SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

Appendix I-1
Noise and Vibration Technical Report

BHP

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Saraji East Mining Lease Project
BM Alliance Coal Operations Pty Ltd
05-Nov-2020

Noise and Vibration Assessment Report

Noise and Vibration Assessment Report

Client: BM Alliance Coal Operations Pty Ltd

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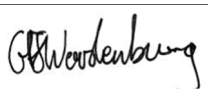
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Table of Contents

Abbreviations v
Executive summary i
1.0 Introduction 1
1.1 Project scope 1
1.2 Limitations 1
1.3 Terms of reference 2
2.0 Site description 5
2.1 Description of site operations 5
2.2 Sensitive receptors 5
3.0 Existing noise environment 7
3.1 Measurement locations 7
3.2 Instrumentation 8
3.3 Noise monitoring results 8
4.0 Mine noise criteria 9
4.1 Construction and operation noise emission 9
4.1.1 Review of applicable construction and operational noise criteria 9
4.1.2 Project specific noise criteria 13
4.2 Low Frequency Noise 13
4.3 Cumulative noise impacts, including public road and rail network traffic noise 14
5.0 Modelling methodology and assumptions 15
5.1 Construction and operation noise 15
5.1.1 Methodology 15
5.1.2 Assessment scenarios 15
5.1.3 Noise emission levels of plant and equipment 17
5.1.4 Equipment locations 17
5.1.5 Terrain data 18
5.1.6 Ground absorption 18
5.1.7 Noise propagation standard and modelled meteorological conditions 18
5.2 Cumulative noise impacts 19
5.2.1 Road traffic noise 19
5.2.2 Rail traffic noise 20
5.2.3 Cumulative noise with existing and possible future development 20
6.0 Impact assessment and discussion 22
6.1 $L_{Aeq(1h)}$ noise impact 22
6.1.1 Predicted noise impact 22
6.1.2 Analysis of Results 24
6.2 $L_{A1(1h)}$ noise impact 27
6.2.1 Predicted noise impact 27
6.2.2 Analysis of results 30
6.3 Low frequency noise impact 31
6.3.1 Predicted noise impacts 31
6.3.2 Analysis of results 33
6.4 Cumulative noise impacts 33
6.4.1 Road traffic noise 33
6.4.2 Rail traffic noise 34
6.4.3 Cumulative noise with existing and future development 35
7.0 Noise management strategies 36
8.0 Conclusion 38

Appendix A
Glossary A

Appendix B
Background Noise Measurements B

Appendix C
Noise Criteria C

Appendix D
CONCAWE D

Appendix E
Equipment Sound Power Levels E

Appendix F
Predicted Mine Noise Contours F

List of Tables

Table 1 Summary of Project specific external noise criteria ii
Table 2 ToR requirements and relevant report sections 2
Table 3 Identified sensitive receptors nearest to the Project 6
Table 4 Summary of noise measurement locations 7
Table 5 Sound measurement instrumentation 8
Table 6 Measured RBL 8
Table 7 Summary of external criteria for quasi-steady noise emissions 11
Table 8 Summary of external criteria for discrete noise emissions 12
Table 9 Summary of Project specific free-field noise criteria 13
Table 10 Summary of low frequency noise screening assessment at sensitive receptors 13
Table 11 Subjective effect of increases in noise levels 14
Table 12 Assessment scenarios 16
Table 13 Meteorological noise modelling parameters 18
Table 14 Summary of predicted future road traffic parameters, with and without the Project 19
Table 15 Summary of predicted future rail traffic volumes, with and without the Project 20
Table 16 Predicted operational noise impacts from the Saraji Mine, including Grevillia Pit Extension 21
Table 17 Predicted external $L_{Aeq(1h)}$ noise impact to nearby receptors 23
Table 18 Predicted external $L_{A1(1h)}$ noise impact to nearby receptors 28
Table 19 Predicted External $L_{LINeq(T)}$ noise impact to nearby receptors 32
Table 20 Predicted increase in road traffic noise levels due to the Project 34
Table 21 Predicted increase in rail traffic noise levels due to the Project 34
Table 22 Predicted increase in industrial noise impact to nearby receptors due to the Project 35
Table 23 EPP (Noise) acoustic quality objectives C-3
Table 24 Subjective effect of increases in noise levels C-5
Table 25 Derived EPP (Noise) Background Creep Noise Goal C-5
Table 26 MMC 07 Noise Limits C-5
Table 27 Derived MMC 17 Criteria C-6
Table 28 Summary of WHO Criteria C-7
Table 29 Environmental authority criteria C-9
Table 30 Noise limits for sensitive places C-9
Table 31 Noise limits C-10
Table 32 Spectral noise data for mine noise sources – operational sources used in Operational FY 2023-FY2042 Scenario E-1
Table 33 Spectral noise data for mine noise sources – construction sources used in all scenarios E-3

List of Figures

Figure 1	Sensitive receptor locations	4
Figure 2	Construction Phase 1 (2021) – Typical equipment locations	F-1
Figure 3	Construction Phase 2.1 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Meadowbrook Homestead – Typical equipment locations	F-2
Figure 4	Construction Phase 2.2 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Lake Vermont Homestead – Typical equipment locations	F-3
Figure 5	Construction Phase 2.3 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Kyewong and Tayglen Homestead – Typical equipment locations	F-4
Figure 6	Operational Phase (2024-2043)– Typical equipment locations	F-5
Figure 7	Construction Phase 1 (2021) – Worst-case meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-6
Figure 8	Construction Phase 1 (2021) – Worst-case meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-7
Figure 9	Construction Phase 1 (2021))– Neutral meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-8
Figure 10	Construction Phase 1 (2021) – Neutral meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-9
Figure 11	Construction Phase 2.1 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Meadowbrook Homestead – Worst-case meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-10
Figure 12	Construction Phase 2.1 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Meadowbrook Homestead -Worst-case meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-11
Figure 13	Construction Phase 2.1 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Meadowbrook Homestead – Neutral meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-12
Figure 14	Construction Phase 2.1 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Meadowbrook Homestead – Neutral meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-13
Figure 15	Construction Phase 2.2 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Lake Vermont Homestead – Worst-case meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-14
Figure 16	Construction Phase 2.2 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Lake Vermont Homestead -Worst-case meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-15
Figure 17	Construction Phase 2.2 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Lake Vermont Homestead – Neutral meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-16
Figure 18	Construction Phase 2.2 (2022-223) and Operational Phase (2023) – Powerline and Waterline Construction near Lake Vermont Homestead – Neutral meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-17
Figure 19	Construction Phase 2.3 (2022-223) &Operational Phase (2023) – Powerline and Waterline Construction near Kyewong & Tayglen Homesteads – Worst-case meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-18
Figure 20	Construction Phase 2.3 (2022-223) &Operational Phase (2023) – Powerline and Waterline Construction near Kyewong &Tayglen Homesteads -Worst-case meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels	F-19
Figure 21	Construction Phase 2.3 (2022-223) & Operational Phase (2023) – Powerline and Waterline Construction near Kyewong & Tayglen Homesteads– Neutral meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels	F-20

Figure 22 Construction Phase 2.3 (2022-223) & Operational Phase (2023) – Powerline and Waterline Construction near Kyewong & Tayglen Homesteads – Neutral meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels F-21
Figure 23 Operational Phase (2024-2043) – Worst-case meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels F-22
Figure 24 Operational Phase (2024-2043) - Worst-case meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels F-23
Figure 25 Operational Phase (2024-2043) – Neutral meteorological conditions – $L_{Aeq(1h)}$ Free-Field Noise Levels F-24
Figure 26 Operational Phase (2024-2043) – Neutral meteorological conditions – $L_{A1(1h)}$ Free-Field Noise Levels F-25

Abbreviations

AECOM	AECOM Australia Pty Ltd
BMA	BM Alliance Coal Operations Pty Ltd
CHPP	Coal Handling and Preparation Plant
dB	decibel
DEHP	Department of Environment and Heritage Protection
DES	Department of Environment and Science
EA	Environmental Authority
EIS	Environmental Impact Statement
EP Act	*Environmental Protection Act 1994*)
EPC	Exploration Permit for Coal
EPP (Noise)	Environmental Protection Policy 2019 (Noise)
EP Regulation	Environmental Protection Regulation 2019
FY	Financial year
ha	hectares
IRC	Isaac Regional Council
km	kilometres
LGA	Local Government Area
m	metres
MIA	Mine Infrastructure Area
MIC	Maximum Instantaneous Charge
ML	Mining Lease
MLA	Mining Lease Application
Mtpa	Million Tonnes Per Annum
NATA	National Association of Testing Authorities
PFNC	Planning for Noise Control
RBL	Rating Background Levels
ROM	Run-of-Mine
SEM	Single Event Maximum
The Project	Saraji East Mining Lease Project
ToR	Terms of Reference
WHO	World Health Organization

Executive summary

AECOM Australia Pty Ltd (AECOM) has been commissioned by BM Alliance Coal Operations Pty Ltd (BMA) to conduct a noise and vibration impact assessment for the proposed Saraji East Mining Lease Project (the Project). This report describes the potential noise and vibration impacts associated with the Project, as well as proposed mitigation measures.

This assessment is intended to satisfy the requirements of the Project's Terms of Reference (ToR) as provided by the Department of Environment and Heritage Protection (DEHP) (now the Department of Environment and Science (DES)).

The Project is a greenfield single-seam underground mine development on Mining Lease Application (MLA) 70383 commencing from within Mining Lease (ML) 1775. The Project also comprises a Coal Handling and Preparation Plant (CHPP), a coal transport conveyor network, a Mine Infrastructure Area (MIA) and a new rail spur and balloon loop, which are proposed to be located on the Project Site, adjacent to the existing Saraji Mine. Additionally, a new transport and infrastructure corridor is proposed to be constructed on MLA 70383. The Project will extract up to eleven million tonnes per annum (Mtpa) of run-of-mine (ROM) coal and produce up to eight Mtpa of metallurgical product coal for an export market over a life of approximately 20 years.

There are seven sensitive receptors in the vicinity of the Project Site, comprising:

- Kyewong Homestead
- Lake Vermont Homestead
- Saraji Homestead 1
- Saraji Homestead 2
- Saraji Homestead 3
- Tay Glen Homestead
- Meadowbrook Homestead.

Meadowbrook and Lake Vermont Homesteads (both of which are owned by BMA) are located within MLA 70383. All other sensitive receptors are located out of the Project Site.

Noise criteria

A review of environmental noise emission criteria was undertaken as part of this assessment. The most appropriate criteria for the Project have been adopted, namely:

- Queensland *Environmental Protection Act 1994* (EP Act)
- Queensland Environmental Protection Regulation 2019 (EP Regulation)
- Queensland Environmental Protection (Noise) Policy 2019 (EPP (Noise))
- DEHP Guideline Model Mining Conditions dated 07 March 2017 (MMC17)
- Ecoaccess (2004), Guideline for the Assessment of Low Frequency Noise
- The World Health Organization (1999), Guidelines for Community Noise
- enHealth: The Health Effects of Environmental Noise – Other than Hearing Loss dated May 2004.

The Project objectives and performance outcomes for noise and vibration, as stated in the ToR, are:

- The environmental objective to be met under the EP Act is that the activity will be operated in a way that protects the environmental values of the acoustic environment.
- The performance outcomes corresponding to these objectives are in Schedule 8, Part 3, Division 1 of the EP Regulation.

Schedule 8, Part 3, Division 1 of the EP Regulation provides the following performance outcomes:

- Sound from the activity is not audible at a sensitive receptor.
- The release of sound to the environment from the activity is managed so that adverse effects on environmental values including health and wellbeing and sensitive ecosystems are prevented or minimised.

The EP Regulation also clarifies that either performance outcome is to be achieved. Due to the relative proximity of some Project-related activities to sensitive receptors, the Project is unlikely to achieve the first performance outcome during some activities and under some meteorological conditions. In this instance, the assessment has focused on the second performance outcome.

The environmental values discussed in this performance outcome are detailed in the EPP (Noise). For dwellings (all nearby sensitive receptors) these environmental values comprise 'health and wellbeing' (during the day and evening periods) and 'health and wellbeing, in relation to the ability to sleep' (during the night-time period). The EPP (Noise) provides Acoustic Quality Objectives for enhancing or protecting these environmental values and provides a framework for making decisions in relation to the acoustic environment. The second performance outcome of the EP Regulation also refers to these Acoustic Quality Objectives.

The above legislation, guidelines, policies and standards have been reviewed for this report to determine values that preserve the amenity of the surrounding areas and protect the health and wellbeing of nearby residents. The enHealth Council document references the WHO document, which outlines guideline values for community noise intended to reduce the likelihood of adverse health effects. EPP(Noise) outlines acoustic quality objectives intended to enhance or preserve health, wellbeing and other environmental values over the long term.

On this basis, criteria have been proposed to protect the amenity of surrounding areas, as well as the health and wellbeing of nearby residents. Proposed Project specific criteria have been summarised in Table 1 and are consistent with the levels recommended in the EPP(Noise) acoustic quality objectives, WHO 1999 and previous approvals for similar developments in Queensland.

