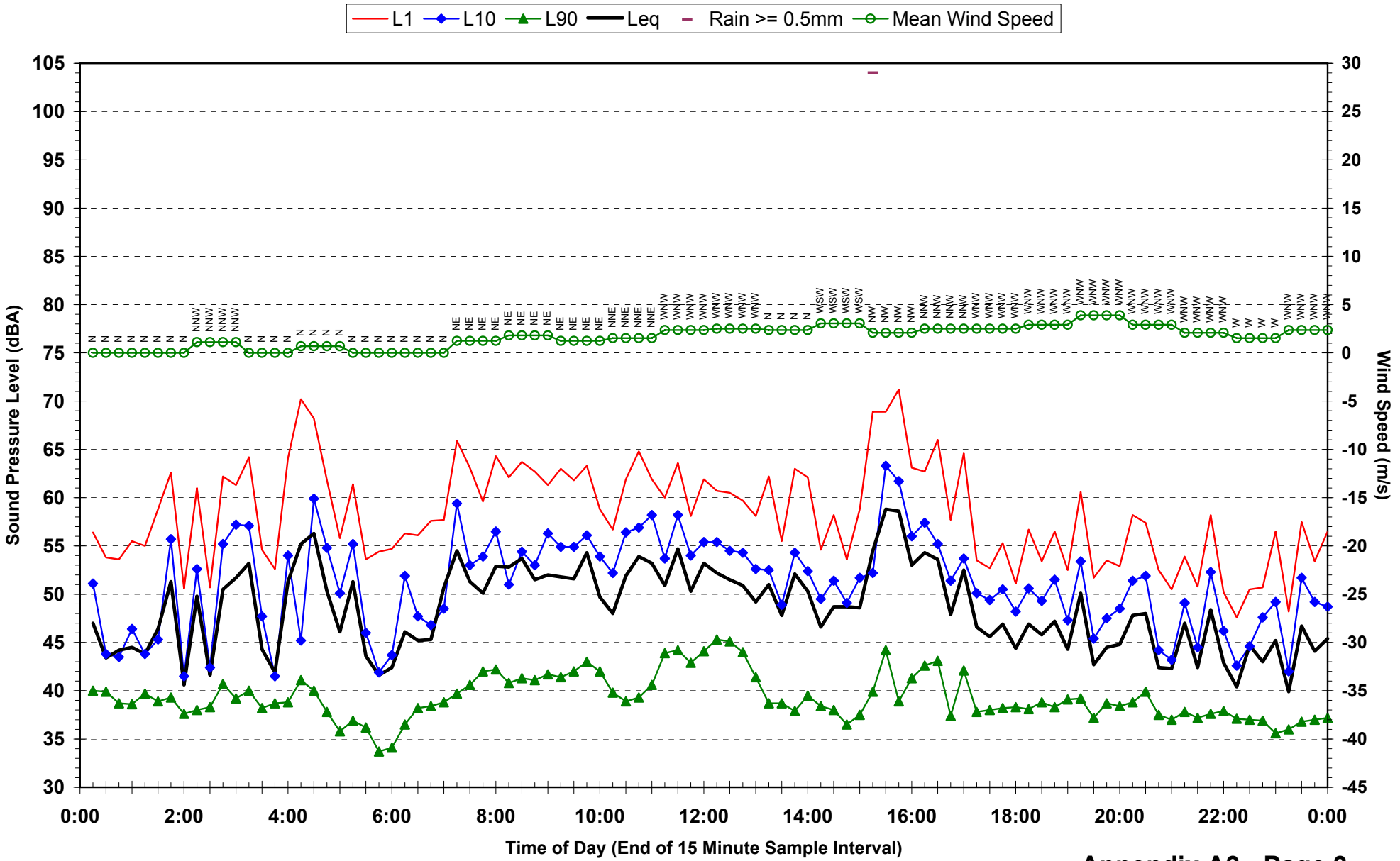
Appendix A3 - Page 1
Statistical Noise Levels
Heggies Report 30-2247

Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Saturday 6 June 2009



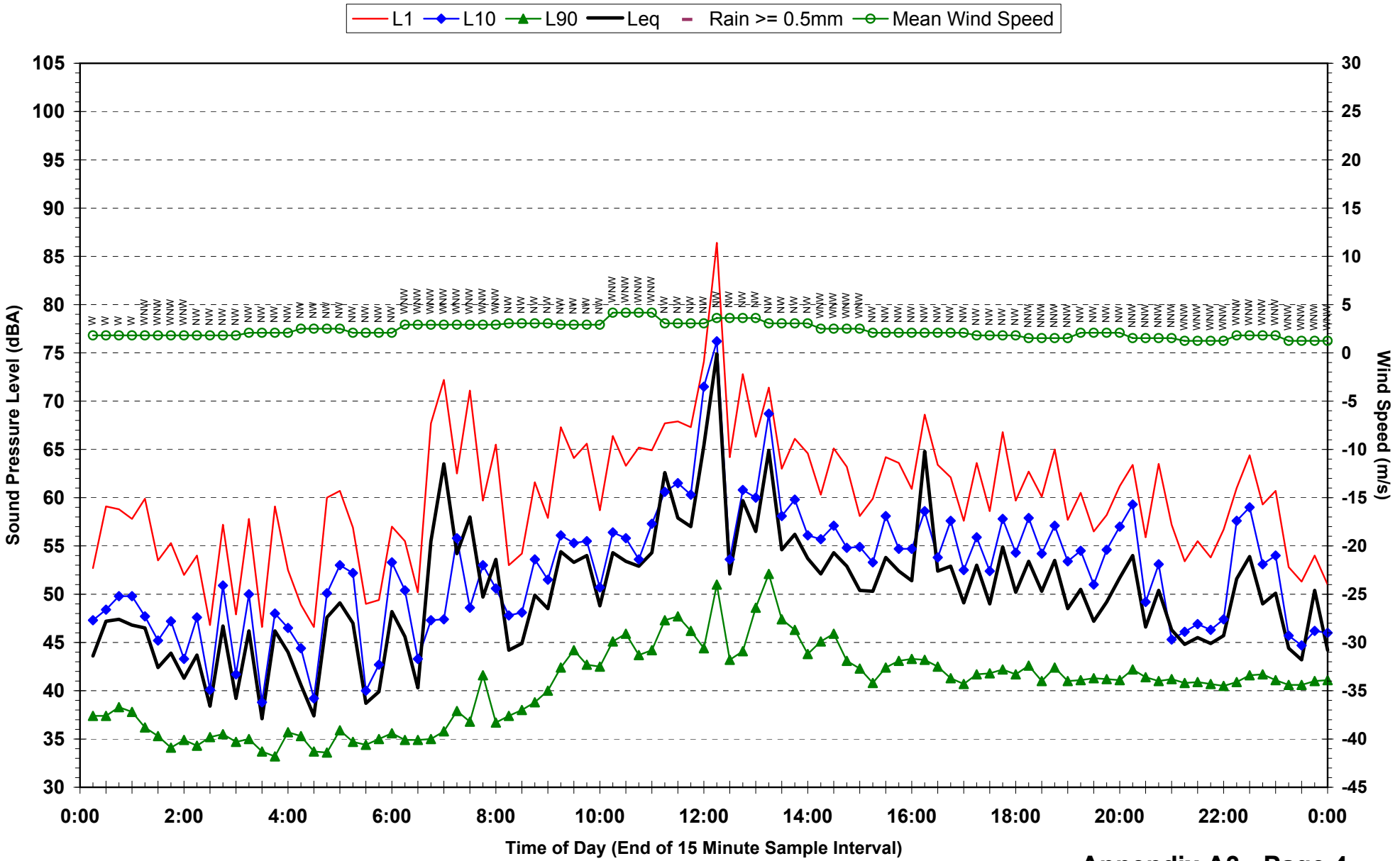
Appendix A3 - Page 2
Statistical Noise Levels
Heggies Report 30-2247

Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Sunday 7 June 2009

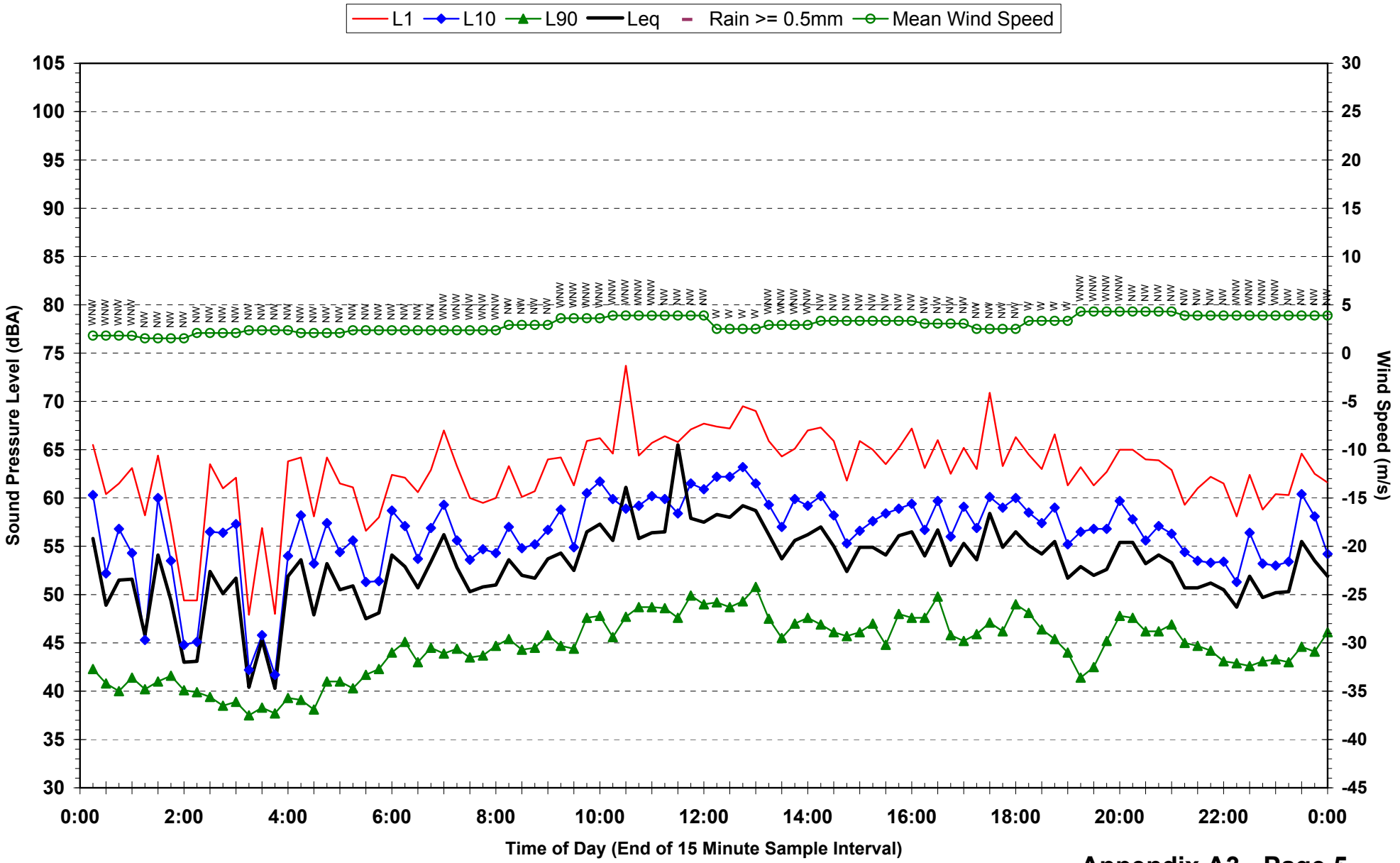


Appendix A3 - Page 3
Statistical Noise Levels
Heggies Report 30-2247

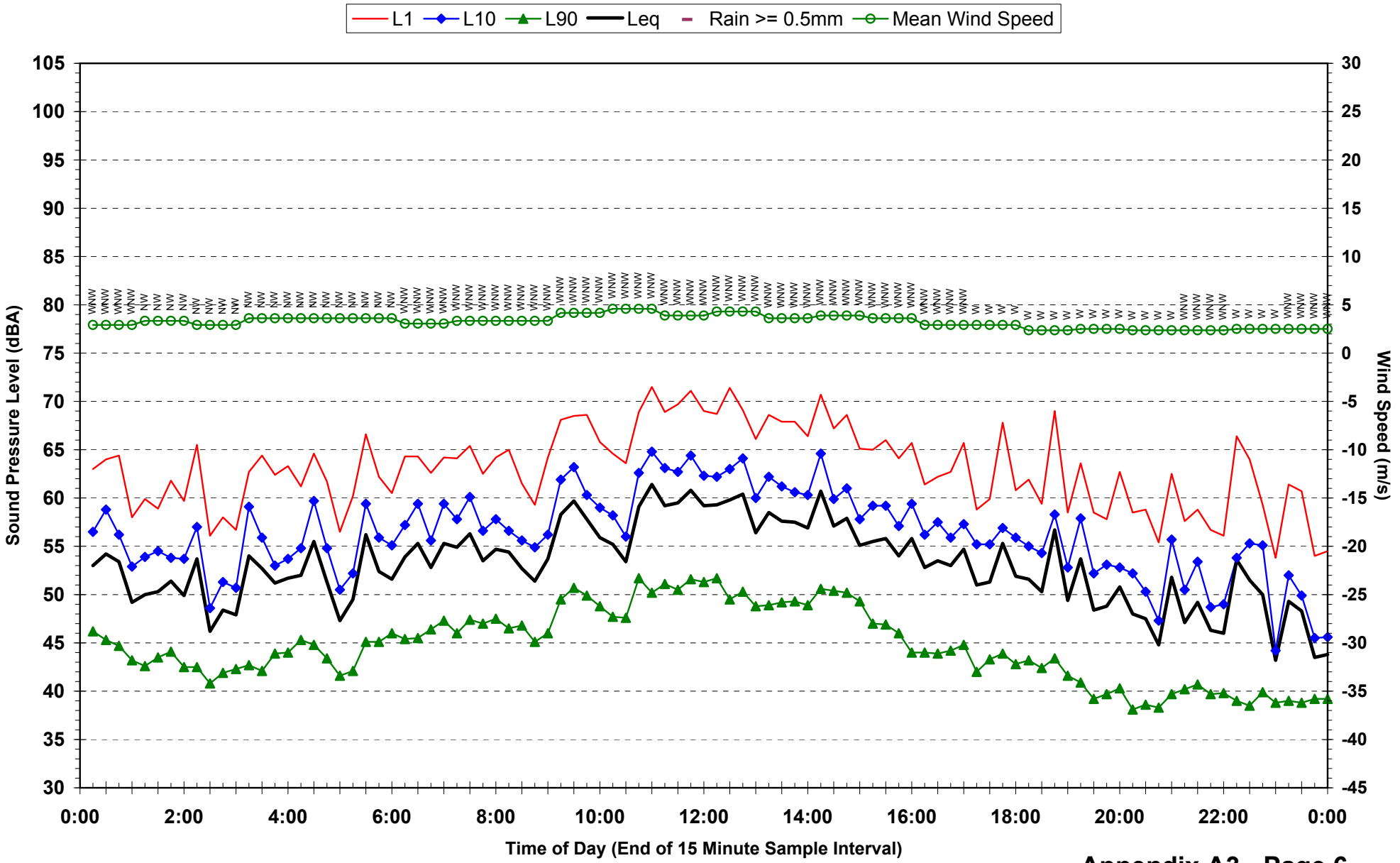
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Monday 8 June 2009



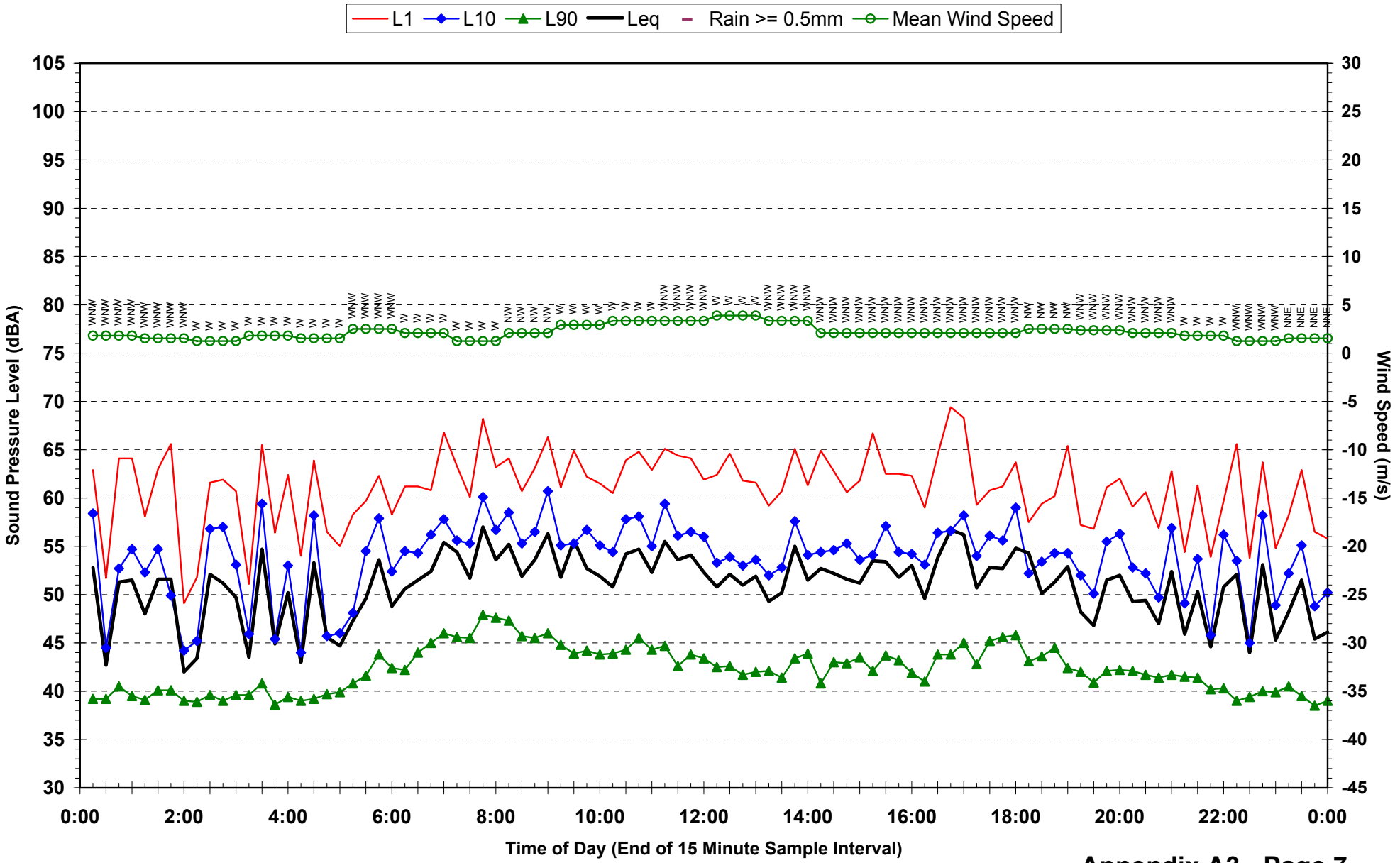
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Tuesday 9 June 2009



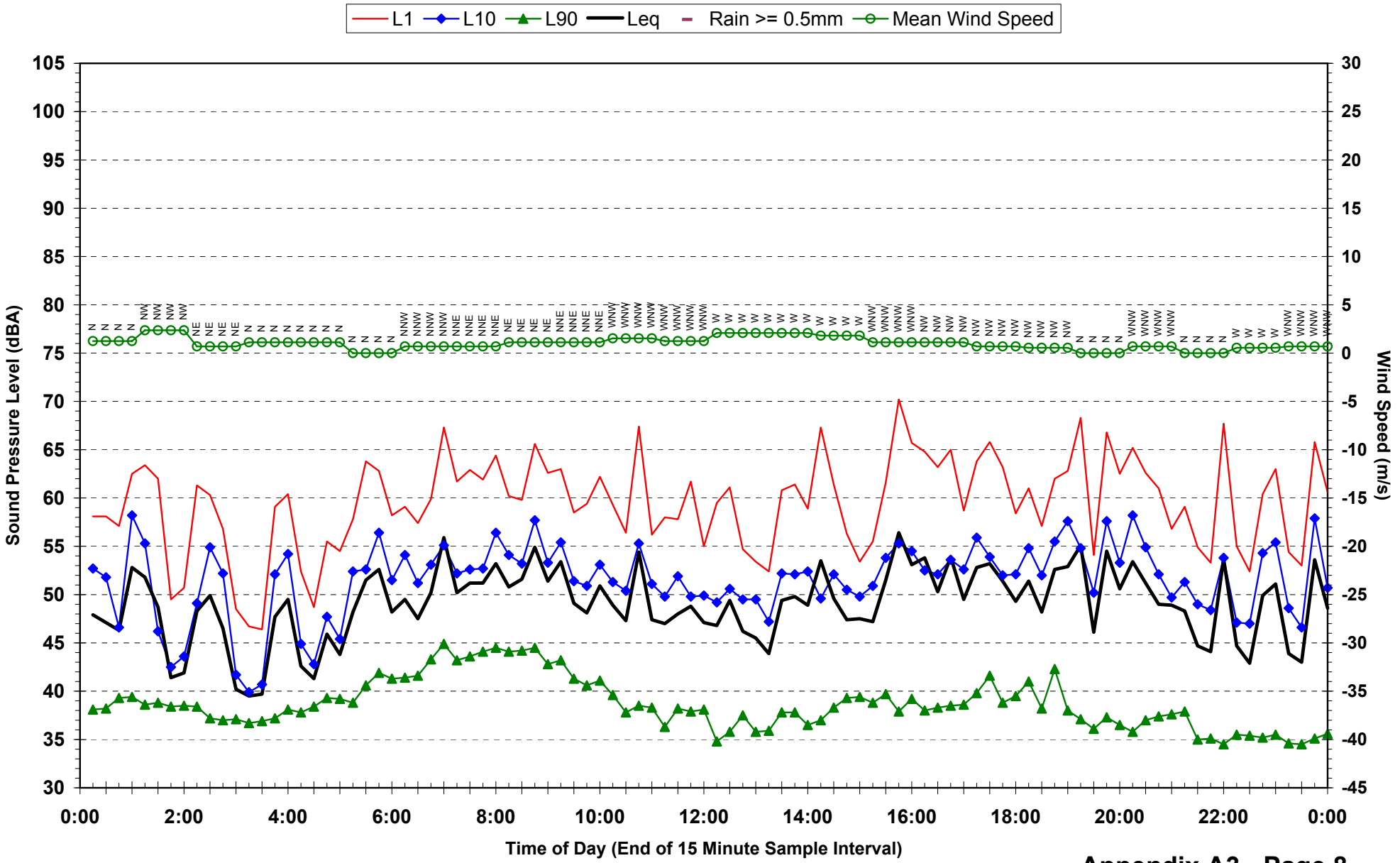
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Wednesday 10 June 2009