Table 1 Summary of Project specific external noise criteria

Period	Time	Quasi-Steady Noise $L_{Aeq(1h)}$ dB(A)	Discrete Noise $L_{A1(1h)}$ dB(A)
Day	7am – 6pm	45	55
Evening	6pm – 10pm	40	50
Night	10pm – 7am	**35**	**45**

As the proposed operation of the mine extension is likely to be operational 24 hours a day, the most stringent criteria at night (shown in bold in Table 1) have therefore been taken as the Project criterion for the assessment of operational noise and is used in the remainder of the operational noise assessment.

Blasting is not proposed as part of the Project. In addition, the construction and operation of the Project is not expected to give rise to perceptible levels of vibration at nearby sensitive receptors. As vibration impacts are not envisaged to be perceptible at nearby receptors, this approach is considered to satisfy the ToR.

Project noise impact

Future Project noise impacts were assessed for several scenarios throughout the life of the Project, under neutral and typical worst-case meteorological conditions; these are discussed in greater detail in Section 5.0 of this report. Based on the results of the noise assessment, noise emissions from the Project during construction and operation phases are forecast to exceed the Project specific noise criterion at five receptors, namely:

- Lake Vermont Homestead
- Saraji Homestead 1

- Saraji Homestead 2
- Saraji Homestead 3
- Meadowbrook Homestead.

The overall increase in mine noise levels as a result of the Project (relative to noise from the existing Saraji Mine) is predicted to be “clearly perceptible” to “twice as loud” at Saraji Homesteads 2 and 3, “just perceptible” at the Meadowbrook Homestead, and not perceptible to most people at the other receptors.

The increase in noise levels associated with increased road traffic on public roads and rail movement on the local rail network is not predicted to be perceptible to most people, with the exception of Dysart-Moranbah Road during FY 2023 when the increase is “just perceptible”.

The following co-existence agreements are currently in place, or being actively sought, at the following receptors:

- Lake Vermont Homestead – BMA owned. When required for mining or subject to mining impacts the homestead will be vacated
- Saraji Homestead 1 – discussions between BMA and the landholder concerning a co-existence agreement have commenced
- Saraji Homestead 2 – Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
- Saraji Homestead 3 – Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
- Meadowbrook Homestead – BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.

Noise management strategies

Noise control measures for the Project may include, where practicable:

- maintaining machinery to minimise noise
- working with equipment suppliers to provide machinery that is designed to be quieter
- stopping and starting up equipment as far away as possible from receptors
- maintaining internal roads in good working order
- ensuring all vehicle and plant operators are aware of the location of sensitive receptors and the measures required for limiting noise where possible
- limiting some construction activities (e.g. power line construction) to daylight hours when encroaching upon receptors.
- treatments to conveyors, such as the used of low noise idlers, and partial enclosures.
- noise control to the ventilation shafts, which may include:
    - orientate discharge outlets away from nearby sensitive receptors
    - variable speed devices fitted to fan motors.

Community and complaints management techniques will be undertaken in accordance with the community complaints and grievances procedure that is current at the time of Project commencement. Such techniques include:

- taking steps to inform the community of how complaints can be made
- investigating the complaints and, where required, the use of appropriate dispute resolution activities
- maintaining a complaints register to record all relevant information associated with the complaint, including the personnel responsible for handling the complaint and the corrective actions taken
- ensuring that a complainant is advised of the outcomes in relation to their complaint.

Specific noise treatments to each receptor are discussed in Section 6.1.2, 6.2.2 and 6.3.2.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been commissioned by BM Alliance Coal Operations Pty Ltd (BMA) to conduct a noise impact assessment for the proposed Saraji East Mining Lease Project (the Project). This report describes the potential operational noise impacts associated with the Project, as well as proposed mitigation and management strategies.

This assessment is intended to satisfy the requirements of the Project's Terms of Reference (ToR) as provided by the Department of Environment and Heritage Protection (DEHP) (now the Department of Environment and Science (DES)).

The Project is a greenfield single-seam underground mine development on Mining Lease Application (MLA) 70383 commencing from within Mining Lease (ML) 1775. The Project also comprises a Coal Handling and Preparation Plant (CHPP), a coal transport conveyor network, a Mine Infrastructure Area (MIA) and a new rail spur and balloon loop, which are proposed to be located on the Project Site adjacent to the existing Saraji Mine. Additionally, a new transport and infrastructure corridor will be constructed on MLA 70383.The Project will extract up to eleven million tonnes per annum (Mtpa) of run-of-mine (ROM) coal and produce up to eight Mtpa of metallurgical product coal for the export market over a life of approximately 20 years. The Project Site is shown in Figure 1.

1.1 Project scope

The scope of the noise assessment is intended to satisfy the requirements of the ToR by:

- identifying background noise levels at sensitive receptors, which could potentially be affected by noise emission from the Project
- assessing the impact of the Project on sensitive receptors that may occur during various stages of the Project life, under neutral and worst-case meteorological conditions
- describing noise management strategies to be implemented for the Project.

Potential noise impacts from Project operations comprise:

- activities associated with the construction of the Project
- activities associated with the operation of the Project (e.g. operation of the conveyors, rail loadout, CHPP, etc.)
- increased road and rail movement noise associated with the construction and operation of the Project
- cumulative noise impacts from the Project and other nearby projects (existing or proposed), such as the existing Saraji Mine.

A glossary of terminology used in this report is included in Appendix A.

1.2 Limitations

The findings of this report are based on the information provided to date, and may change as the Project progresses. Should the final design differ from that which is currently available, the impact to nearby receptors may differ from the findings presented in this report.

Blasting is not proposed as part of the Project. In addition, the construction and operation of the Project is not envisaged to give rise to perceptible levels of vibration at nearby sensitive receptors. As vibration impacts associated with the project are not envisaged to be perceptible at nearby receptors, this approach is considered to satisfy the Project's ToR.

The assessment of noise impacts on local fauna was excluded from this assessment. Impacts to fauna are discussed in the Terrestrial Ecology Technical Report (AECOM, 2019).

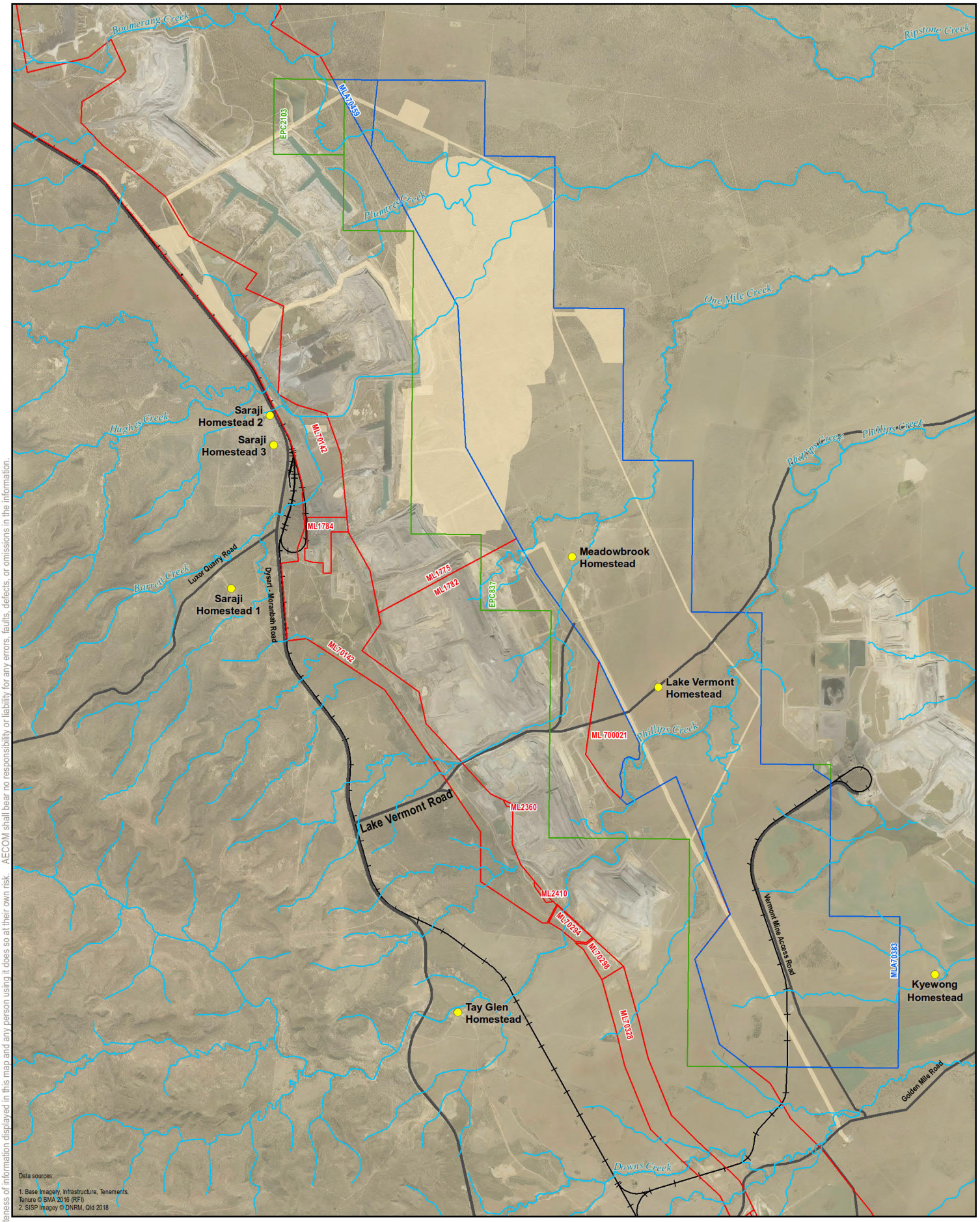
1.3 Terms of reference

The noise and vibration section of the Project's ToR (Section 8.7) has been reproduced in Table 2, alongside the section/s of this report where the ToR have been addressed.

Table 2 ToR requirements and relevant report sections

ToR	Requirement	Report section
Objective and performance outcomes	The environmental objective to be met under the EP Act is that the activity will be operated in a way that protects the environmental values of the acoustic environment. The performance outcomes corresponding to these objectives are in Schedule 5, Table 1 of the EP Regulation. The proponent should supply sufficient evidence (including through studies and proposed management measures) that show these outcomes can be achieved.	The EP Regulation was updated in September 2019 and is referred to in this assessment, with the performance outcomes now located in Schedule 8, Part 3, Division 1. The requirements of the EP Act and Schedule 8, Part 3, Division 1 of the EP Regulation have been summarised in Section 4.0, with a detailed discussion in Appendix C.
8.7.1	Fully describe the environmental values and characteristics of the noise and vibration sources that would be emitted when carrying out the activity (point source and general emissions). Noise and vibration emissions (including fugitive sources) that may occur during construction, commissioning, upset conditions, operation and closure should be described.	The pre-Project noise environment is discussed in Section 3.0. Environmental values are discussed in Section 4.0, with a detailed discussion in Appendix C. Noise emissions for various stages of the project have been assessed. These are discussed in Section 5.1.2. Blasting is not proposed as part of the Project. In addition, the construction and operation of the Project is not envisaged to give rise to perceptible levels of vibration at nearby sensitive receptors. As vibration impacts associated with the Project are not envisaged to be perceptible at nearby receptors, this approach is considered to satisfy the ToR.
8.7.2	Predict the impacts of the noise and vibration emissions from the activity on the environmental values of the receiving environment, with reference to sensitive receptors, using recognised quality assured methods. Taking into account the practices and procedures that would be used to avoid or minimise impacts, the impact prediction must address the: • activity's consistency with the objectives • cumulative impact of the noise and vibration with other emissions of noise associated with existing development and possible future development (as described by approved plans) • potential impacts of any low-frequency (<200 Hz) noise emissions	Cumulative impact of noise emissions associated with the Project and surrounding existing mines, such as the existing Saraji Mine, including the recently approved Grevillea Pit Extension, are discussed in Sections 4.1.2 and 6.4.3. In addition, the noise levels associated with increases in road and rail traffic volumes due to the Project are discussed in Section 4.1.2 and Section 6.4. The potential impacts of any low-frequency are discussed in Section 6.3.

ToR	Requirement	Report section
	• impacts from blasting.	
8.7.3	Describe how the proposed activity would be managed to be consistent with best practice environmental management for the activity. Where a government plan is relevant to the activity, or the site where the activity is proposed, describe the activity's consistency with that plan.	Recommendations for noise mitigation measures and noise and vibration monitoring, are discussed in Section 7.0.
8.7.4	Describe how the objectives would be achieved, monitored and audited, and how corrective actions would be managed.	Recommendations for noise mitigation measures and noise and vibration monitoring, are discussed in Section 7.0.



LEGEND

Project Footprint

Sensitive Receptors
- Homestead

Watercourse
Public Road
Existing Railway

Mining Tenement
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)

N

Figure 1
Sensitive Receptor Locations

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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2.0 Site description

2.1 Description of site operations

The Project is located within the Isaac Regional Council (IRC) Local Government Area (LGA) approximately 25 km north of Dysart and approximately 170 km south-west of Mackay in Queensland.

The Project is located directly adjacent to the existing Saraji Mine. BMA currently operates the Saraji Mine under Environmental Authority (EA) Permit No. EPML00862313.

The Project is a greenfield single-seam underground mine development on MLA 70383 commencing from within ML 1775. It has been designed to utilise the existing approved Saraji Mine infrastructure, such as electricity lines, water supply pipelines, CHPP, haul roads, workshops and warehouses, wherever practical. The Project will require upgrades to existing mine infrastructure and additional mine infrastructure. As such, the Project also comprises a new CHPP, associated MIA and a new rail spur and balloon loop, each of which is proposed to be located on the adjacent Saraji Mine. A new infrastructure and transport corridor will be constructed on MLA 70383 and MLA 70459 to accommodate the reconfiguration of existing power and water networks and internal access roads.

The Project Site is bound by Exploration Permit for Coal (EPC) 837, EPC 2103, MLA 70383, MLA 70459, ML 1775, ML 70142 and ML 1782. The Project Site encompasses approximately 11,427 hectares (ha) of land. Mining and the infrastructure required to support the Project is not proposed within the full extent of the Project Site, with direct impacts constrained to a smaller area of some 3,541 ha within MLA 70383, MLA 70459, ML 70142 and ML 1775. These areas are collectively referred to as the Project Footprint.

The Project will broadly comprise the following stages:

- Construction Phase (Financial Year (FY) 2021-FY 2023), comprising the construction of the portal, construction accommodation camp, gas drainage infrastructure (western location), water and storage dams, MIA, rail loop and load out, vent shafts (western location), water pipelines, and powerline.
- Operation Phase (FY 2023-FY 2042), comprising the operation of the mine (above ground and underground activities), as well as the construction of the gas drainage infrastructure and vent shafts (eastern location). Only underground mining activities are proposed in FY 2023. Export of coal is anticipated to begin in FY 2024.

2.2 Sensitive receptors

The land surrounding the Project Site is predominantly farming and grazing land. The nearest sensitive receptors to the Project Site were identified in consultation with BMA and comprise rural dwellings summarised in Table 3. These locations are also shown in Figure 1. Meadowbrook and Lake Vermont Homesteads are located within MLA 70383; all other sensitive receptors are located outside current ML or MLA areas.

Table 3 Identified sensitive receptors nearest to the Project

Receptor	Locations*	Direction from Project Site	Ownership/Comments
Kyewong Homestead	148.426, -22.511	1 km east of Project Site	Private landholder
Lake Vermont Homestead	148.360, -22.448	Within Project Site	BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.
Saraji Homestead 1	148.259, -22.428	4 km west of Project Site	Private landholder. Discussions between BMA and the landholder concerning a co-existence agreement have commenced.
Saraji Homestead 2	148.268, -22.389	1 km from Project Site (south of MIA)	Private landholder. Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
Saraji Homestead 3	148.268 -22.396	1 km from Project Site (south of MIA)	Private landholder. Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
Tay Glen Homestead	148.313 -22.520	7 km west of Project Site	Private landholder
Meadowbrook Homestead	148.339 -22.420	Within Project Site	BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.

* Latitudes/Longitudes based on GDA94

The Project proposes a construction accommodation camp. The construction accommodation camp will be used solely by the Project's employees or contractors. As such, these are not considered sensitive receptors as consistent with the DEHP (now DES) document *Guideline Model Mining Conditions* dated 7 March 2017.

3.0 Existing noise environment

Noise measurements were taken at the majority of sensitive receptors closest to the Project. This allowed the pre-Project (baseline) background noise levels to be captured at receptors predicted to receive the highest noise impact from the Project.

3.1 Measurement locations

Long term, unattended noise monitoring was undertaken at the majority of sensitive receptors previously discussed Section 2.2. These measurements were carried out by:

- SLR Consulting Australia Pty Ltd (SLR) in 2011. The methodology and findings of these measurements are captured in their draft report to BMA (Baseline Noise and Vibration Report, reference 624.10024-R1D1, 21 December 2011) (hereafter referred to as the "SLR Report").
- AECOM in 2016.

All measurements were carried out in general accordance with the version of the DEHP *Noise Measurement Manual* in force at the time of the measurements (the 2000 version for the SLR measurements, and the 2013 version for the AECOM measurements), with all equipment microphones located in the free-field. The relevant sections of the SLR Report have been reproduced in this report.

Table 4 Summary of noise measurement locations

Receptor	Measurements Conducted by	Period of Monitoring
Kyewong Homestead	SLR	Wednesday 25 May 2011 to Thursday 9 June 2011 Thursday 16 June 2011 to Friday 17 June 2011
Lake Vermont Homestead	SLR	Wednesday 25 May 2011 to Monday 13 June 2011 Thursday 16 June 2011 to Friday 17 June 2011
Saraji Homestead 1	SLR	Thursday 26 May 2011 to Thursday 9 June 2011 Thursday 16 June 2011 to Friday 17 June 2011
Saraji Homestead 2	SLR	Thursday 26 May 2011 to Friday 3 June 2011 Thursday 16 June 2011 to Friday 17 June 2011
Tay Glen Homestead	SLR	Wednesday 25 May 2011 to Sunday 5 June 2011 Thursday 16 June 2011 to Friday 17 June 2011
Meadowbrook Homestead	AECOM	Monday 10 October 2016 to Thursday 20 October 2016

Both Saraji Coal Mine and nearby Lake Vermont Mine have continued to be operational since the measurements were captured in 2011; as such, industrial noise impacts to these receptors are unlikely to have grown quieter after 2011. In addition, the night-time background noise measurements at Kyewong Homestead and Meadowbrook Homestead were measured to be under 25 dB(A), which is below the threshold level stated in the *Guideline - Planning for Noise Control* dated 2016 (PFNC). Accordingly, adopting the 2011 background measurement data is considered a conservative approach in determining the representative background noise levels at these receptors.

3.2 Instrumentation

The noise measurement instrumentation used for this assessment is summarised in Table 5. All equipment was in current *National Association of Testing Authorities* (NATA) calibration at the time of use. NATA is Australia's national laboratory accreditation authority. Field calibration of the equipment was carried out at the start and end of the measurements against a field calibrator. No significant drift in calibration (i.e. 1.0 dB or greater) was detected.

Table 5 Sound measurement instrumentation

Receptor	Instrument	Serial Number
Kyewong Homestead	ARL Environmental Noise Logger EL316	16-299-426
Lake Vermont Homestead	SVAN 957 Sound Level Meter	21425
Saraji Homestead 1	ARL Environmental Noise Logger EL316	16-203-505
Saraji Homestead 2	ARL Environmental Noise Logger EL316	16-203-527
Tay Glen Homestead	ARL Environmental Noise Logger EL316	16-306-045
All above receptors	Rion NC-73 Calibrator B&K 4231 Calibrator	10697066 2594716
Meadowbrook Homestead	Rion NA21 Environmental Noise Logger Rion NC-74 Calibrator	00187446 34483785

3.3 Noise monitoring results

The results of the background noise measurements are summarised in Table 6. Data recorded during periods affected by adverse weather conditions, as recorded at the Saraji Mine weather station, were excluded. Background noise levels are generally represented by the Rating Background Levels (RBL), which are calculated based on the procedure outlined in PFNC.

Table 6 Measured RBL

Receptor	Period	RBL dB(A)		
		Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Kyewong Homestead	Wednesday 25 May 2011 to Thursday 9 June 2011 Thursday 16 June 2011 to Friday 17 June 2011	26	25*	25*
Lake Vermont Homestead	Wednesday 25 May 2011 to Monday 13 June 2011 Thursday 16 June 2011 to Friday 17 June 2011	26	25	26
Saraji Homestead 1	Thursday 26 May 2011 to Thursday 9 June 2011 Thursday 16 June 2011 to Friday 17 June 2011	32	36	36
Saraji Homestead 2	Thursday 26 May 2011 to Friday 3 June 2011 Thursday 16 June 2011 to Friday 17 June 2011	35	38	37
Tay Glen Homestead	Wednesday 25 May 2011 to Sunday 5 June 2011 Thursday 16 June 2011 to Friday 17 June 2011	31	28	28
Meadowbrook Homestead	Monday 10 October 2016 to Thursday 20 October 2016	34	32	25

* The calculated RBL was lower than the threshold background level of 25 dB(A). As such, the threshold background level was used.

The RBLs for Saraji Homestead 2 are taken to also apply to Saraji Homestead 3, as these receptors are located relatively close to each other (approximately 550 metres apart). Noise traces recorded at each measurement location are provided in Appendix B.

4.0 Mine noise criteria

4.1 Construction and operation noise emission

4.1.1 Review of applicable construction and operational noise criteria

A review of noise emission criteria was undertaken as part of this assessment and the most appropriate criteria, as outlined below, was adopted. The criteria were sourced from:

- Queensland *Environmental Protection Act 1994* (EP Act)
- Queensland Environmental Protection Regulation 2019 (EP Regulation)
- Queensland Environmental Protection (Noise) Policy 2019 (EPP (Noise))
- DEHP (now DES) Guideline Model Mining Conditions dated 7 March 2017 (MMC17)
- The World Health Organization Guidelines for Community Noise dated April 1999 (WHO Guidelines)
- enHealth: The Health Effects of Environmental Noise – Other than Hearing Loss dated May 2004 (enHealth).

These documents are discussed in detail in Appendix C. A review of previous approvals for similar operations in Queensland has also been included in this appendix.

The ToR states the following as objectives and performance outcomes of the Project:

- *the environmental objective to be met under the EP Act is that the activity will be operated in a way that protects the environmental values of the acoustic environment*
- *the performance outcomes corresponding to these objectives are in Schedule 5, Table 1 of the EP Regulation* (now located in Schedule 8, Part 3, Division 1).

Schedule 8, Part 3, Division 1 of the EP Regulation lists the following performance outcomes:

1. sound from the activity is not audible at a sensitive receptor
2. the release of sound to the environment from the activity is managed so that adverse effects on environmental values including health and wellbeing and sensitive ecosystems are prevented or minimised.

As clarified in EP Regulation, either Item 1 or Item 2 of the performance outcomes is to be achieved. Due to the relative proximity of some Project-related activities to sensitive receptors, the Project is unlikely to achieve the first performance outcome during some activities and under some meteorological conditions. In this instance, the assessment has focused on the second performance outcome, as clarified in Part 3 of the EP Regulation (and discussed further in Appendix C).

The environmental values associated with this second performance outcome are detailed in the EPP (Noise). For dwellings (all nearby sensitive receptors), the environmental values are “health and wellbeing” during the day and evening periods, and “health and wellbeing, in relation to the ability to sleep” during the night. This document further provides Acoustic Quality Objectives for enhancing or protecting these environmental values, and provides a framework for making decisions in relation to the acoustic environment. Schedule 3, Part 3, Division 1 of the EP Regulation also refers to these Acoustic Quality Objectives. These Acoustic Quality Objectives are designed to be long-term noise limits and are not applied to any individual project or enterprise; however they can inform the decision-making process around the limits and can assist in identifying whether the environmental values are protected. A detailed discussion of the requirements of the EPP (Noise) is provided in Appendix C.

Noise criteria derived from the above documents are summarised in Table 7 and Table 8. These criteria have been separated into two groups; namely:

- criteria for quasi-steady (i.e. continuous) noise emissions in Table 7, which are generally assessed with the $L_{Aeq(T)}$ noise descriptor. This noise descriptor is generally used to assess against background creep criteria and acoustic quality objectives or similar amenity requirements.
- criteria for discrete (i.e. maximum or “one off”) noise emissions in Table 8, which are generally assessed with the $L_{Amax(T)}$ or $L_{A1(T)}$ noise descriptors. These noise descriptors are generally used to assess against acoustic quality objectives or similar amenity requirements, particularly in relation to sleep disturbance.

As discussed in Section 2.2, the proposed construction accommodation camp would be used solely by Project employees or contractors, and as such is not considered a sensitive receptor and is excluded from further assessment.

Table 7 Summary of external criteria for quasi-steady noise emissions

Receptor	EPP Noise Background Creep $L_{Aeq,adj,T}$ dB(A)			EPP Noise Acoustic Quality Objectives $L_{Aeq,\ adj,\ 1h}$ dB(A)*			WHO Guideline/enHealth $L_{Aeq,T}$ dB(A)			MMC17 $L_{Aeq,\ adj,\ T}$ dB(A)		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Kyewong Homestead	29	28	28	50	50	35-40	40-45	40-45	35-40	35	35	30
Lake Vermont Homestead	29	28	29	50	50	35-40	40-45	40-45	35-40	35	35	30
Saraji Homestead 1	35	39	39	50	50	35-40	40-45	40-45	35-40	37	41	36
Saraji Homestead 2	38	41	40	50	50	35-40	40-45	40-45	35-40	40	43	37
Saraji Homestead 3	38	41	40	50	50	35-40	40-45	40-45	35-40	40	43	37
Tay Glen Homestead	34	31	31	50	50	35-40	40-45	40-45	35-40	36	35	30
Meadowbrook Homestead	37	35	28	50	50	35-40	40-45	40-45	35-40	39	37	30

* Not intended as noise criteria for any individual project. However, they can inform the decision-making process around the limits, and can assist in identifying whether the environmental values are protected.