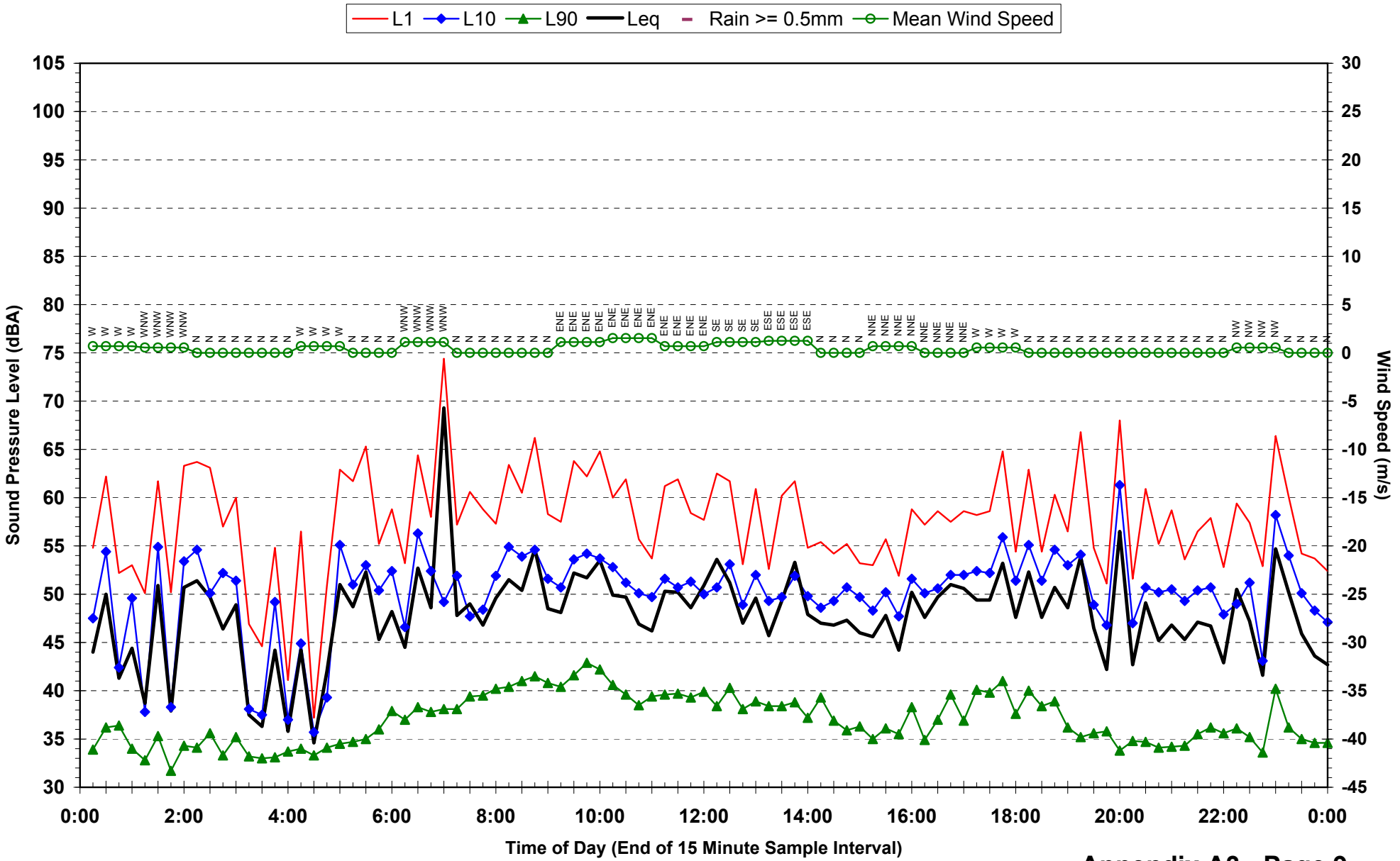
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Thursday 11 June 2009



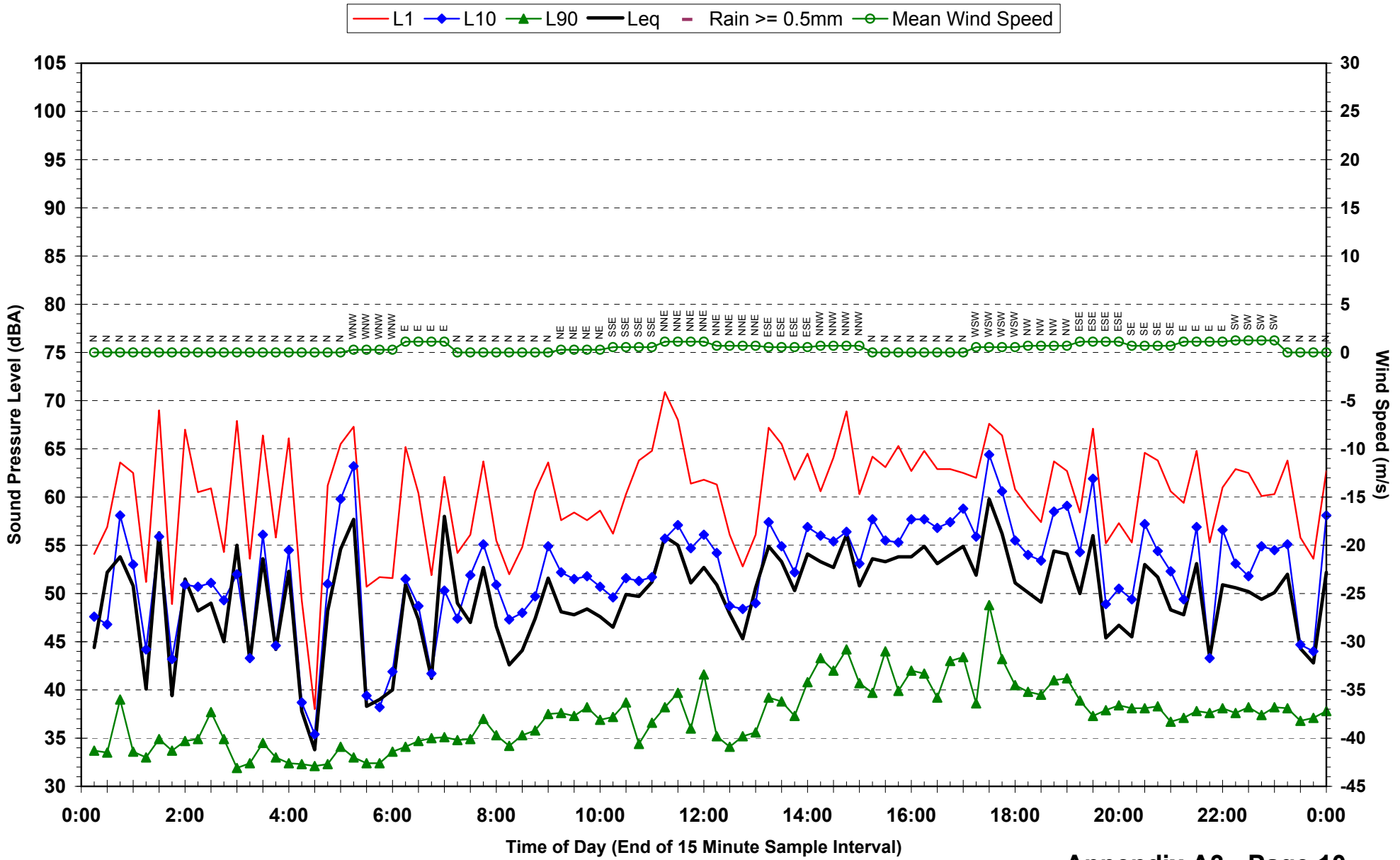
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Friday 12 June 2009



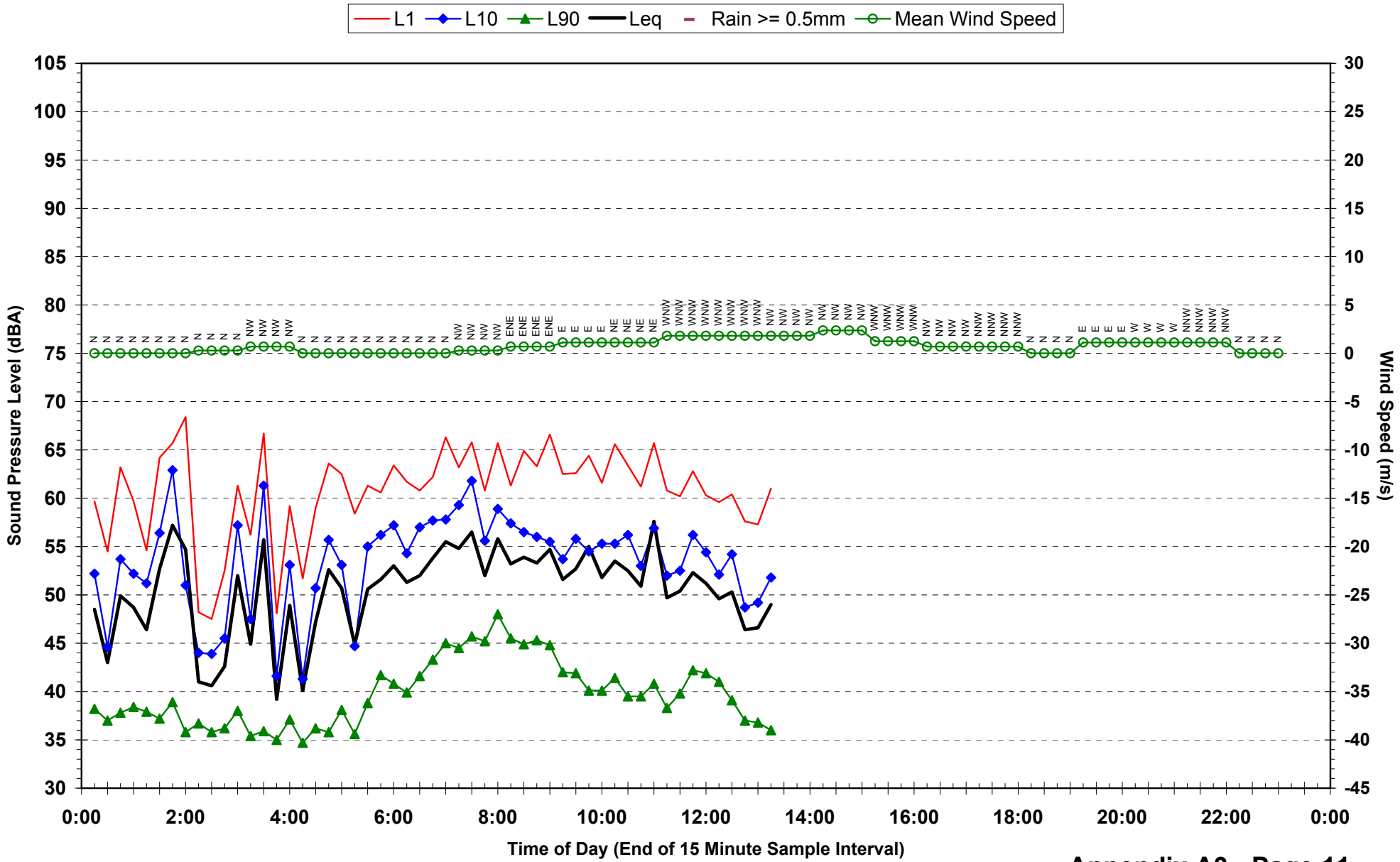
Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Saturday 13 June 2009



Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Sunday 14 June 2009



Statistical Ambient Noise Levels
30-2247 256 Wollombi Road, Farley - Monday 15 June 2009



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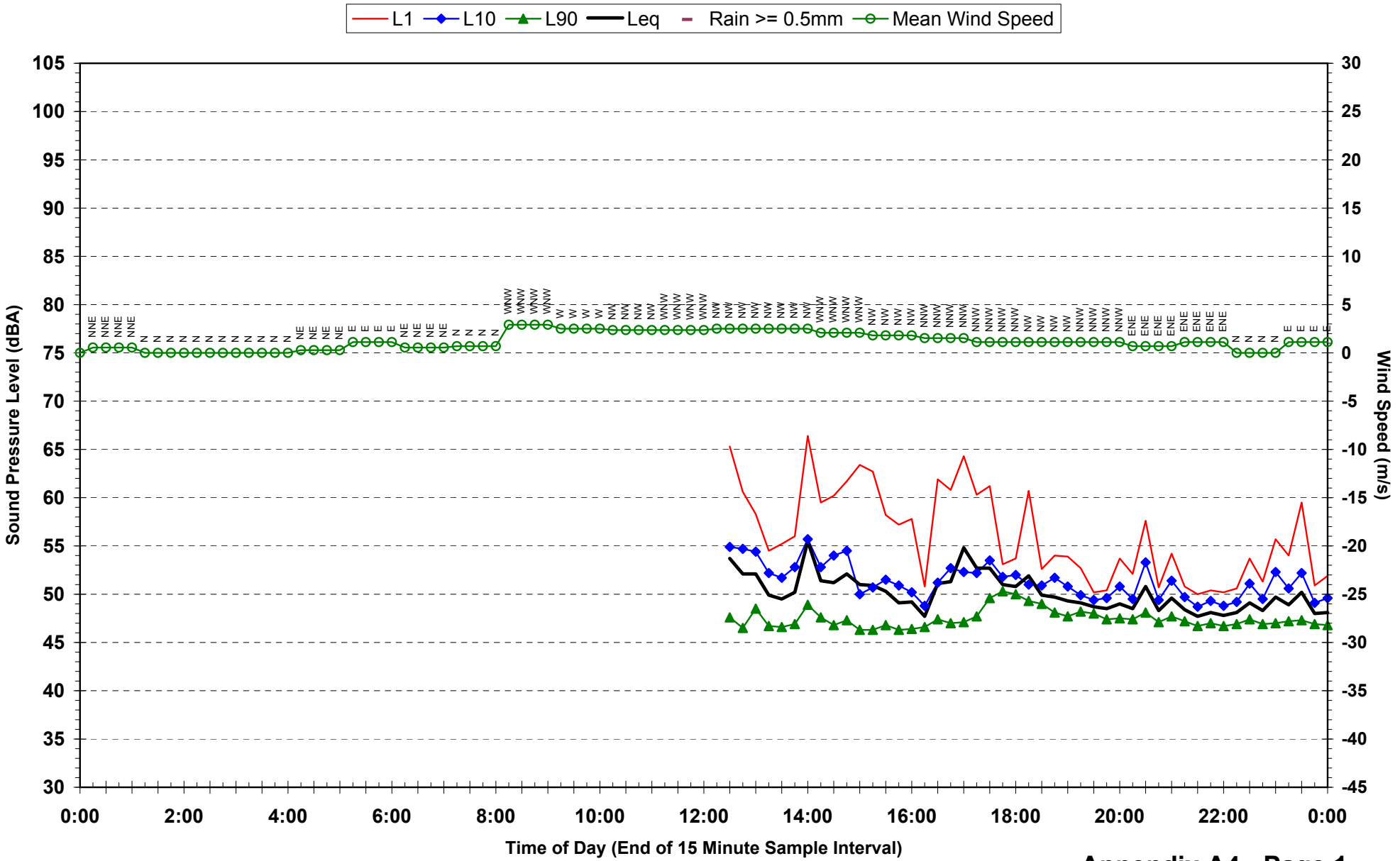
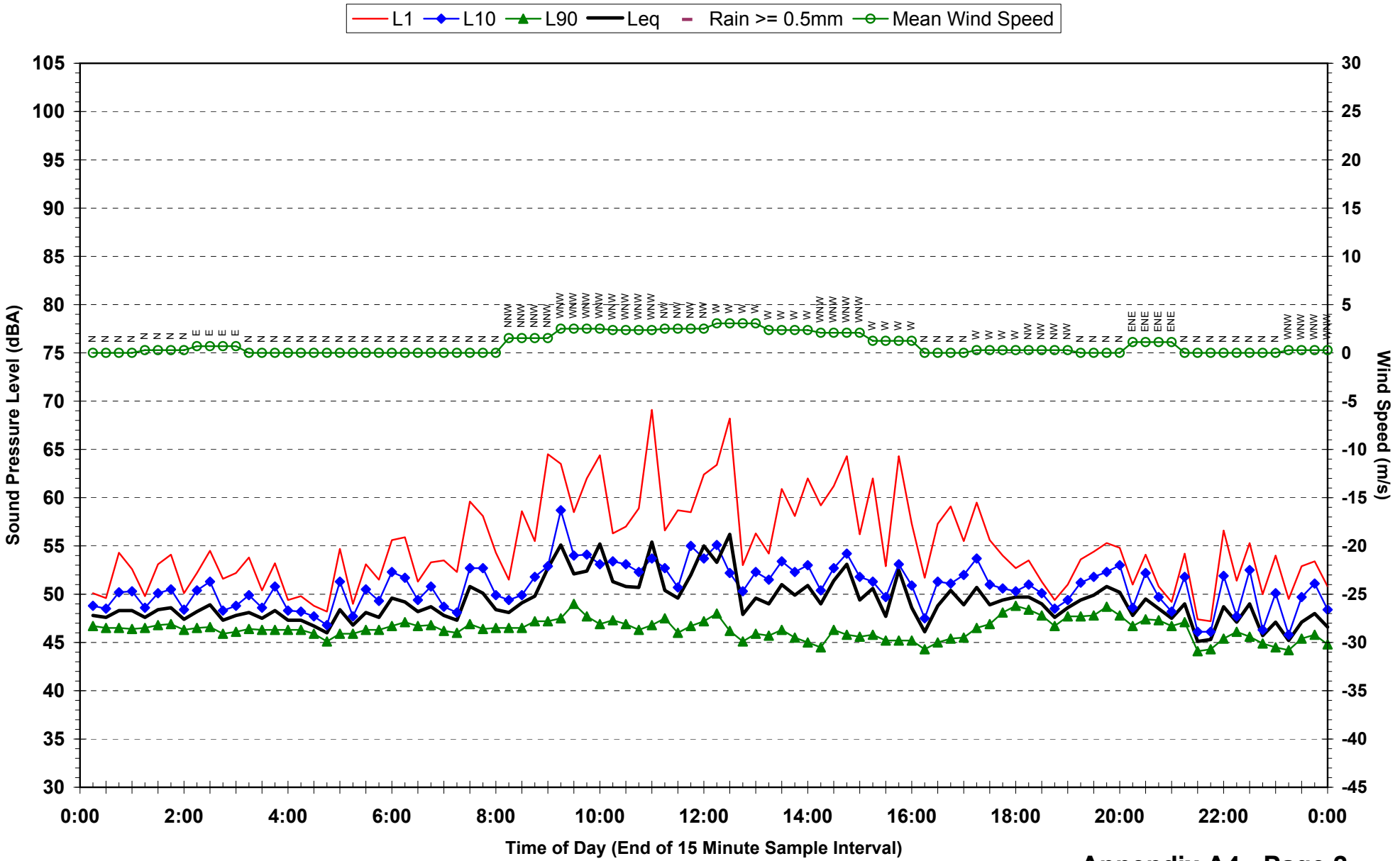
Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Friday 5 June 2009



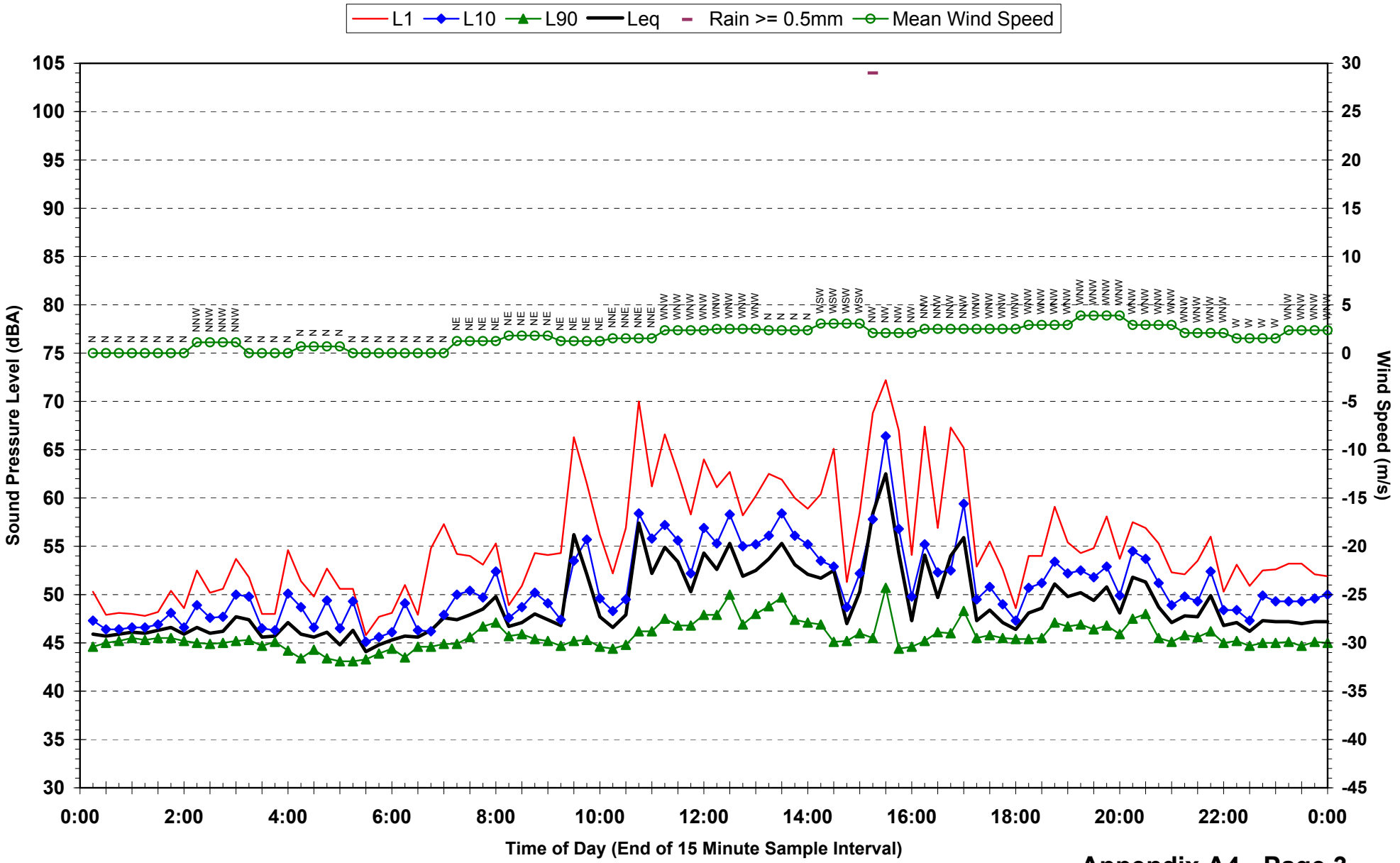
Appendix A4 - Page 1
Statistical Noise Levels
Heggies Report 30-2247

Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Saturday 6 June 2009

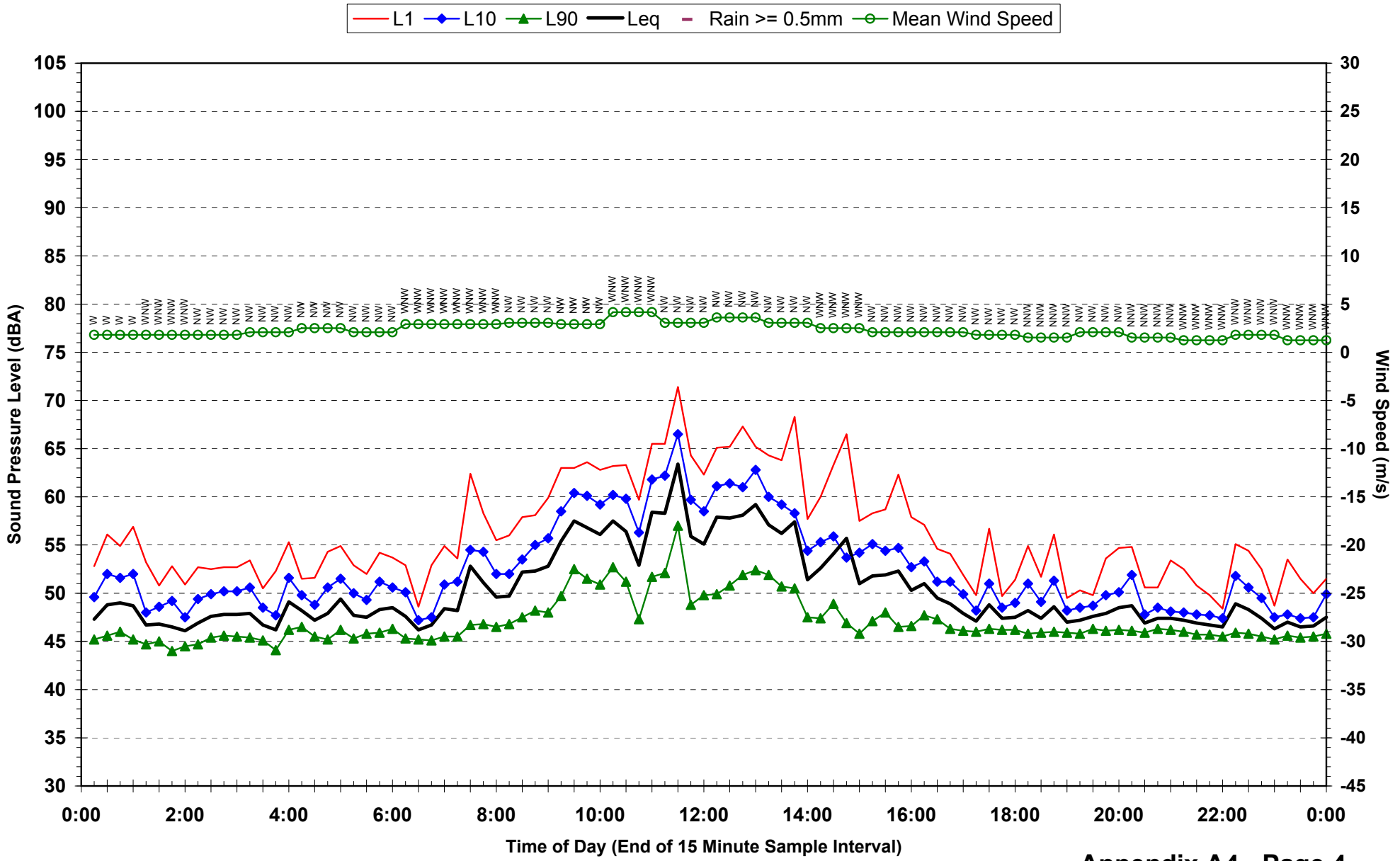


Appendix A4 - Page 2
Statistical Noise Levels
Heggies Report 30-2247

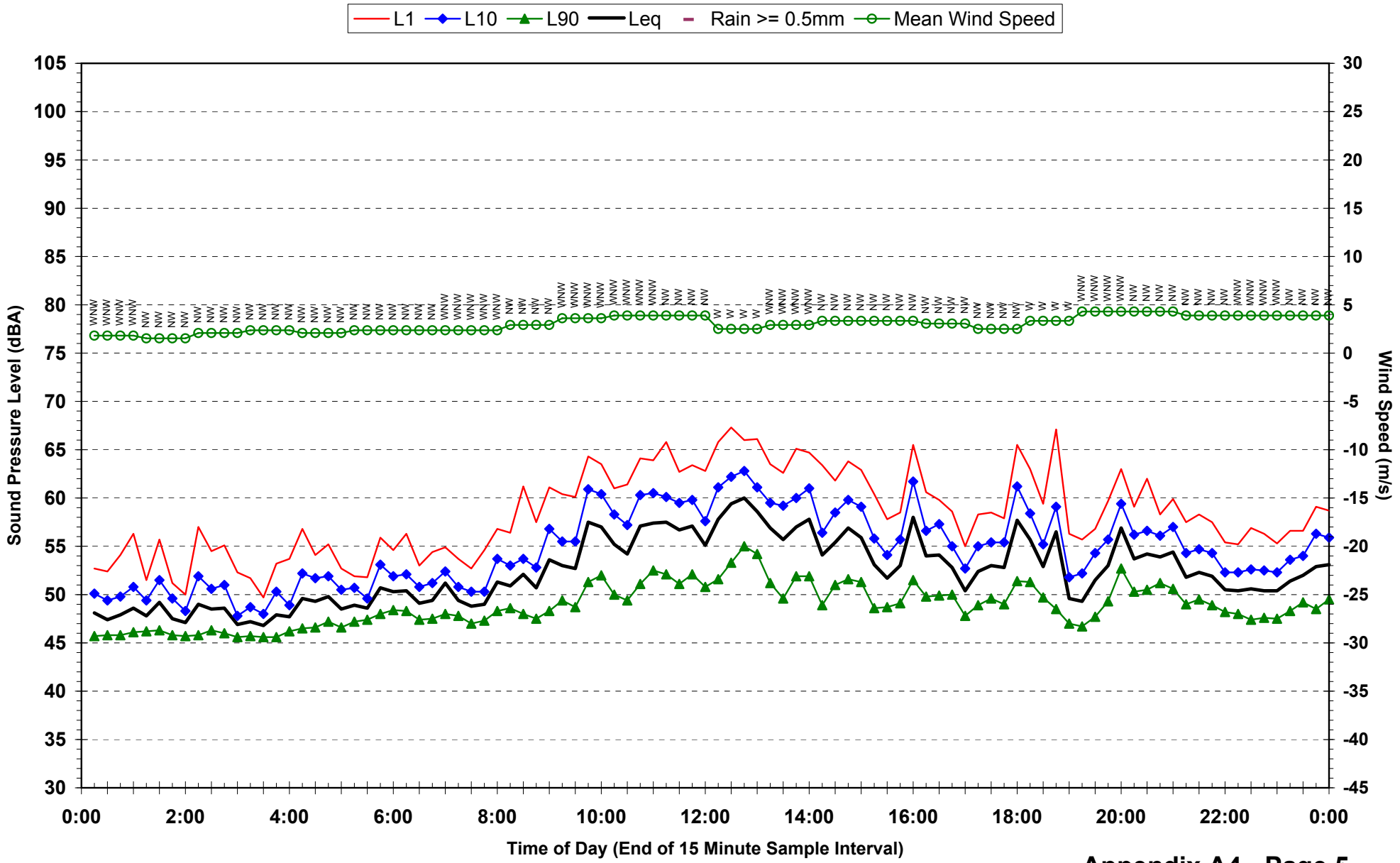
Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Sunday 7 June 2009



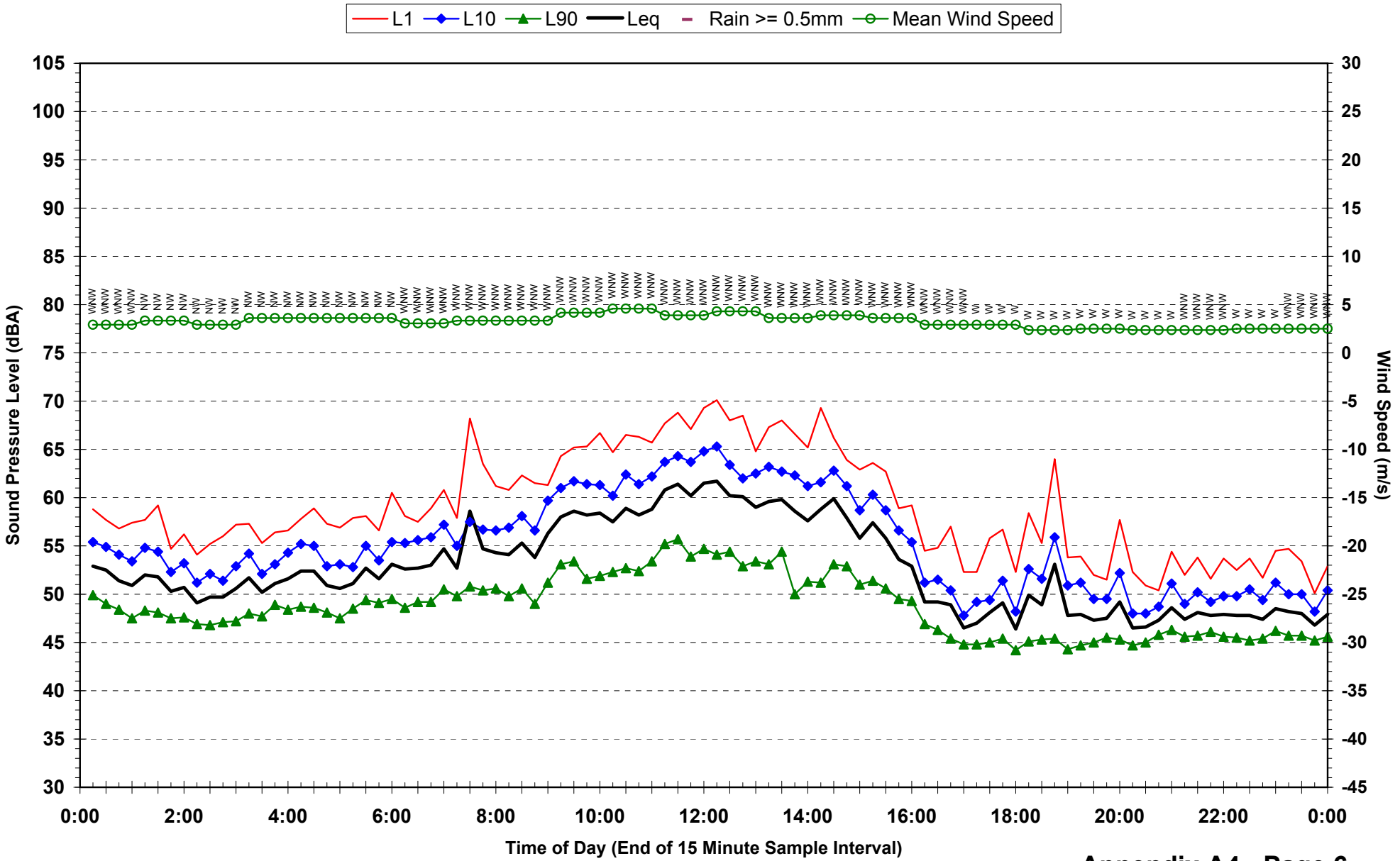
Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Monday 8 June 2009