Table 8 Summary of external criteria for discrete noise emissions

Receptor	EPP Noise Acoustic Quality Objectives $L_{A1,adj,1h}$ dB(A)			WHO Guideline / enHealth $L_{Amax,T}$ dB(A)	MMC17 $L_{A1,adj,T}$ dB(A)		
	Day	Evening	Night	Night	Day	Evening	Night
Kyewong Homestead	65	65	45-50	50-55	40	40	35
Lake Vermont Homestead	65	65	45-50	50-55	40	40	35
Saraji Homestead 1	65	65	45-50	50-55	42	46	41
Saraji Homestead 2	65	65	45-50	50-55	45	48	42
Saraji Homestead 3	65	65	45-50	50-55	45	48	42
Tay Glen Homestead	65	65	45-50	50-55	41	40	35
Meadowbrook Homestead	65	65	45-50	50-55	44	42	35

4.1.2 Project specific noise criteria

The above legislation, guidelines, policies and standards have been reviewed for this report to determine values that preserve the amenity of the surrounding areas and protect the health and wellbeing of nearby residents. The enHealth Council document references the WHO document, which outlines guideline values for community noise intended to reduce the likelihood of adverse health effects. EPP(Noise) outlines acoustic quality objectives intended to enhance or preserve health, wellbeing and other environmental values over the long term, further noting that these acoustic quality objectives were informed by the WHO document.

On this basis, criteria have been proposed to protect the amenity of surrounding areas, as well as the health and wellbeing of nearby residents. Proposed Project specific criteria have been summarised in Table 9 and are consistent with the levels recommended in the EPP(Noise) acoustic quality objectives, WHO 1999 and previous approvals for similar developments in Queensland.

Table 9 Summary of Project specific free-field noise criteria

Period	Time	Quasi-Steady Noise $L_{Aeq(1h)}$ dB(A)	Discrete Noise $L_{A1(1h)}$ dB(A)
Day	7am – 6pm	45	55
Evening	6pm – 10pm	40	50
Night	10pm – 7am	**35**	**45**

As the proposed operation of the mine extension is likely to be operational 24 hours a day, the most stringent criteria at night (shown in bold in Table 9) have therefore been taken as the Project criterion for the assessment of operational noise and is used in the remainder of the operational noise assessment.

It should be noted that the mining activities associated with the Project may be audible at certain periods and still comply with the proposed criterion.

4.2 Low Frequency Noise

The assessment of low frequency noise is discussed in the EcoAccess "Guideline for the Assessment of Low Frequency Noise" dated 2004. The guideline separates low frequency noise into infrasound (1 – 20 Hz) and low frequency noise (20 – 200 Hz). The initial screening assessment detailed in this guideline has been adopted for the current assessment, further assuming a 5 dB reduction through open windows to obtain the equivalent external noise criterion. This is summarised in Table 10 below.

Table 10 Summary of low frequency noise screening assessment at sensitive receptors

Period	Ecoaccess Low Frequency L_{LINeq} dBL
All time periods	55*

* The dBL noise levels should be no more than 15 dB higher than the dB(A) noise level.

The guideline also clarifies the following concerning the initial assessment:

> *The initial assessment is intended for use in cases where an individual complains about low frequency noise and a decision needs to be made as to whether the particular noise is audible. This assessment does not verify whether the noise is annoying or not. A sound that is audible is not necessarily unacceptable.*

4.3 Cumulative noise impacts, including public road and rail network traffic noise

Cumulative noise impacts are assessed by considering the current or permissible noise levels from existing and future approved industry, and the predicted increase with the inclusion of the Project. In this instance, the subjective change in noise level associated with the cumulative increase in noise levels was used as the assessment metric.

It is generally accepted that a change in noise levels of up to 2 dB is not perceptible to most people. It follows then that an increase in noise levels of no more than 2 dB is not considered to perceptibly worsen the baseline noise environment with the inclusion of the Project.

Additionally, the *Noise Measurement Manual* (DEHP, 2013) provides the following subjective effects of changes in noise levels as shown in Table 11.

Table 11 Subjective effect of increases in noise levels

Change in level of dB	Subjective effect
3	Just perceptible
5	Clearly perceptible
10	Twice as loud

The above subjective effects, based on the magnitude of change in noise levels, were used to assess the cumulative impacts of noise associated with:

- an increase in road traffic noise on nearby public roads
- an increase in rail traffic noise on the local rail network
- an increase in noise impacts to nearby receptors with regard to existing and future approved noise from other mines.

These cumulative impacts are discussed in greater detail in Section 5.2.

5.0 Modelling methodology and assumptions

5.1 Construction and operation noise

5.1.1 Methodology

A computer noise model was developed in order to assess the free-field, external noise impacts from the Project. This model was developed using SoundPLAN v7.4, a modelling package used for predicting industrial noise emissions. The model is accepted by DES for this purpose.

The acoustic model takes into account the following site conditions:

- ground topography and the extent of ground absorption from different surfaces
- neutral and typical worst case meteorological conditions, the latter comprising the presence of temperature inversion
- the noise emission of each source, its location and elevation above local ground level
- the location and elevation above local ground level of all sensitive receptors
- screening from any barriers, earth berms, buildings or hills
- attenuation due to distance and atmospheric absorption
- the increase in noise level due to reflections from nearby surfaces and buildings.

5.1.2 Assessment scenarios

The following five assessment scenarios, spanning life of the mine from FY 2021 to 2042, have been adopted in this current assessment. These scenarios, alongside the anticipated activities, are summarised in Table 9. The proposed powerline and water pipeline (during the construction phase in FY 2022-2023) extends past Meadowbrook, Lake Vermont, Kyewong and Tay Glen homesteads. As such, separate scenarios (2.1, 2.2 and 2.3) have been considered for this construction phase for when powerline and water pipeline construction activities are located close to these receptors.

Initially, BMA had included an operational accommodation village within the scope of the Project at the commencement of the EIS. The operational accommodation village was proposed to be located south of the proposed construction accommodation village on the eastern boundary of MLA 0783.

Following consideration of feedback from the Office of the Coordinator-General (OCG) and IRC during the development of the Project and Social Impact Assessment (SIA), it became evident to BMA that the proposed operational village did not align with stakeholder expectations. As a result, BMA has investigated alternative off site accommodation options and opted to remove the operational accommodation village from the Project. Instead, workers will be accommodated at Coppabella, Dysart or Moranbah in existing BMA accommodation villages or other accommodation in town. However, to provide for a conservative assessment this noise and vibration assessment report retains construction of the operational accommodation village within the assessment scenarios presented in Table 12.

Table 12 Assessment scenarios

Scenario	Assessed Activities
Construction Phase 1 (FY 2021)	Construction of: • portal • construction accommodation camp • gas drainage infrastructure (three western-most gas wells and three western-most locations for the gas pipeline) • raw water dam and processed water dam.
Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023)	Construction of: • powerline (close to Meadowbrook homestead) • Mine Infrastructure Area (MIA) • rail loop and load out • operation accommodation camp • vent shafts (3 western-most locations) • water pipelines (one near the MIA, and one near Meadowbrook homestead). Operation of the Project (underground mining activities).
Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023)	Construction of: • powerline (close to Lake Vermont homestead) • MIA • rail loop and load out • operation accommodation camp • vent shafts (3 western-most locations) • water pipelines (one near the MIA, and one near Lake Vermont homestead). Operation of the Project (underground mining activities).
Construction Phase 2.3 (FY 2022-2023) and Operational Phase (FY 2023)	Construction of: • powerline (close to Kyewong and Tay Glen homesteads) • MIA • rail loop and load out • operation accommodation camp • vent shafts (western locations) • water pipelines (one near the MIA, and one near Kyewong and Tay Glen homesteads). Operation of the Project (underground mining activities).
Operational Phase (FY 2024-FY 2042)	Operation of the Project (underground and above ground mining activities); conservatively assuming all gas wells, vents and flares are operational. Construction of gas drainage infrastructure (3 eastern-most gas wells and 3 eastern-most locations for the gas pipeline), and vent shafts (3 eastern-most locations), conservatively assuming that these works are present whilst all gas wells, vents and flares are operational.

It is anticipated that decommissioning of the Project involves the use of similar heavy equipment used during construction. As such, the noise impacts from decommissioning of the Project can be taken to be no worse than the noise impacts predicted for the above five scenarios.

Indicative locations of these activities are depicted in the site plans in Appendix F.

5.1.3 Noise emission levels of plant and equipment

The construction and operation of the Project will make use of a variety of fixed and mobile equipment, all of which will generate noise. The sound power levels used in the modelling of this equipment are based on noise measurements captured during previous assessments of other similar coal mines in Queensland. The type of noisy plant and equipment used on the Project are dictated by mine activities; accordingly, alternative plant and equipment which may have lower power ratings (and consequently lower noise emissions levels) cannot practically be used to reduce noise impacts without compromising the Project's throughput.

It is often found that noise levels measured of stationary equipment differs from the noise levels actually produced by equipment being used in the field. The noise emission of machinery can vary with a number of factors including the age and condition of the equipment, the type of terrain the equipment is operating on, the type of operation the equipment is performing and the ability of the operator.

Whilst the actual sound power level can vary, the levels used in the environmental noise model are indicative of the predicted level when proper maintenance and operating procedures are followed. The $L_{Aeq(T)}$ octave band sound power level, noise source elevation and number of acoustically-significant equipment entered in the acoustic model are shown in Appendix E.

For consistency with the ToR requirements, the $L_{A1(1h)}$ noise levels for these equipment have also been assessed; the $L_{A1(1h)}$ noise values used for modelling were estimated by adjusting the corresponding $L_{Aeq(1h)}$ values by +10 dB.

During the course of the construction, various activities may occur simultaneously at varying levels of intensity in numerous locations as indicated in Appendix F. It is therefore difficult to accurately predict construction noise emission during the construction program. As a conservative approach, all activities and equipment associated with the construction scenarios have been assumed to be operating concurrently and have been positioned to be as close to nearby receptors as possible whilst remaining within their anticipated works boundary. As such, construction phase FY 2022-FY 2023 of the Project was assessed as three separate scenarios, each with activities associated with the construction of the powerline and water pipeline located close to the Meadowbrook, Lake Vermont, and Tay Glen and Kyewong homesteads, respectively.

It is anticipated that noise emissions generated by underground mining activities during the operational phase are insignificant at nearby sensitive receptors, when compared to above-ground noise sources. These above ground sources comprise the MIA, CHPP, train loadout, conveyors, gas drainage infrastructure and mine ventilation.

5.1.4 Equipment locations

Locations for the equipment in each modelled scenario were determined based on the expected typical fleet locations, as provided by BMA. These are depicted in Appendix F.

The locations of noisy plant and equipment are constrained by the mine plan, MIA layout, and operational requirements of the mine; accordingly, these noisy plant and equipment cannot practically be located farther away from sensitive receptors so as to reduce noise impacts.

5.1.5 Terrain data

The following terrain data was used to create a three-dimensional model of the site:

- within the MLA: one metre contour data for the 2031 Saraji Mine landform scenario (provided by BMA)
- areas surrounding the mine: 10 metre contour data (from AECOM's GIS database).

The majority of the noise sources are located at (or above) the natural surface level (outside of the existing and future mining pits of the Saraji Mine). This is not expected to change between the five modelled scenarios.

5.1.6 Ground absorption

Noise propagation is affected by the type of ground cover between the source and receptor. Most standards use a 'ground absorption factor' to evaluate the ground effect. The ground absorption factor ranges from zero (which is applied to hard surfaces such as asphalt and water) to one (which is applied to soft surfaces such as fields and grass). The value can be set to any value in between to represent an average of soft and hard ground in the assessment area.

The following ground absorption coefficients were used:

- area within the mining lease: 0
- vegetated and rural areas: 0.8.

5.1.7 Noise propagation standard and modelled meteorological conditions

The CONCAWE prediction method was used to model environmental noise emissions from the Project. CONCAWE is the generally accepted method used to predict noise from industrial sites in Queensland and Australia, including coal mines. A detailed discussion of this prediction method is provided in Appendix D.

Modelled parameters representing the weather conditions above are presented in Table 10.

Table 13 Meteorological noise modelling parameters

Meteorological Condition	Temperature	Relative Humidity	Wind Speed and direction	Pasquil Stability Class
Neutral	25 °C	70%	0 (calm)	D
Worst Case (1)	10 °C	60%	0 (calm)	F
Worst Case (2)	10 °C	60%	3 m/s, adverse (from source to receptor)	F

Class D is considered neutral to the propagation of sound and can occur under a range of conditions including little or no wind and no temperature inversion. Class F conditions are characterised by a temperature inversion during the night time period. It assists the propagation of noise and can increase the noise impact in areas surrounding a site. This meteorological condition is expected to occur during periods of cold weather (typically winter months) when temperature inversions are present.

The above modelled meteorological conditions are consistent with the requirements of the DEHP (now DES) document *EIS Information Guideline – Noise and Vibration* (referenced in the ToR), which require that "all calculations and the noise model must include both summer and winter conditions, including specifically with temperature inversion".

5.2 Cumulative noise impacts

5.2.1 Road traffic noise

Access to the Project Site will be via Dysart-Moranbah Road to the west of the Project, which is situated off the Peak Down Highway. The road provides access to the existing Saraji Mine and will continue to provide access during construction and operation of the Project.

The increase in road traffic noise levels with and without the Project, during construction and operational phases, were predicted based on the traffic projections with and without the Project. Traffic volumes and percentage of heavy vehicles along Dysart-Moranbah Road and Peak Downs Highway, with and without the Project, are shown in Table 14. This information is based on the AECOM report *Saraji East Mining Lease Project – Traffic and Transport Impact Assessment* (2019). Based on this report, the Project is predicted to generate:

- FY 2021-2022: 324 movements per day
- FY 2023: 534 movements per day
- FY 2024-2040: 150 movements per day
- FY 2041-2042: 90 movements per day.

It was assumed that other traffic characteristics (such as speed and road surfaces) remain unchanged.

Table 14 Summary of predicted future road traffic parameters, with and without the Project

Road	Scenario	Annual Average Daily Traffic (Percentage of Heavy Vehicle)			
		FY 2021-2022	FY 2023	FY 2024-2040	FY 2040
Dysart-Moranbah Road	Without Project	2005 (15%)	2045 (15%)	2045 (15%)	2420 (15%)
	With Project	2329 (27%)	2579 (33%)	2195 (21%)	2570 (20%)
Peak Downs Highway	Without Project	2960 (18%)	3020 (18%)	3020 (18%)	3575 (18%)
	With Project	3284 (26%)	3554 (30%)	3170 (22%)	3725 (21%)

Traffic generation from the Project between FY 2041-FY 2042 are less than in FY 2040. As such, the discussion concerning FY 2040 is also taken to conservatively apply to Years FY 2041-FY 2042.

Road traffic noise in Queensland is generally described by the $L_{A10\ (18h)}$ noise descriptor. As such, the change in $L_{A10(18h)}$ noise levels associated with the inclusion of the Project was calculated using the *Calculation of Road Traffic Noise 1998* prediction methodology; this is discussed further in Section 6.4.1. This change has been discussed in the context of its subjective perceptibility, as previously discussed in Section 4.1.2.

5.2.2 Rail traffic noise

Similar to the assessment of road traffic noise, the increase in rail traffic noise levels with and without the Project, during construction and operational phases, were predicted based on the traffic projects with and without the Project. Daily rail movements, with and without the Project, are shown in Table 15.

This information was based on the following inputs and assumptions:

- baseline daily rail movements (without the Project) is 12 movements (six trains) per day, as advised by BMA
- the average number of additional coal train movements per day associated with the Project comprises:
  - FY 2021-FY 2023: no additional movements
  - FY 2024-FY 2042: six additional movements (i.e. three trains per day, based on a peak coal production of 8 Mtpa).

It was further assumed that other traffic characteristics (such as the typical train speed, length, number of locomotives) remain unchanged.

Table 15 Summary of predicted future rail traffic volumes, with and without the Project

Rail Network Scenario	Daily Train Movements	
	FY 2021-2023	FY 2024-2042
Without Project	12	12
With Project	12 (no increase)	18

Rail noise in Queensland is generally described by the $L_{Aeq(24h)}$ noise level, and the Single Event Maximum (SEM) noise level (which is calculated as the arithmetic average of the 15 loudest train passbys). The change in $L_{Aeq(24h)}$ and SEM noise levels associated with the inclusion of the Project is then calculated using the Nordic Rail Prediction Method (Kilde Rep. 130) prediction methodology. This change has been discussed in the context of its subjective perceptibility, as previously discussed in Section 4.1.2.

5.2.3 Cumulative noise with existing and possible future development

Cumulative noise impacts were assessed by considering the current or permissible noise levels from existing and future approved industry and the predicted increase with the inclusion of the Project.

Sensitive receptors identified in Section 2.0 are located in the vicinity of the existing Saraji Mine, Peak Downs Mine and the Lake Vermont Mine. The existing Saraji Mine has been in operation since 1974 and was recently granted approval for an extension to the Grevillea Pit (Environmental Authority (EA) EPML00862313). It is envisaged that the lifetime of the existing Saraji Mine will extend until at least 2040.

As part of the amendment to the EA to accommodate the Grevillea Pit Extension, AECOM carried out a noise impact assessment. The results are contained in the technical report Saraji Open Cut Extension Project Noise and Vibration Assessment Report dated 30 November 2016. The predicted noise impact results from the Saraji Mine and the Grevillea Pit extension are summarised in Table 16.

Table 16 Predicted operational noise impacts from the Saraji Mine, including Grevillia Pit Extension

Receptor	Predicted Operational Noise Impact $L_{Aeq(T)}$ dB(A)	
	Neutral Metrological Conditions	Worst-Case Meteorological Conditions
Kyewong Homestead	26	33
Lake Vermont Homestead	42	49
Saraji Homestead 1	40	46
Saraji Homestead 2	40	46
Saraji Homestead 3	42	47
Tay Glen Homestead	31	38
Meadowbrook Homestead	43	49

The predicted Saraji Mine noise impact to nearby receptors, with and without the component noise from the Project, is discussed in Section 6.4.3. The difference in noise levels has been discussed in the context of its subjective perceptibility, as previously discussed in Section 4.1.2.

6.0 Impact assessment and discussion

6.1 $L_{Aeq(1h)}$ noise impact

6.1.1 Predicted noise impact

Noise impacts outlined in this section have been predicted based on the assumptions provided in Section 5.1 and for the meteorological conditions discussed in Section 5.1.2. The predicted $L_{Aeq(1h)}$ noise levels under the three meteorological conditions are presented in Table 17, alongside the Project specific night-time noise criterion discussed in Section 4.1.2 . For clarity, predicted exceedances of the Project specific night-time noise criterion have been shown in **bold** in Table 17, with the magnitude of exceedance provided in the row beneath.

Noise contour maps under neutral and worst-case (1) meteorological conditions have been provided in Appendix F. As noise contours have been provided in intervals of 5 dB(A), the noise contours maps for worst-case (1) meteorological conditions can be taken to also provide an indication of the noise contours under worst-case (2) meteorological conditions, as the difference in noise levels between these two meteorological conditions is less than 5 dB, and the predicted noise levels under worst-case (1) are generally higher than under worst-case (2).

Table 17 Predicted external $L_{Aeq(1h)}$ noise impact to nearby receptors

Receptor	Project Specific Night-time Criteria $L_{Aeq(1h)}$ dB(A)	Construction Phase 1 (FY 2021)			Construction Phase 2.1 (FY 2022-FY 2023) and Operational Phase (FY 2023)			Construction Phase 2.2 (FY 2022-FY 2023) and Operational Phase (FY 2023)			Construction Phase 2.3 (FY 2022-FY 2023) and Operational Phase (FY 2023)			Operational Phase (FY 2024-FY 2042)		
		Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)
Kyewong Homestead	35	12	23	19	13	23	19	16	26	22	28	**37**	**36**	14	25	20
		-	-	-	-	-	-	-	-	-	-	2	1	-	-	-
Lake Vermont Homestead	35	22	32	29	31	**39**	**38**	**51**	**55**	**56**	35	**42**	**42**	28	**38**	35
		-	-	-	-	4	3	16	20	21	-	7	7	-	3	-
Saraji Homestead 1	35	30	**40**	**37**	29	**38**	35	28	**37**	35	28	**37**	34	34	**44**	**41**
		-	5	2	-	3	-	-	2	-	-	2	-	-	9	6
Saraji Homestead 2	35	**44**	**52**	**51**	**49**	**56**	**56**	**49**	**56**	**56**	**49**	**56**	**56**	**49**	**57**	**56**
		9	17	16	14	21	21	14	21	21	14	21	21	14	22	21
Saraji Homestead 3	35	**42**	**51**	**50**	**42**	**50**	**49**	**42**	**50**	**49**	**42**	**50**	**49**	**45**	**54**	**52**
		7	16	15	7	15	14	7	15	14	7	15	14	10	19	17
Tay Glen Homestead	35	19	29	25	21	31	27	23	33	29	23	32	29	22	33	29
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meadowbrook Homestead	35	31	**40**	**38**	**60**	**63**	**63**	32	**41**	**40**	29	**38**	35	**41**	**48**	**47**
		-	5	3	25	28	28	-	6	5	-	3	-	6	13	12

6.1.2 Analysis of Results

6.1.2.1 Kyewong Homestead

Noise from the Project is predicted to be under the 35 dB(A) $L_{Aeq(1h)}$ Project specific criterion at this receptor for all modelled scenarios except during Construction Phase 2.3 (FY 2022-FY 2023), which is consistent with the construction of the powerline and water pipeline at positions along their respective proposed corridors closest to this receptor. The magnitude of exceedance during Construction Phase 2.3 is predicted to be 1-2 dB(A) above the Project specific noise criterion. As discussed in Section 4.3, a change in noise level of 2 dB is not perceptible to most people; as such the predicted noise levels are considered to effectively meet the nominated noise criterion.

Additionally, it is envisaged that exposure to this noise level is relatively short-lived, as the nature of construction works along the powerline and water pipeline have noise-generating activities which move closer to, and then subsequently away from, this receptor.

Mitigation measures discussed in Section 7 are recommended to minimise impacts at this location.

6.1.2.2 Lake Vermont Homestead

At the Lake Vermont Homestead, the highest noise level of 56 dB(A) $L_{Aeq(1h)}$ is predicted during Construction Phase 2.2 (FY 2022-FY 2023) and Operational Phase (FY 2023) when construction of the powerline and water pipeline are closest to this receptor. This predicted noise level exceeds the Project specific night-time criterion by 21 dB(A).

It is envisaged that exposure to this noise level is relatively short-lived, as the nature of construction works along the powerline and water pipeline have noise-generating activities which move closer to, and then subsequently away from, this receptor. When the construction of the powerline and water pipeline are located farther north (Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023)) and father south (Construction Phase 2.3 (FY 2022-2023) and Operational Phase (FY 2023)) of this receptor, the predicted noise levels are much lower at 39 and 42 dB(A) $L_{Aeq(1h)}$ respectively. Furthermore, the highest predicted noise level during the Operational Phase (FY 2024-FY 2042) is 38 dB(A) $L_{Aeq(1h)}$, which is 18 dB(A) quieter than the highest predicted noise level during Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023). Notwithstanding this, the predicted noise level during the Operational Phase (FY 2024-FY 2042) exceeds the Project specific night-time noise criterion by 3 dB(A).

The Lake Vermont Homestead is owned by BMA, and BMA currently has an existing compensation agreement with the tenant of this property. Notwithstanding this agreement, the following noise mitigation measures are recommended to control noise ingress into habitable spaces:

- provision of air-conditioning and mechanical ventilation – to allow windows and doors to remain closed
- upgrades to the building façade, including treatments to roof, walls, doors, windows and raised floors (if any), if the building is not of contemporary construction.

A combination of the above treatments is envisaged to allow a reduction in noise levels of approximately 25 dB(A) through the closed façade; giving rise to residual impacts of 31 dB(A) $L_{Aeq(1h)}$ internally during Construction Phase 2.2 (FY 2022-FY 2023) and Operational Phase (FY 2023). This residual impact effectively meets the Acoustic Quality Objective inside bedrooms of 30 dB(A) $L_{Aeq(1h)}$, noting that a difference in noise levels of up to 2 dB is not perceptible to most people, as discussed in Section 4.1.2. The residual impact during Operational Phase (FY 2024-2042) with the abovementioned treatments is 13 dB(A) $L_{Aeq(1h)}$, which is well under the Acoustic Quality Objective inside bedrooms.

As the dwelling is owned by BMA, the final treatments are dependent on further discussions between BMA and the occupant.

6.1.2.3 Saraji Homestead 1

At Saraji Homestead 1, the highest noise level of 44 dB(A) $L_{Aeq(1h)}$ is predicted during the Operational Phase (FY 2024-FY 2042) of the Project. This predicted noise level exceeds the Project specific night-time criterion by 9 dB(A). Analysis of the predicted noise levels indicates that nearby mine ventilation (vent shafts) comprise the highest contributors of noise to this receptor.

Negotiations have commenced between BMA and the landholder concerning a co-existence agreement between both parties. Notwithstanding these negotiations, the following noise mitigation measure is recommended to control noise ingress into habitable spaces:

- provision of air-conditioning and mechanical ventilation – to allow windows and doors to remain closed.

The above treatment is expected to allow a reduction in noise levels of approximately 15 dB(A) through the closed façade; giving rise to residual impacts of 29 dB(A) $L_{Aeq(1h)}$. This residual impact is predicted to meet the Acoustic Quality Objective inside bedrooms of 30 dB(A) $L_{Aeq(1h)}$.

The final treatments are dependent on further discussions between BMA and the landowner.

6.1.2.4 Saraji Homestead 2

Noise levels of up to 57 dB(A) $L_{Aeq(1h)}$ are predicted at Saraji Homestead 2 during the Operational Phase (FY 2024-FY 2042) of the Project. This predicted noise level exceeds the Project specific night-time criterion by 22 dB(A). Analysis of the predicted noise levels indicates that the conveyor, crusher, mobile plant and other sources of noise within the MIA are the highest contributors of noise to this receptor.

A co-existence agreement is currently in place between BMA and the landholder. Notwithstanding this agreement, the following noise mitigation measures are recommended to control noise ingress into habitable spaces.

- provision of air-conditioning and mechanical ventilation – to allow windows and doors to remain closed
- upgrades to the building façade, including treatments to roof, walls, doors, windows and raised floors (if any), if the building is not of contemporary construction.

A combination of the above treatments is envisaged to allow a reduction in noise levels of approximately 25 dB(A) through the closed façade; giving rise to residual impacts of 32 dB(A) $L_{Aeq(1h)}$ internally. This residual impact effectively meets the Acoustic Quality Objective inside bedrooms of 30 dB(A) $L_{Aeq(T)}$, noting that a difference in noise levels of up to 2 dB is not perceptible to most people, as discussed in Section 4.1.2.