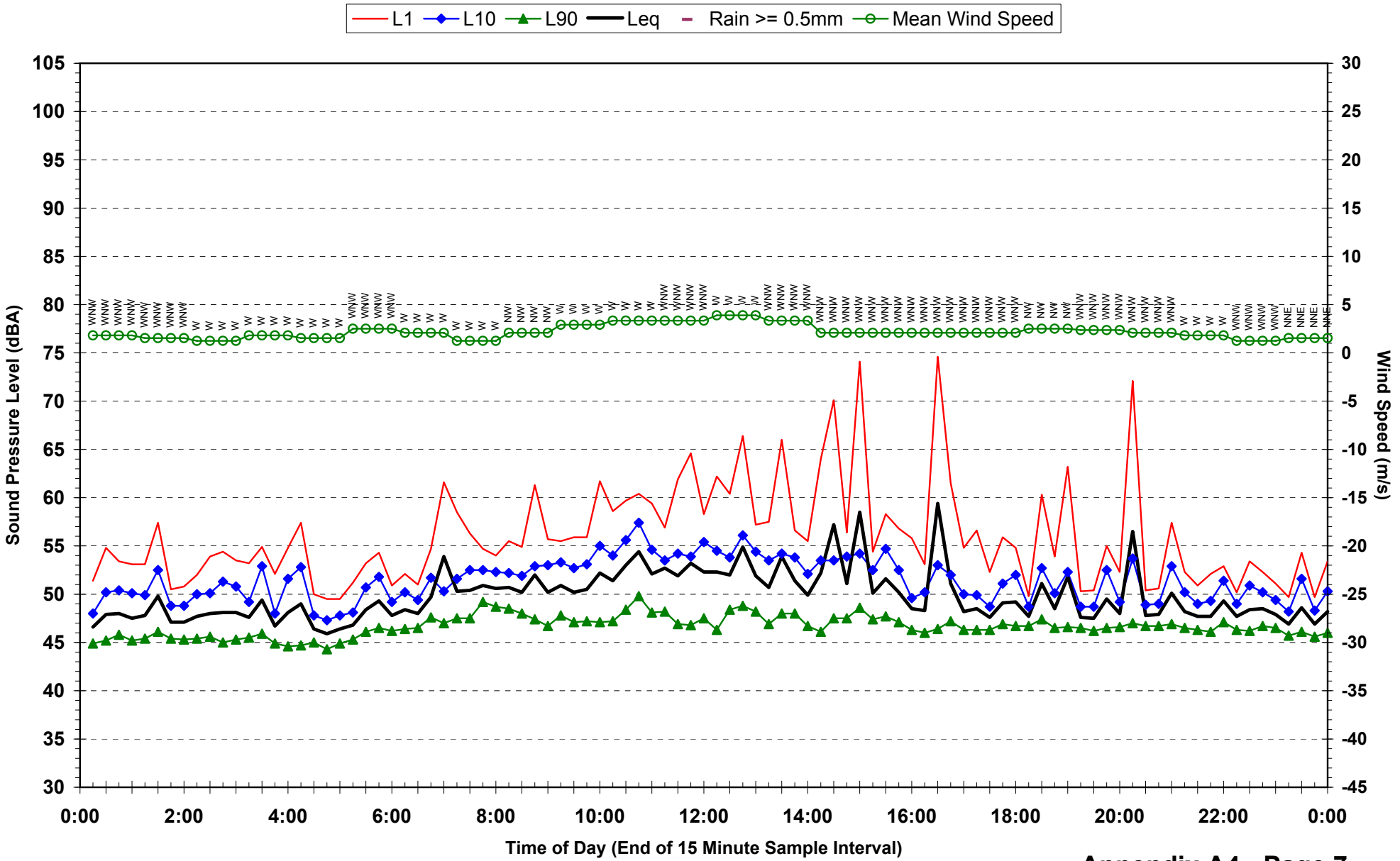
Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Tuesday 9 June 2009



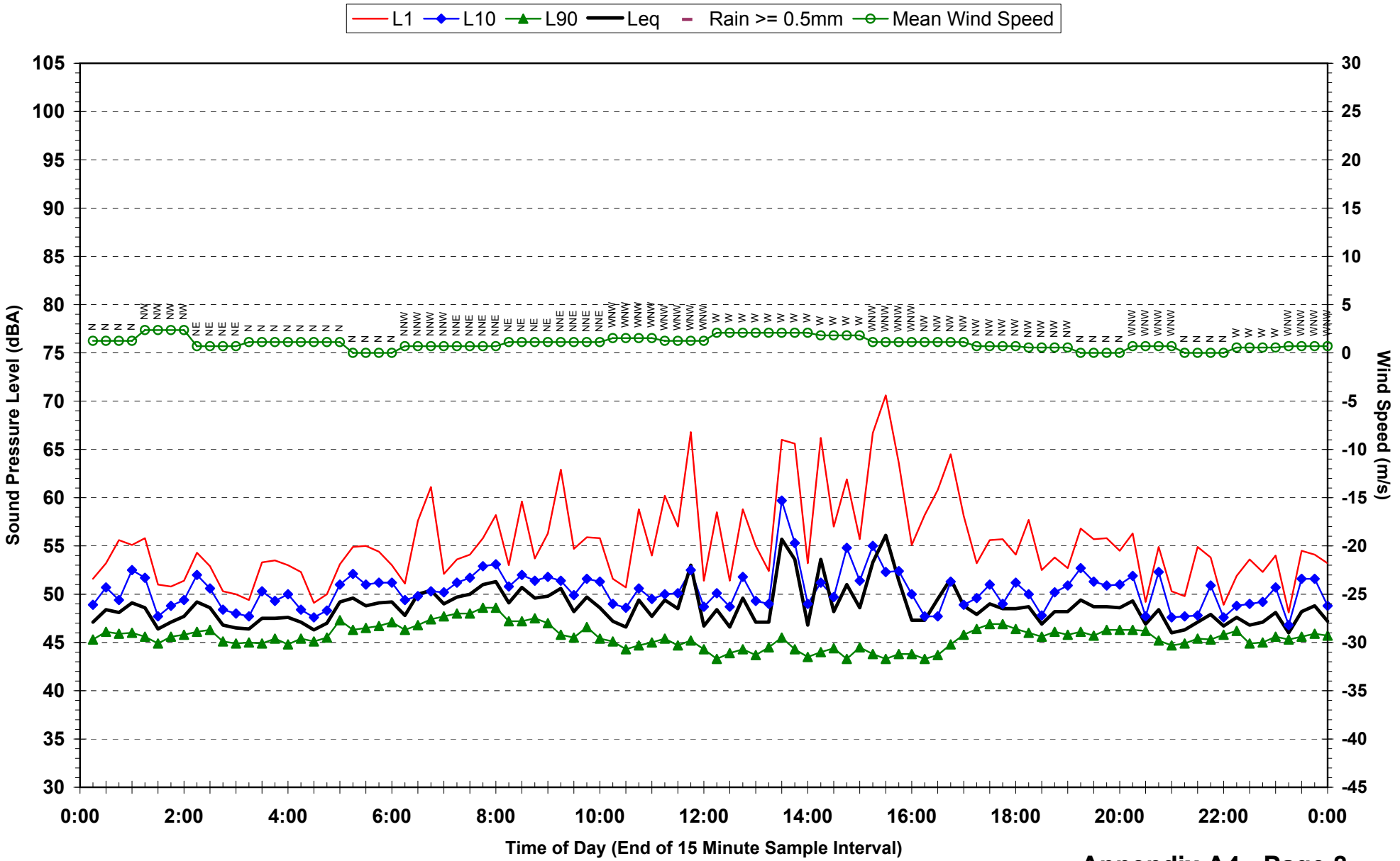
Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Wednesday 10 June 2009



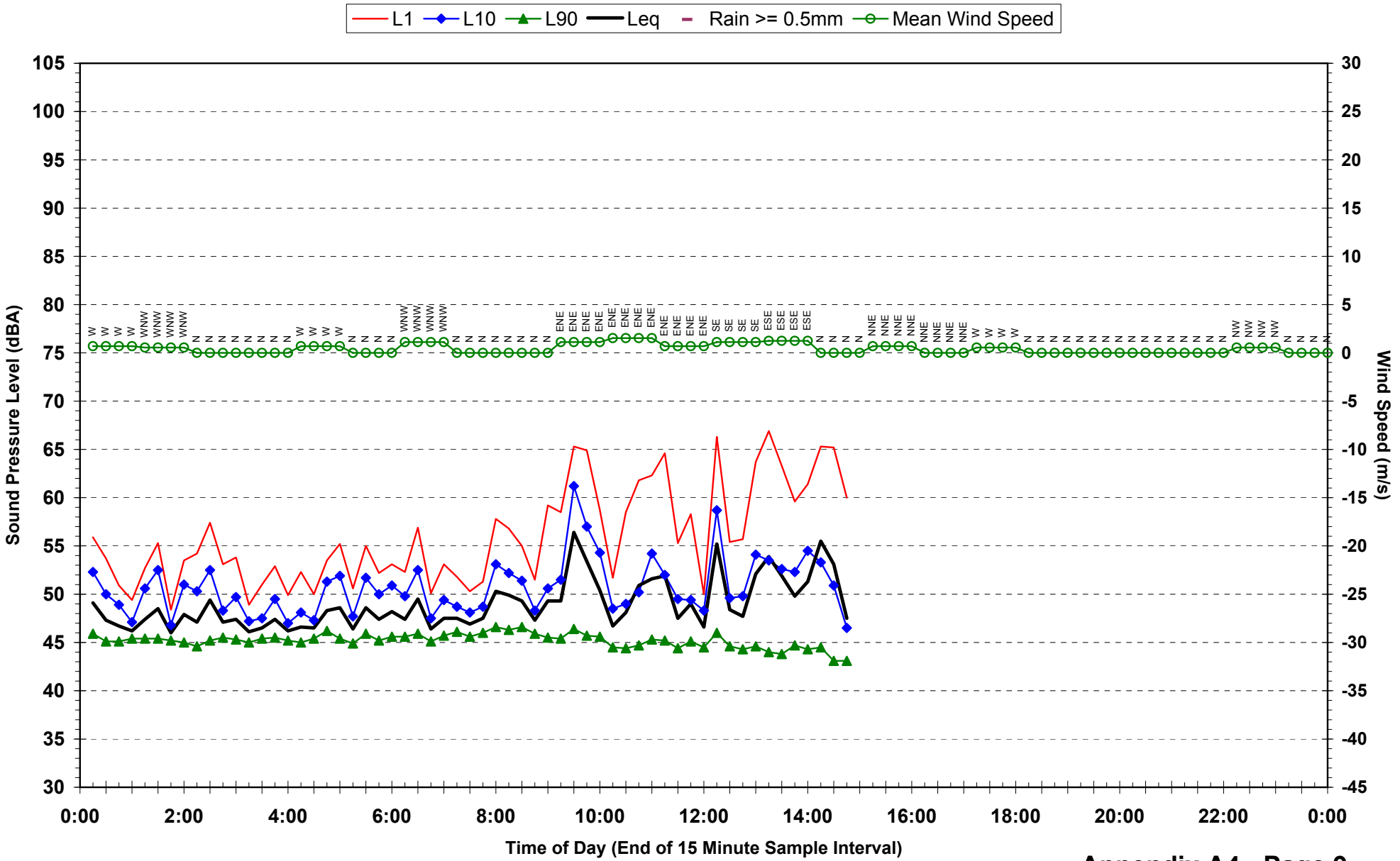
Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Thursday 11 June 2009



Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Friday 12 June 2009



Statistical Ambient Noise Levels
30-2247 Southern Boundary NCIA Site - Saturday 13 June 2009



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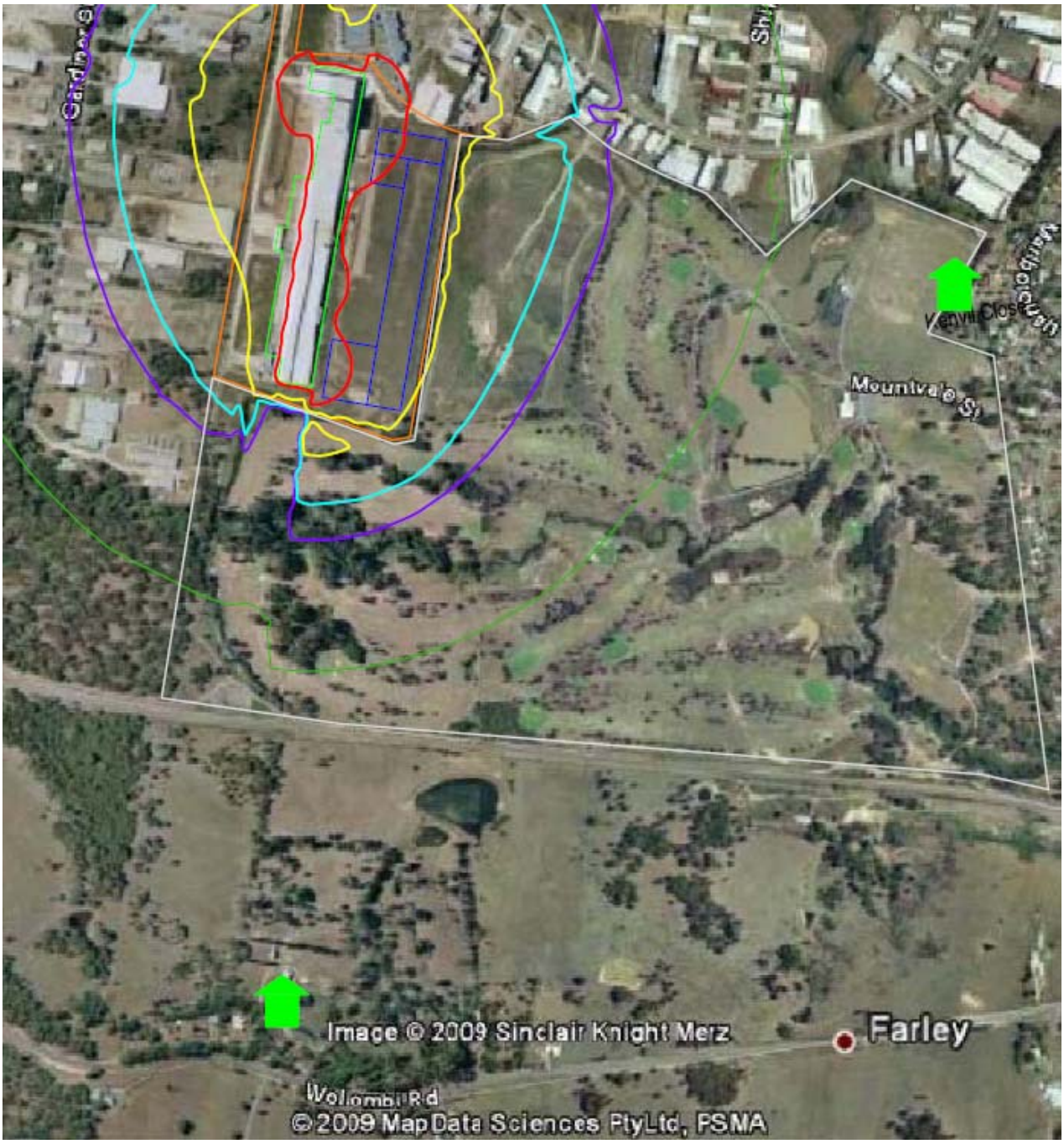
Noise Contours - Existing Operations (Calm)



- NCIA Site Boundary
- Proposed factory building
- Existing factory building
- Approximate Heritage Green Site Boundary
- Nearest residential areas

- **$L_{Aeq(15minute)}$** 55 dBA (Acceptable Noise Level at Active Recreation Area)
- **$L_{Aeq(15minute)}$** 47 dBA (Daytime criteria - Rutherford East)
- **$L_{Aeq(15minute)}$** 43 dBA (Night criteria - Rutherford West and Daytime criteria - Farley)
- **$L_{Aeq(15minute)}$** 41 dBA (Night criteria - Rutherford East, most restrictive of all night-time criteria)
- **$L_{Aeq(15minute)}$** 35 dBA (Minimum INP noise criteria)

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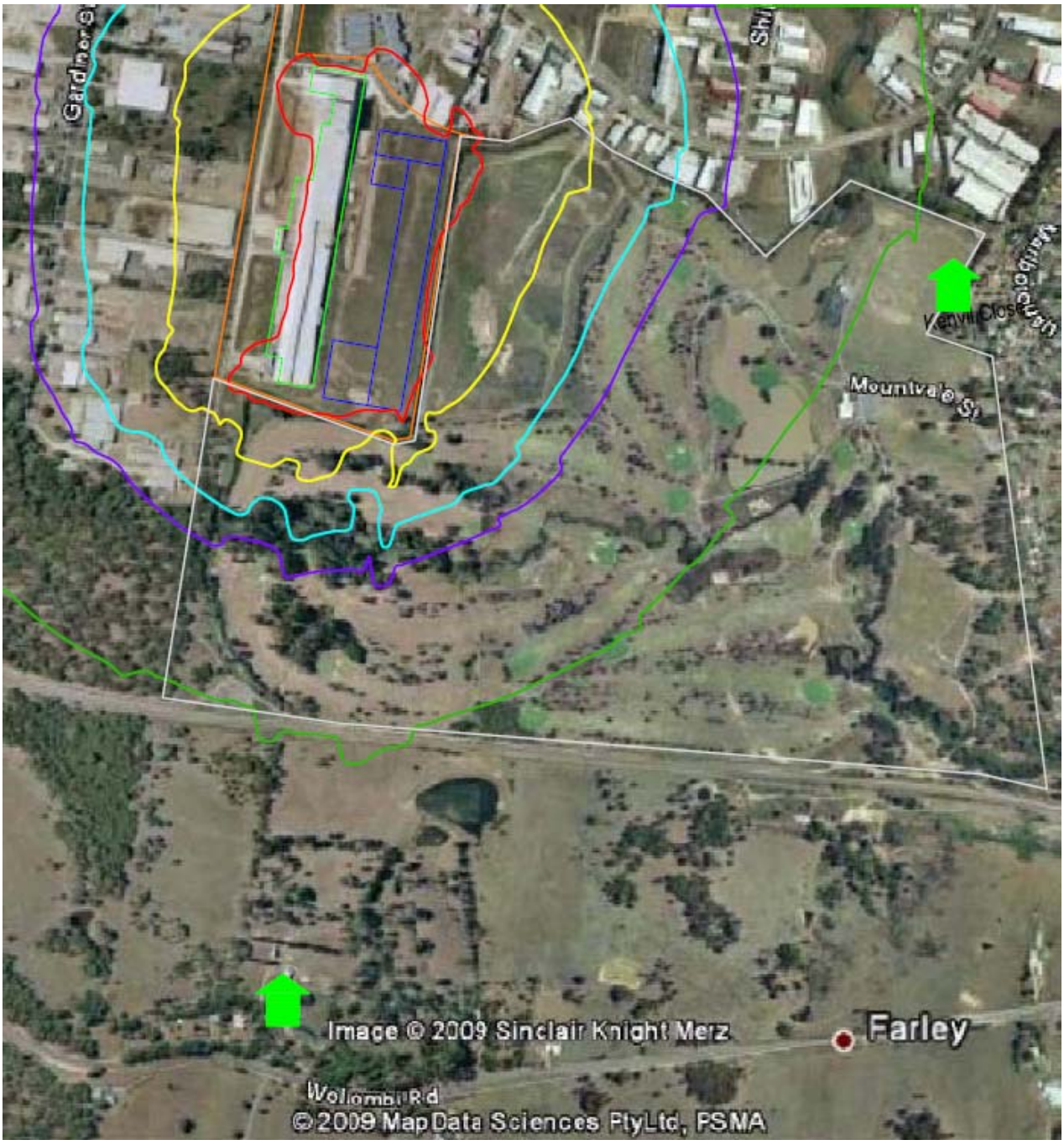
Noise Contours - Proposed Operations (Calm)



- NCIA Site Boundary
- Proposed factory building
- Existing factory building
- Approximate Heritage Green Site Boundary
- Nearest residential areas

- **LAeq(15minute)** 55 dBA (Acceptable Noise Level at Active Recreation Area)
- **LAeq(15minute)** 47 dBA (Daytime criteria - Rutherford East)
- **LAeq(15minute)** 43 dBA (Night criteria - Rutherford West and Daytime criteria - Farley)
- **LAeq(15minute)** 41 dBA (Night criteria - Rutherford East, most restrictive of all night-time criteria)
- **LAeq(15minute)** 35 dBA (Minimum INP noise criteria)

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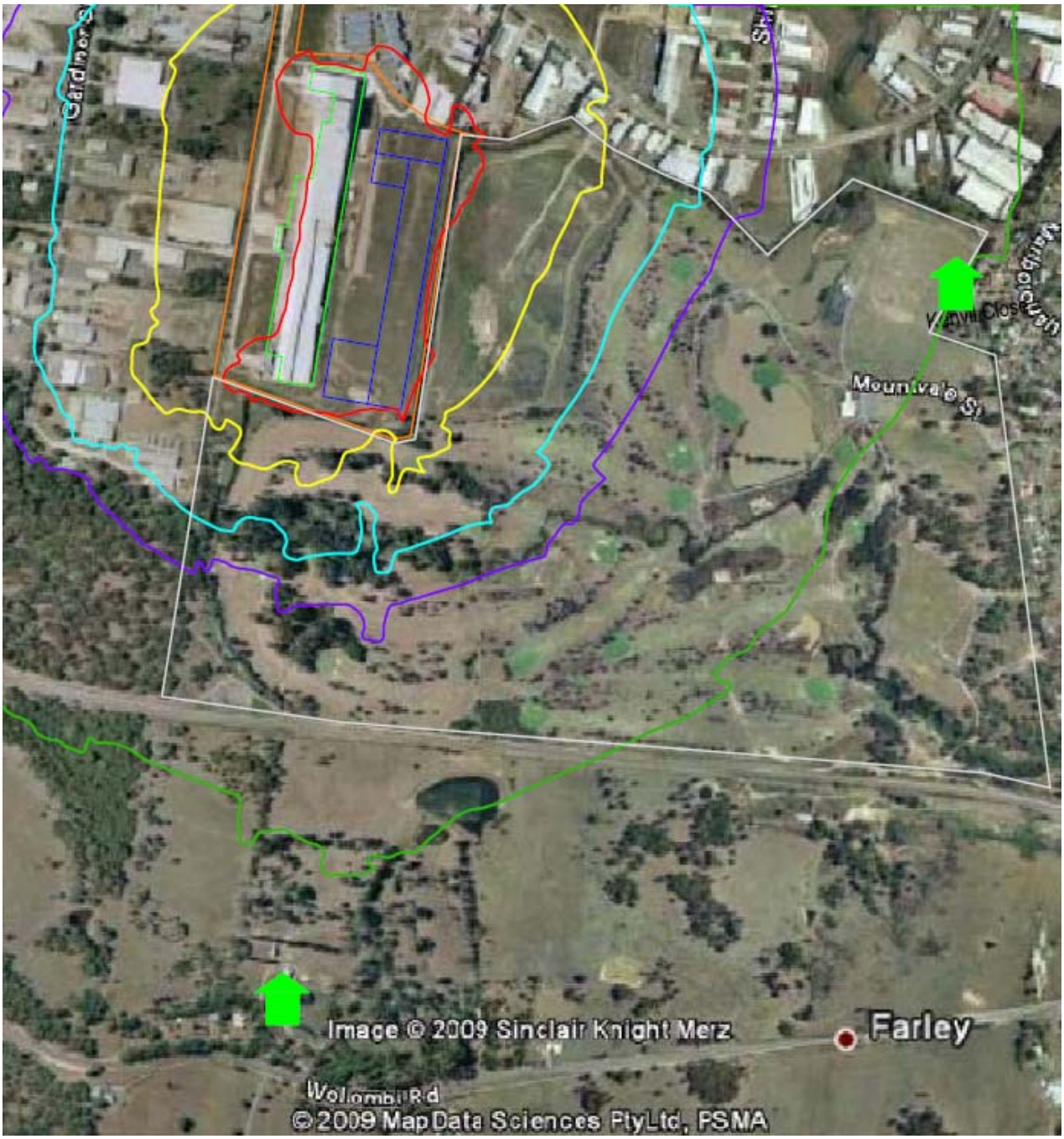
Noise Contours - Proposed Operations (Temperature Inversion)