As an existing agreement is currently in place between BMA and this landholder, the final treatments are dependent on further discussions between both parties.

6.1.2.5 Saraji Homestead 3

Noise levels of up to 54 dB(A) $L_{Aeq(1h)}$ are predicted at Saraji Homestead 3 during the Operational Phase (FY 2024-FY 2042) of the Project. This predicted noise level exceeds the Project specific night-time criterion by 19 dB(A). Analysis of the predicted noise levels indicates that the vent shafts, conveyor, crusher, mobile plant and other sources of noise within the MIA are the highest contributors of noise to this receptor.

A co-existence agreement is currently in place between BMA and the landholder. Notwithstanding this agreement, the following noise mitigation measures are recommended to control noise ingress into habitable spaces.

- provision of air-conditioning and mechanical ventilation – to allow windows and doors to remain closed
- upgrades to the building façade, including treatments to their roof, walls, doors, windows and raised floors (if any), if the building is not of contemporary construction.

A combination of the above treatments are envisaged to allow a reduction in noise levels of approximately 25 dB(A) through the closed façade; giving rise to residual impacts of 29 dB(A) $L_{Aeq(1h)}$ internally. This residual impact is predicted to meet the Acoustic Quality Objective inside bedrooms of 30 dB(A) $L_{Aeq(1h)}$.

As an agreement is currently in place between BMA and this landholder, the final treatments are dependent on further discussions between both parties.

6.1.2.6 Tay Glen Homestead

Noise from the Project is predicted to be below the 35 dB(A) $L_{Aeq(1h)}$ Project specific night-time criterion at the Tay Glen Homestead for the life of the mine. Higher noise levels predicted during Construction Phase 2.3 (FY 2022-FY 2023) and Operational Phase (FY 2023) are consistent with the construction of the powerline and water pipeline at positions along their respective proposed corridors closest to this receptor. Mitigation measures discussed in Section 7 are likely to sufficiently minimise impacts at this location.

6.1.2.7 Meadowbrook Homestead

At Meadowbrook Homestead, the highest noise level of 63 dB(A) $L_{Aeq(1h)}$ is predicted during Construction Phase 2.1 (FY 2022-FY 2023) and Operational Phase (FY 2023) when the construction of the powerline and water pipeline is closest to this receptor. This predicted noise level exceeds the Project specific night-time criterion by 28 dB(A). It is envisaged that exposure to this noise level is relatively short lived, as the nature of construction works along the powerline has noise generating activities which move closer to and then subsequently away from this receptor.

When the construction of the powerline and water pipeline is located farther south (Construction Phase 2.2 (FY 2022-FY 2023) and Operational Phase (FY 2023), and subsequently Construction Phase 2.3 (FY 2022-2023) and Operational Phase (FY 2023)), the noise levels are much lower at 41 dB(A) $L_{Aeq(1h)}$.

The highest predicted noise level during Operational Phase (FY 2024-FY 2042) is 48 dB(A) $L_{Aeq(1h)}$ which is 15 dB(A) quieter than the highest predicted noise level during Construction Phase 2.1 (FY 2022- FY 2023) and Operational Phase (FY 2023). Notwithstanding this, the predicted noise level during the Operational Phase (FY 2024-FY 2042) exceeds the Project specific night-time noise criterion by 13 dB(A).

The Meadowbrook Homestead is owned by BMA. Notwithstanding this, the following noise mitigation measures are recommended to control noise ingress into habitable spaces.

- provision of air-conditioning and mechanical ventilation – to allow windows and doors to remain closed
- upgrades to the building façade, including treatments to their roof, walls, doors, windows and raised floors (if any), if the building is not of contemporary construction.

A combination of the above treatments is envisaged to allow a reduction in noise levels of approximately 25 dB(A) through the closed façade; giving rise to residual impacts of 38 dB(A) $L_{Aeq(1h)}$ during Construction Phase 2.1 (FY 2022- FY 2023) and Operational Phase (FY 2023), and 23 dB(A) $L_{Aeq(1h)}$ during Operational Phase (FY 2024-FY 2042). As this residual impact continues to exceed the Acoustic Quality Objective inside bedrooms of 30 dB(A) $L_{Aeq(1h)}$ during Construction Phase 2.1 (FY 2022-FY 2023) and Operational Phase (FY 2023), further noise treatments may be required during these periods. These further treatments may include:

- limiting construction activities to the day-time period as works approach this receptor
- relocation of sleeping/living spaces to the western side of the building (facing away from the construction works)
- relocation of the building/occupants to a location less impacted by mine noise.

It is anticipated that the Meadowbrook Homestead will not be inhabited during construction and operation of the Project. If this homestead is occupied during this period, the above recommendations will be taken into consideration. Furthermore, as the dwelling is owned by BMA, the final treatments are dependent on further discussions between BMA and the occupant.

6.2 $L_{A1(1h)}$ noise impact

6.2.1 Predicted noise impact

Noise impacts outlined in this section have been predicted based on the assumptions provided in Section 5.1, and for the meteorological conditions discussed in Section 5.1.2. The predicted $L_{Amax(1h)}$ noise levels under the three meteorological conditions are presented in Table 18, alongside the Project specific night-time noise criterion discussed in Section 4.1.2 . For clarity, predicted exceedances of the Project specific night-time noise criterion have been shown in **bold** in Table 18, with the magnitude of exceedance provided in the row beneath.

Noise contour maps under neutral and worst-case (1) meteorological conditions have been provided in Appendix F. As noise contours have been provided in intervals of 5 dB(A), the noise contours maps for worst-case (1) meteorological conditions can be taken to also provide an indication of the noise contours under worst-case (2) meteorological conditions as the difference in noise levels between these two meteorological conditions is less than 5 dB, and the predicted noise levels under worst-case (1) are generally higher than under worst-case (2).

Table 18 Predicted external $L_{A1(1h)}$ noise impact to nearby receptors

Receptor	Project Specific Night-time Criteria $L_{A1(1h)}$ dB(A)	Construction Phase 1 (FY 2021)			Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023)			Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023)			Construction Phase 2.3 (FY 2022-2023) and Operational Phase (FY 2023)			Operational Phase (FY 2024-2042)		
		Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)
Kyewong Homestead	45	8	18	14	12	21	18	16	24	21	32	41	40	13	23	19
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Vermont Homestead	45	18	27	24	31	40	40	**55**	**59**	**60**	39	**46**	**46**	28	39	36
		-	-	-	-	-	-	10	14	15	-	1	1	-	-	-
Saraji Homestead 1	45	26	36	33	27	35	33	27	35	33	27	35	33	36	**46**	43
		-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Saraji Homestead 2	45	44	**52**	**52**	**50**	**56**	**57**	**50**	**56**	**57**	**50**	**56**	**57**	**51**	**58**	**58**
		-	7	7	5	11	12	5	11	12	5	11	12	6	13	13
Saraji Homestead 3	45	42	**51**	**51**	43	**50**	**50**	43	**50**	**50**	43	**50**	**50**	45	**53**	**52**
		-	6	6	-	5	5	-	5	5	-	5	5	-	8	7
Tay Glen Homestead	45	15	25	21	20	29	26	24	33	30	22	31	28	22	34	30
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Receptor	Project Specific Night-time Criteria $L_{A1(1h)}$ dB(A)	Construction Phase 1 (FY 2021)			Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023)			Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023)			Construction Phase 2.3 (FY 2022-2023) and Operational Phase (FY 2023)			Operational Phase (FY 2024-2042)		
		Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)
Meadowbrook Homestead	45	29	39	38	**64**	**67**	**68**	32	41	40	25	33	32	43	49	**49**
		-	-	-	19	22	23	-	-	-	-	-	-	-	-	4

6.2.2 Analysis of results

6.2.2.1 Kyewong Homestead and Tay Glen Homestead

Noise from the Project is predicted to be under the 45 dB(A) $L_{A1(1h)}$ noise level at Kyewong Homestead and Tay Glen Homestead for the life of the mine.

Nevertheless, the noise mitigation measures discussed in Section 7.0 continue to be recommended.

6.2.2.2 Lake Vermont Homestead

At the Lake Vermont Homestead, the highest noise level of 60 dB(A) $L_{A1(1h)}$ is predicted during Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023) when the construction of the powerline and water pipeline are closest to this receptor. This predicted noise level exceeds the Project specific night-time criterion by 15 dB(A) It is envisaged that exposure to this noise level is relatively short-lived, as the nature of construction works along the powerline and water pipeline has noise-generating activities which move closer to, and then subsequently away from, this receptor. The highest predicted noise level during the operational phase is 39 dB(A) $L_{A1(1h)}$ which is 21 dB(A) quieter than during Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023), and under the Project specific night-time criterion.

The Lake Vermont Homestead is owned by BMA, and BMA currently has a compensation agreement with the tenant of this property. However, the noise mitigation measures discussed in Section 6.1.2.2 are recommended to control noise ingress into habitable spaces.

As the dwelling is owned by BMA, the final treatments are dependent on further discussions between BMA and the tenant.

6.2.2.3 Saraji Homestead 1

Noise from the Project is predicted to be under the 45 dB(A) $L_{A1(1h)}$ Project specific criterion at this receptor for all modelled scenarios except during Operational Phase (FY 2024-FY 2042). The magnitude of exceedance is predicted to be 1 dB(A) above the Project specific noise criterion. As discussed in Section 4.3, a change in noise level of 2 dB is not perceptible to most people, as such this magnitude of exceedance is considered to be small, and the predicted noise levels are considered to effectively meet the nominated noise criterion.

Nevertheless, the noise mitigation measures discussed in Section 7.0 continue to be recommended for Saraji Homestead 1.

6.2.2.4 Saraji Homestead 2

Noise levels of up to 58 dB(A) $L_{A1(1h)}$ were predicted at Saraji Homestead 2. This predicted noise level exceeds the Project specific night-time criterion by 13 dB(A). Analysis of the predicted noise levels indicates that noise from the primary crusher within the MIA comprised the highest contributor of noise to this receptor, followed by noise from mobile plant operating within the MIA.

A co-existence agreement is currently in place between BMA and this landholder. However, the noise mitigation measures discussed in 6.1.2.4 are recommended to control noise ingress into habitable spaces. As an agreement is currently in place between BMA and this landholder, the final treatments are dependent on further discussions between both parties.

6.2.2.5 Saraji Homestead 3

Noise levels of up to 53 dB(A) $L_{A1(1h)}$ were predicted at Saraji Homestead 3. This predicted noise level exceeds the Project specific night-time criterion by 8 dB(A). A co-existence agreement is currently in place between BMA and this landholder. However, the noise mitigation measures discussed in Section 6.1.2.5 are recommended to control noise ingress into habitable spaces. As an agreement is currently in place between BMA and this landholder, the final treatments are dependent on further discussions between both parties.

6.2.2.6 Meadowbrook Homestead

At the Meadowbrook Homestead, the highest noise level of 68 dB(A) $L_{A1(1h)}$ is predicted during Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023) when the construction of the powerline and water pipeline are closest to this receptor. This predicted noise level exceeds the Project specific night-time criterion by 23 dB(A). It is expected that exposure to this noise level is relatively short-lived, as the nature of construction works along the powerline has noise-generating activities which move closer to, and then subsequently away from, this receptor. The highest predicted noise level during the operational phase is 49 dB(A) $L_{A1(1h)}$, which is 19 dB(A) quieter than during Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023). Notwithstanding this, the predicted noise level during the Operational Phase (FY 2024-FY 2042) exceeds the Project specific night-time noise criterion by 4 dB(A).

It is anticipated that Meadowbrook Homestead will not be inhabited during construction and operation of the Project. If this homestead is occupied during this period, the recommendations provided in Section 6.1.2.7 will be taken into consideration. Furthermore, as the dwelling is owned by BMA, the final treatments are dependent on further discussions between BMA and the occupant.

6.3 Low frequency noise impact

6.3.1 Predicted noise impacts

Noise impacts outlined in this section have been predicted based on the assumptions provided in Section 5.1, and for the meteorological conditions discussed in Section 5.1.2. The predicted $L_{LINeq(T)}$ noise levels under the three meteorological conditions are presented in Table 19 and have been compared against the screening assessment discussed in the Ecoaccess guideline *Assessment of Low Frequency Noise* criteria. The screening assessment requires both the $L_{LINeq(T)}$ noise level to be above 55 dBL, and the difference between the A-weighted $L_{Aeq(T)}$ and unweighted $L_{LINeq(T)}$ to be greater than 15 dB, for there to be an increased likelihood of low frequency noise annoyance. The $L_{Aeq(T)}$ predicted noise levels are presented in Table 17 for reference.

For convenience, only $L_{LINeq(T)}$ values which exceed both trigger requirements i.e. greater than 55 dB(L) and 15 dB greater than their corresponding A-weighted values in Table 19 have been shaded in grey.

The guideline also clarifies the following concerning the initial assessment:

The initial assessment is intended for use in cases where an individual complains about low frequency noise and a decision needs to be made as to whether the particular noise is audible. This assessment does not verify whether the noise is annoying or not. A sound that is audible is not necessarily unacceptable.

Table 19 Predicted External $L_{LINeq(T)}$ noise impact to nearby receptors

Receptor	Ecoaccess Low Frequency Criterion L_{LINeq} dBL	Construction Phase 1 (FY 2021)			Construction Phase 2.1 (FY 2022-2023) and Operational Phase (FY 2023)			Construction Phase 2.2 (FY 2022-2023) and Operational Phase (FY 2023)			Construction Phase 2.3 (FY 2022-2023) and Operational Phase (FY 2023)			Operational Phase (FY 2024-2042)		
		Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)	Neutral	Worst Case (1)	Worst Case (2)
Kyewong Homestead	55*	29	39	36	31	39	37	34	41	39	45	49	49	31	40	38
Lake Vermont Homestead	55*	40	47	45	48	52	52	64	66	67	51	54	54	46	51	51
Saraji Homestead 1	55*	49	54	53	47	53	52	47	52	51	46	52	51	51	57	56
Saraji Homestead 2	55*	60	65	64	64	68	68	64	68	68	64	68	68	65	68	68
Saraji Homestead 3	55*	58	63	62	59	63	63	59	63	63	59	63	63	61	65	65
Tay Glen Homestead	55*	38	45	44	40	47	46	42	48	47	41	48	47	43	49	50
Meadowbrook Homestead	55*	49	53	53	72	73	74	50	54	54	47	52	51	57	60	60

* additionally, the dBL noise levels should be no more than 15 dB higher than the dB(A) noise level.

6.3.2 Analysis of results

6.3.2.1 Kyewong Homestead, Lake Vermont Homestead and Tay Glen Homestead

The predicted noise levels at Kyewong Homestead, Lake Vermont Homestead, and Tay Glen Homestead are predicted to comply with the conditions of the initial assessment.

Nevertheless the treatments recommended in Section 6.1.2.2 continue to be recommended for the Lake Vermont Homestead

In addition, AECOM recommends the noise mitigation strategies as discussed in Section 7.0 to be implemented.

6.3.2.2 Saraji Homestead 1

At Saraji Homestead 1, the likelihood of increased low frequency noise annoyance is predicted during Operational Phase FY 2024-FY 2042 during worst-case meteorological conditions with adverse winds, although this comprises a marginal (1 dB) exceedance of the first step in the screening assessment. BMA has commenced discussions with the landholder concerning a co-existence agreement; in addition, noise mitigation measures discussed in Section 7.0 continue to be recommended.

6.3.2.3 Saraji Homestead 2

At Saraji Homestead 2, the likelihood of increased low frequency noise annoyance is predicted during Construction Phase 1 (FY 2021), and Operational Phase (FY 2024-2042). A co-existence agreement is currently in place between BMA and this landholder. However, the noise treatments discussed in Section 6.1.2.4 continue to be recommended.

6.3.2.4 Saraji Homestead 3

At Saraji Homestead 3, the likelihood of increased low frequency noise annoyance is predicted during neutral meteorological conditions, across all modelled scenarios. A co-existence agreement is currently in place between BMA and this landholder. However, the noise treatments discussed in Section 6.1.2.5 continue to be recommended.

6.3.2.5 Meadowbrook Homestead

At Meadowbrook Homestead, the likelihood of increased low frequency noise annoyance is predicted during neutral meteorological conditions in the Operational Phase (FY 2024-2042).

It is anticipated that the Meadowbrook Homestead will not be inhabited during construction and operation of the Project. If this homestead is occupied during this period, the recommendations given in Section 6.1.2.7 will be taken into consideration. Furthermore, as the dwelling is owned by BMA, the final treatments are dependent on further discussions between BMA and the occupant.

6.4 Cumulative noise impacts

6.4.1 Road traffic noise

Noise impacts outlined in this section have been predicted based on the assumptions and methodology discussed in Section 5.2.1. The predicted increase in traffic noise levels as a result of the Project are summarised in Table 20.

Table 20 Predicted increase in road traffic noise levels due to the Project

Road	Scenario	Annual Average Daily Traffic (Percentage of Heavy Vehicle)			
		FY 2021-2022	FY 2023	FY 2024	FY 2040
Dysart Moranbah Road	Without Project	2005 (15%)	2045 (15%)	2045 (15%)	2420 (15%)
	With Project	2329 (27%)	2579 (33%)	2195 (21%)	2570 (20%)
Predicted Increase in $L_{A10\ (18h)}$ Noise Level dB		**+1.9**	**+2.8**	**+1.0**	**+0.8**
Peak Downs Highway	Without Project	2960 (18%)	3020 (18%)	3020 (18%)	3575 (18%)
	With Project	3284 (26%)	3554 (30%)	3170 (22%)	3725 (21%)
Predicted Increase in $L_{A10\ (18h)}$ Noise Level dB		**+1.3**	**+1.9**	**+0.6**	**+0.5**

For all scenarios except for Dysart-Moranbah Road in FY 2023, the predicted increase in road traffic noise levels are no more than 2 dB (0.4 is rounded down, while 0.5 is rounded up). As discussed in Section 4.1.2, changes in noise levels of up to 2 dB are not perceptible to most people. Therefore, no adverse noise impacts are expected due to increased road traffic noise on public roads.

For Dysart-Moranbah Road in FY 2023, the increase in road traffic noise is predicted to be 2.8 dB (rounded up to 3 dB). As discussed in Section 4.1.2, a 3 dB change in noise levels is just perceptible to most people. In addition, this change in noise level is only predicted for FY 2023; the change in noise level reduces to +1 dB the following year when traffic generation from the mine falls with the completion of the construction phase of the mine. As such, given the "just perceptible" increase in noise levels for only one year, the predicted impacts are considered to be negligible.

6.4.2 Rail traffic noise

Noise impacts outlined in this section have been predicted based on the assumptions and methodology discussed in Section 5.2.2. The predicted increase in rail noise levels as a result of this Project are summarised in Table 21.

Table 21 Predicted increase in rail traffic noise levels due to the Project

Rail	Daily Train Movements	
	FY 2021- FY 2023	FY 2024-FY 2042
Rail Network, without Project	12	12
Rail Network, with Project	12	18
Predicted Increase in $L_{Aeq(24h)}$ noise level dB	**No change**	**+1.8**
Predicted Increase in SEM noise level dB	**No change**	**No Change**

The above increase in noise levels is predicted to be less than 2 dB. As discussed in Section 4.1.2, changes in noise levels of up to 2 dB are not perceptible to most people. Therefore, no adverse noise impacts are expected due to increased rail movement noise on the rail network.

6.4.3 Cumulative noise with existing and future development

The noise impacts in this section are based on the following:

- The predicted operational $L_{Aeq(1h)}$ mine noise impacts from the existing Saraji Mine (including Grevillea Pit Extension) to nearby receptors, which are considered to be the baseline noise impact to these receptors. These are shown under the 'Saraji Mine Component' columns in Table 22.
- The predicted operational $L_{Aeq(T)}$ mine impact from the Project to nearby receptors, as discussed in Section 5.2.3. These are shown under the 'Project Component' columns in Table 22 below.
- The cumulative noise impacts are based on the energy-addition of the above component noise impacts, shown in orange shading in Table 22.

Table 22 Predicted increase in industrial noise impact to nearby receptors due to the Project

Receptor	Predicted Operational Noise Impact $L_{Aeq(1h)}$ dB(A) – Neutral Conditions				Predicted Operational Noise Impact $L_{Aeq(1h)}$ dB(A) – Worst-Case Conditions			
	Saraji Mine Component	Project component	Cumulative Noise Levels	Predicted Increase in noise level*	Wider Saraji Mine	Project component	Cumulative Noise Levels	Predicted Increase in noise level*
Kyewong Homestead	26	14	26	0	33	25	34	1
Lake Vermont Homestead	42	28	42	0	49	38	49	0
Saraji Homestead 1	40	34	41	1	46	44	48	2
Saraji Homestead 2	40	49	50	10	46	57	57	11
Saraji Homestead 3	42	45	47	5	47	54	55	8
Tay Glen Homestead	31	22	31	0	38	33	39	1
Meadowbrook Homestead	43	41	45	2	49	48	52	3

* "Cumulative Noise Levels" minus "Saraji Mine Component".

As discussed in Section 4.1.2, changes in noise levels of up to 2 dB are not perceptible to most people. As such, no adverse noise impacts are expected due to increased industrial noise at the Kyewong Homestead, Lake Vermont Homestead, Saraji Homestead 1 and Tay Glen Homestead.

In addition, a 3 dB change in noise levels is just perceptible to most people, as discussed in Section 4.1.2. As such, the increase in industrial noise is considered to be "just perceptible" at the Meadowbrook Homestead. This dwelling is owned by BMA; as such, the final treatments are dependent on further discussions between BMA and the occupant.

The industrial noise levels at Saraji Homestead 2 and Saraji Homestead 3 are predicted to be 5 to 11 dB higher with the inclusion of the Project. Subjectively, this increase in industrial noise ranges from "clearly perceptible" to "twice as loud", as discussed in Section 4.1.2. A co-existence agreement is currently in place between BMA and these landholders. The noise treatments discussed in Sections 6.1.2.4 and 6.1.2.5 continue to be recommended.

It is further noted that blasting is not proposed as part of the Project, and construction and operation of the Project are not envisaged to give rise to perceptible levels of vibration at nearby sensitive receptors. As such, there are no predicted increases in vibration impacts to nearby receptors associated with the Project.

7.0 Noise management strategies

Noise control measures for the Project will include the following, where practicable:

- maintaining machinery to minimise noise
- working with equipment suppliers to provide machinery that is designed to be quieter
- stopping and starting up equipment as far away as possible from receptors
- maintaining internal roads in good working order
- use of broadband reverse alarms on all machinery that regularly reverse (e.g. bulldozers and front-end loaders)
- noise control to the ventilation shafts. These comprise:
  - orientate discharge outlets away from nearby sensitive receptors
  - variable speed devices fitted to fan motors.
- treatments to conveyors, such as the use of low noise idlers, and partial enclosures.

BMA will provide awareness and understanding of noise issues through site inductions for all staff and contractors.

Community and complaints management techniques will be undertaken in accordance with the community complaints and grievances procedure that is current at the time of Project commencement. Such techniques include:

- taking steps to inform the community of how complaints can be made
- investigating the complaints and, where required, the use of appropriate dispute resolution activities
- maintaining a complaints register to record all relevant information associated with the complaint, including the personnel responsible for handling the complaint and the corrective actions taken
- ensuring that a complainant is advised of the outcomes in relation to their complaint.

Co-existence agreements are currently in place, or being actively sought, at the following receptors:

- Lake Vermont Homestead – BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.
- Saraji Homestead 1 – discussions between BMA and the landholder concerning a co-existence agreement have commenced.
- Saraji Homestead 2 – Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
- Saraji Homestead 3 – Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
- Meadowbrook Homestead – BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.

BMA will consider the above current or pending agreements with potentially affected landowners when finalising mitigation measures. Specific noise treatments to each receptor are discussed in Section 6.1.2, 6.2.2 and 6.3.2, and may include the provision of air-conditioning and mechanical ventilation (to allow windows and doors to remain closed), or upgrades to the building façade. BMA will finalise the noise mitigation program prior to the construction phase.

When requested by the administering authority or as a result of a noise or vibration complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer), noise or vibration monitoring will be undertaken at the nearest privately-owned dwelling or affected receiver and the results notified to the administering authority. A complaints-based system for monitoring noise and vibration is considered appropriate for the Project given that:

- co-existence agreements are currently in place, or actively being sought, at receptors which are predicted to receive noise exceeding the Project specific noise criterion,
- the predicted increase in industrial noise at privately owned receptors during operational phase of the project is predicted to be imperceptible.

8.0 Conclusion

An assessment of noise emissions was undertaken for the Project. Noise emissions during neutral and worst-case meteorological conditions were predicted for a range of construction and operational scenarios. A three-dimensional computer model of the site was created for this purpose. Based on the results of the noise assessment, noise emissions from the Project during construction and operation phases are forecast to exceed the nominated noise criteria at five receptors. These receptors comprise Lake Vermont Homestead, Saraji Homestead 1, Saraji Homestead 2, Saraji Homestead 3 and Meadowbrook Homestead.

The overall increase in mine noise levels as a result of the Project (when considering noise from the existing Saraji Mine) is predicted to be “clearly perceptible “ to “twice as loud” at Saraji Homesteads 2 and 3, “just perceptible” at the Meadowbrook Homestead, and not perceptible to most people at the other receptors.

The increase in noise levels associated with increased road traffic on public roads and rail movement on the local rail network is not predicted to be perceptible to most people, with the exception of Dysart-Moranbah Road during FY 2023 when the increase is “just perceptible”.

It is further noted that blasting is not proposed as part of the Project, and therefore construction and operation of the Project is not envisaged to give rise to perceptible levels of vibration at nearby sensitive receptors. As such, there are no predicted increases in vibration impacts to nearby receptors associated with the Project.

It is also noted that co-existence agreements are currently in place, or being actively sought, at the following receptors:

- Lake Vermont Homestead – BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.
- Saraji Homestead 1 – discussions between BMA and the landholder concerning a co-existence agreement have commenced.
- Saraji Homestead 2 – Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
- Saraji Homestead 3 – Co-existence agreement currently in place between BMA and the landholder. When required for mining or subject to mining impacts the homestead will be vacated.
- Meadowbrook Homestead – BMA owned. When required for mining or subject to mining impacts the homestead will be vacated.

Notwithstanding the above current or pending agreements with potentially affected landowners, noise management strategies and treatments discussed in Section 7.0 are recommended for this Project.