- NCIA Site Boundary
- Proposed factory building
- Existing factory building
- Approximate Heritage Green Site Boundary
- Nearest residential areas

- **LAeq(15minute)** 55 dBA (Acceptable Noise Level at Active Recreation Area)
- **LAeq(15minute)** 47 dBA (Daytime criteria - Rutherford East)
- **LAeq(15minute)** 43 dBA (Night criteria - Rutherford West and Daytime criteria - Farley)
- **LAeq(15minute)** 41 dBA (Night criteria - Rutherford East, most restrictive of all night-time criteria)
- **LAeq(15minute)** 35 dBA (Minimum INP noise criteria)

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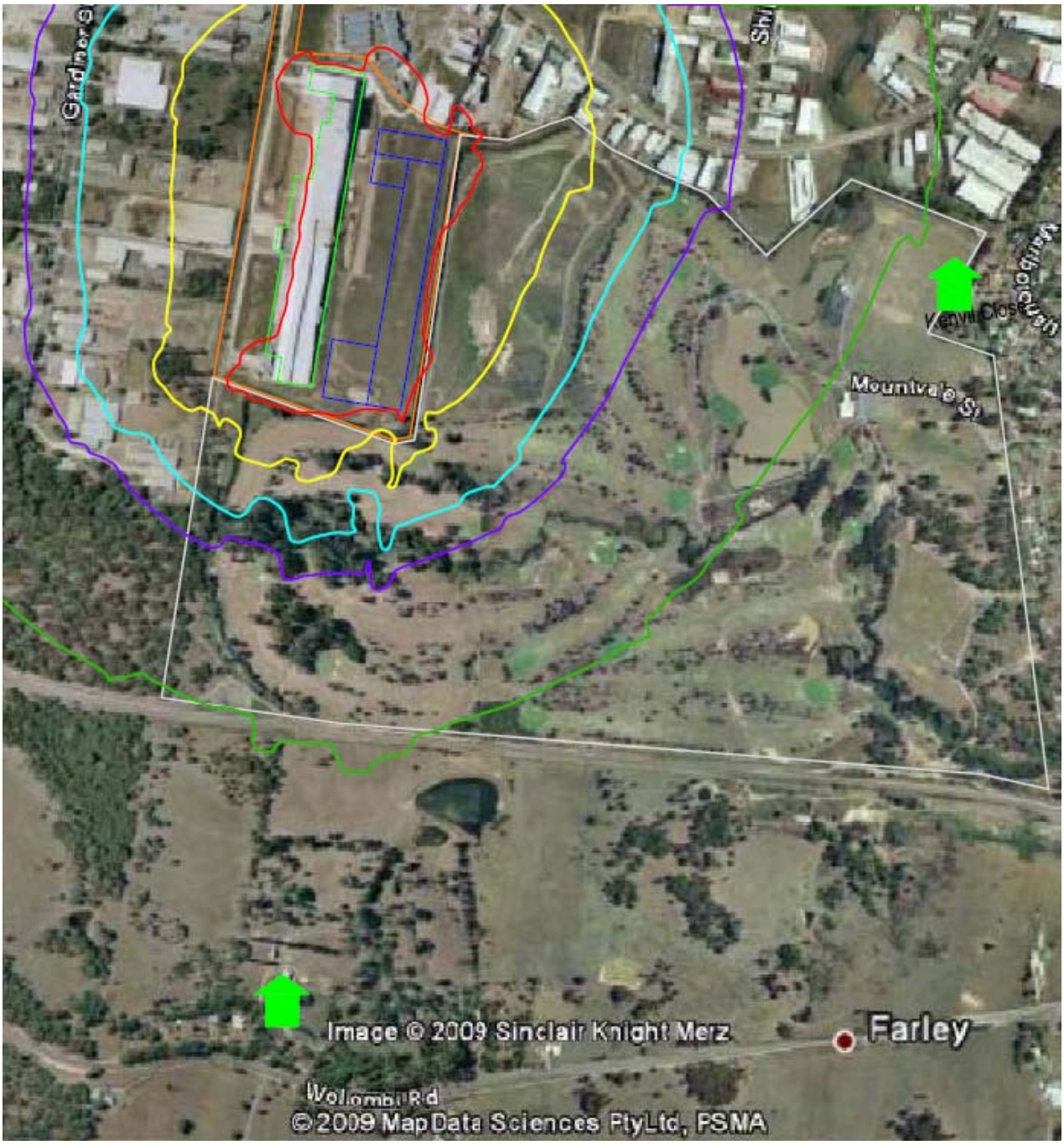
Noise Contours - Proposed Operations (South East 3m/s Wind)



- NCIA Site Boundary
- Proposed factory building
- Existing factory building
- Approximate Heritage Green Site Boundary
- Nearest residential areas

- **$L_{Aeq(15minute)}$** 55 dBA (Acceptable Noise Level at Active Recreation Area)
- **$L_{Aeq(15minute)}$** 47 dBA (Daytime criteria - Rutherford East)
- **$L_{Aeq(15minute)}$** 43 dBA (Night criteria - Rutherford West and Daytime criteria - Farley)
- **$L_{Aeq(15minute)}$** 41 dBA (Night criteria - Rutherford East, most restrictive of all night-time criteria)
- **$L_{Aeq(15minute)}$** 35 dBA (Minimum INP noise criteria)

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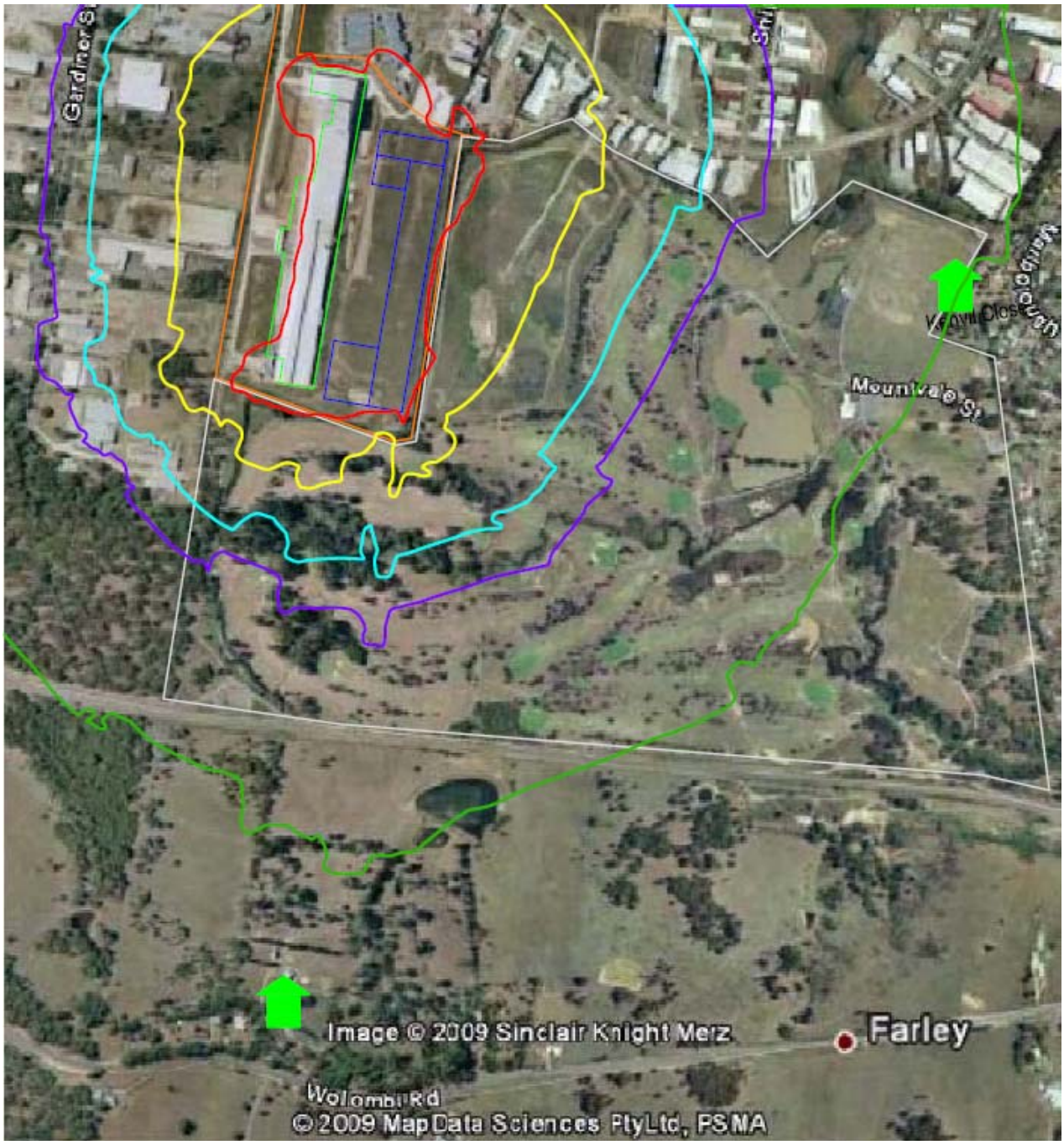
Noise Contours - Proposed Operations (North West 3m/s Wind)



- NCIA Site Boundary
- Proposed factory building
- Existing factory building
- Approximate Heritage Green Site Boundary
- Nearest residential areas

- **$L_{Aeq(15minute)}$** 55 dBA (Acceptable Noise Level at Active Recreation Area)
- **$L_{Aeq(15minute)}$** 47 dBA (Daytime criteria - Rutherford East)
- **$L_{Aeq(15minute)}$** 43 dBA (Night criteria - Rutherford West and Daytime criteria - Farley)
- **$L_{Aeq(15minute)}$** 41 dBA (Night criteria - Rutherford East, most restrictive of all night-time criteria)
- **$L_{Aeq(15minute)}$** 35 dBA (Minimum INP noise criteria)

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