Appendix A

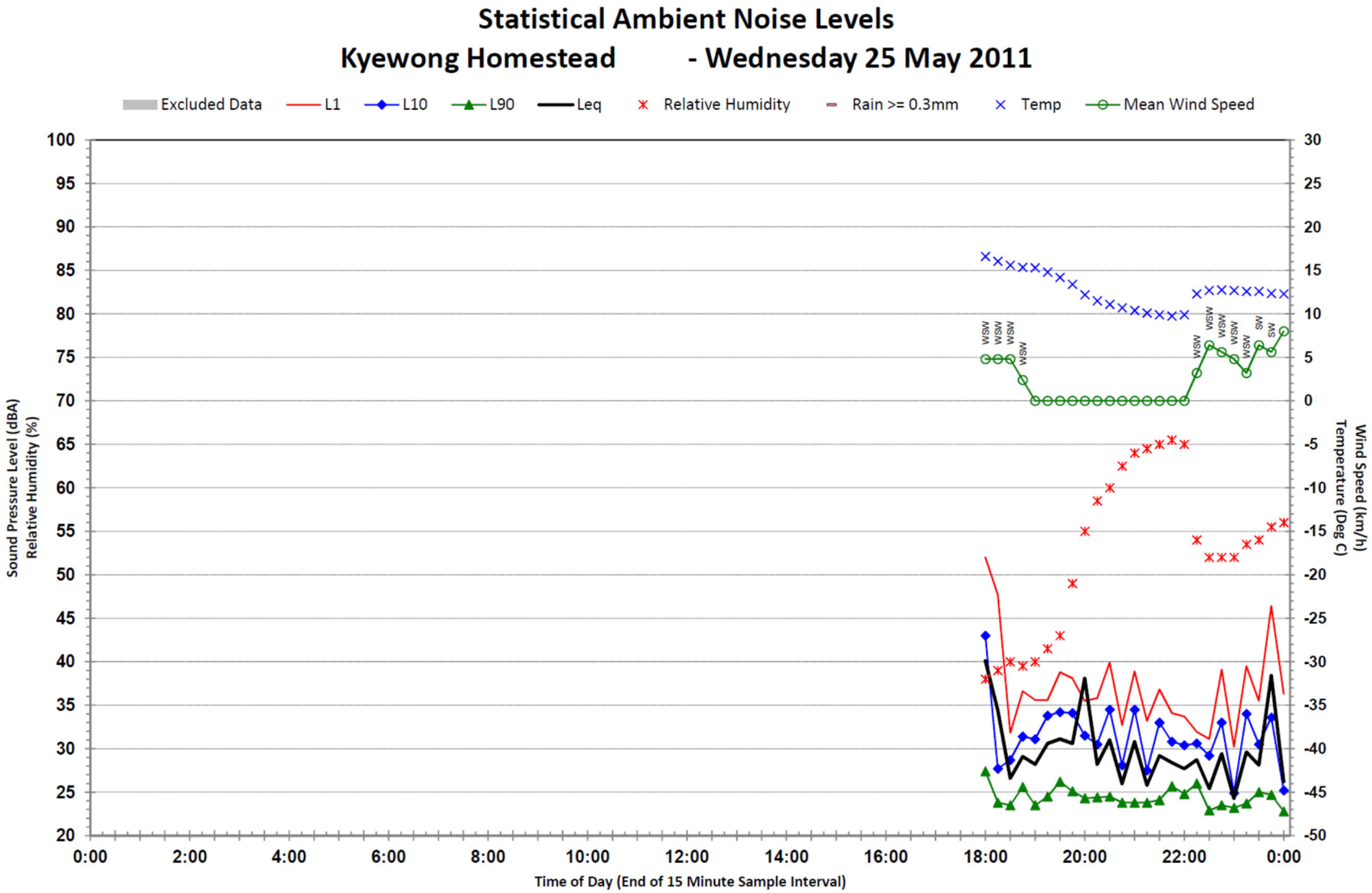
Glossary

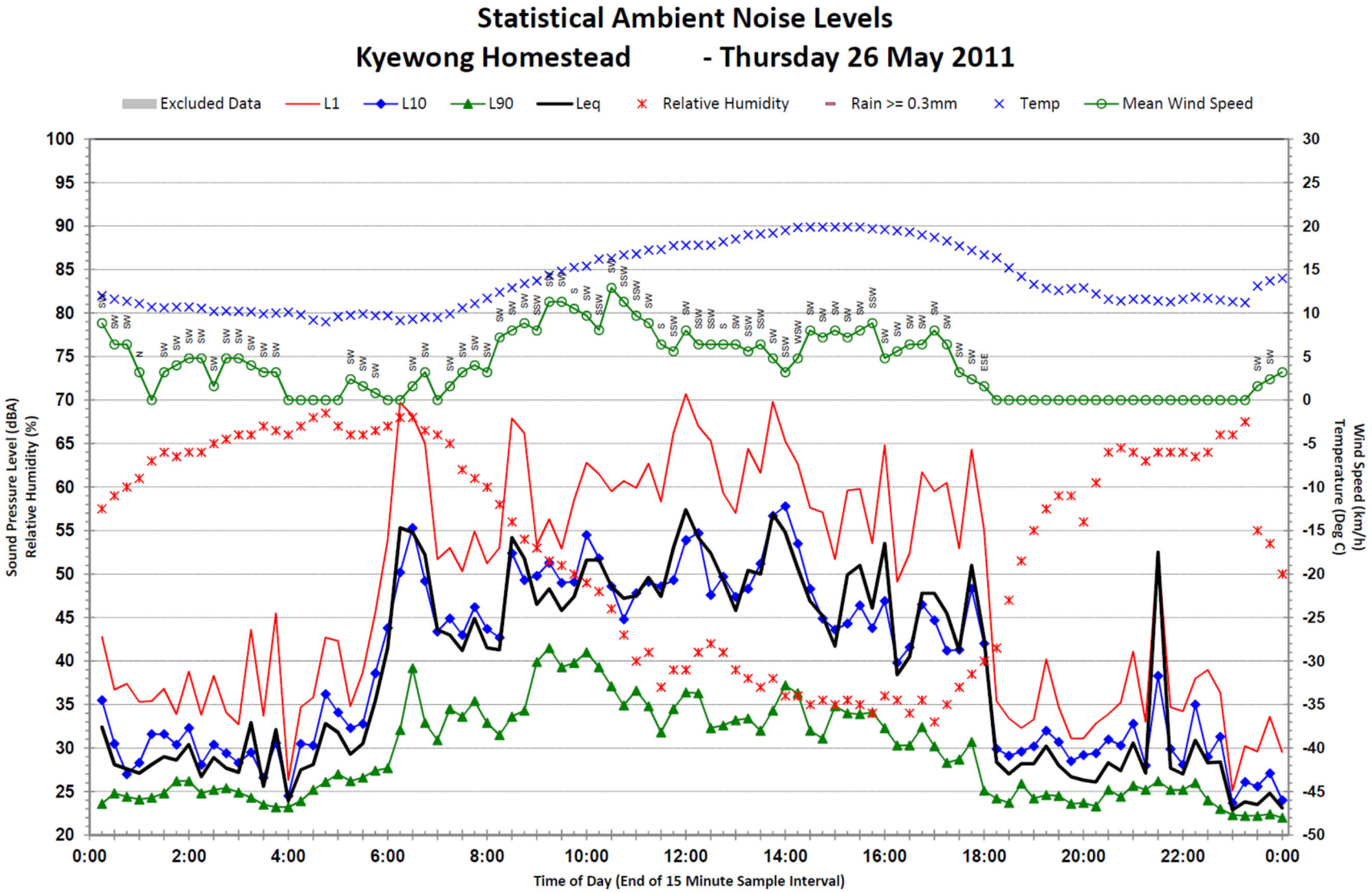
Appendix A Glossary

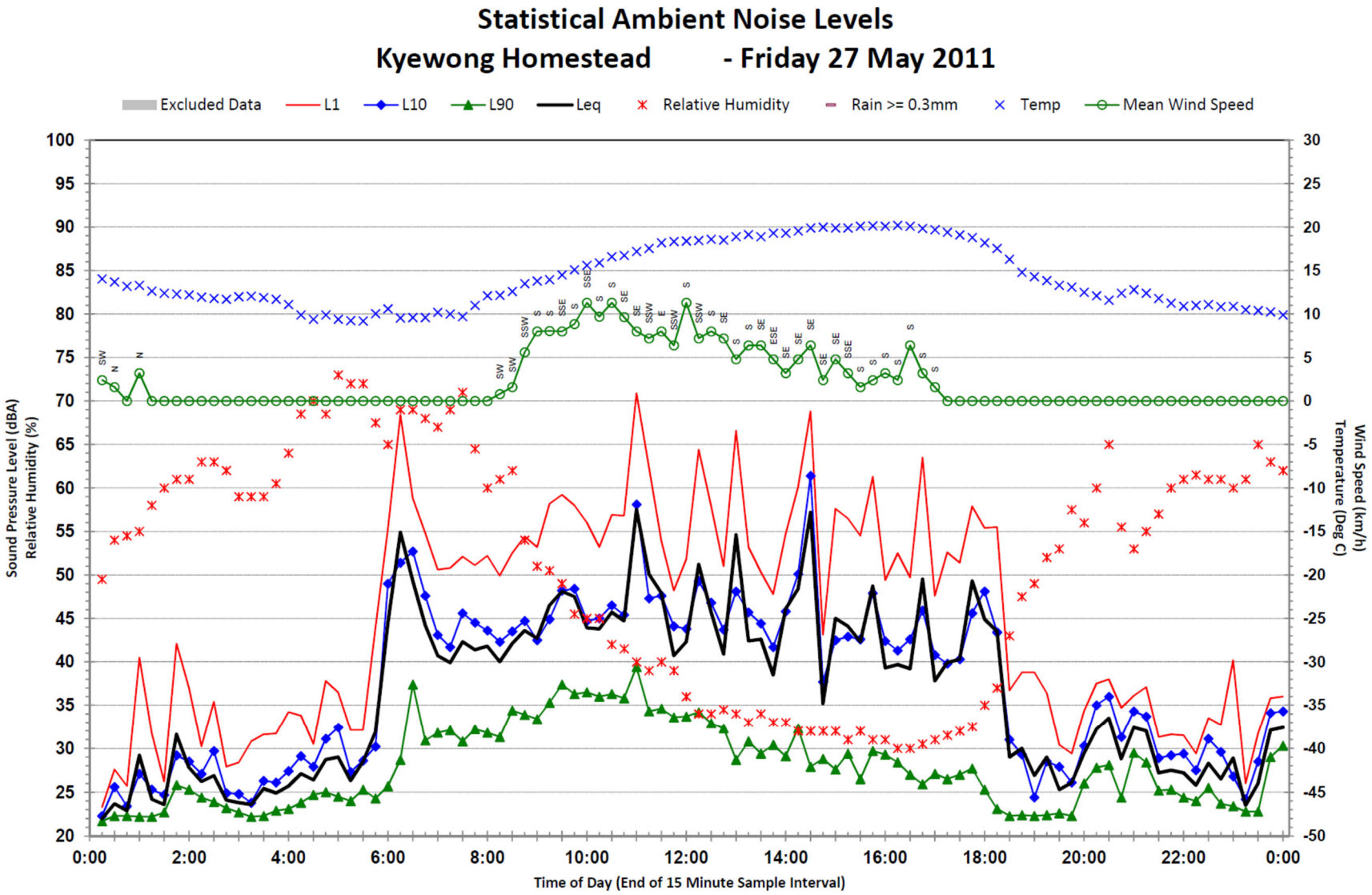
'A' Weighted	Frequency filter applied to measured noise levels to represent how humans hear sounds.
dB(A)	'A' Weighted overall sound pressure level.
Frequency (Hz)	The human ear responds to sound in the frequency range of 20 Hertz (Hz) to 20,000 Hz. A combination of sound pressure and frequency determine perceived loudness. The centre frequency of an octave is double the frequency of the lower octave. Sound measurements are usually taken at 16 one-third octave bands between 50 Hz and 5000 Hz.
L_1	Noise level exceeded for 1% of the measurement period. The L_1 represents a 'typical maximum' noise level and is often used to represent intermittent noises.
L_{10}	Noise level exceeded for 10% of the measurement period. The L_{10} represents the intrusive noise level and is often used to represent traffic/ music noise.
L_{90}	Noise level exceeded for 90% of the measurement period. This represents the background noise level excluding nearby sources.
$L_{Aeq(T)}$	A-weighted energy-averaged noise level over the measurement period (T).
$L_{LINeq(T)}$	Linear weighted energy-averaged noise level over the measurement period (T).
$L_{Amax(T)}$	The maximum A-weighted noise level over the measurement period (T).
Pasquil Stability Classes	There are six distinct atmospheric classes typically used to represent atmospheric stability. These range from Class A to Class F. Each of these classes represents a differing ability of sound to propagate across terrain.
Sound Power Level	The total sound energy radiated from a source per unit of time. The sound power is a property of the source and not affected by the surrounding environment.
Sound Pressure Level	The sound pressure level is a property of the surrounding environment and is dependent on the distance to the source and surrounding surfaces.
Temperature inversion	A meteorological phenomenon which typically occurs on cloudless nights in winter when the ground becomes cooler than the surrounding air.

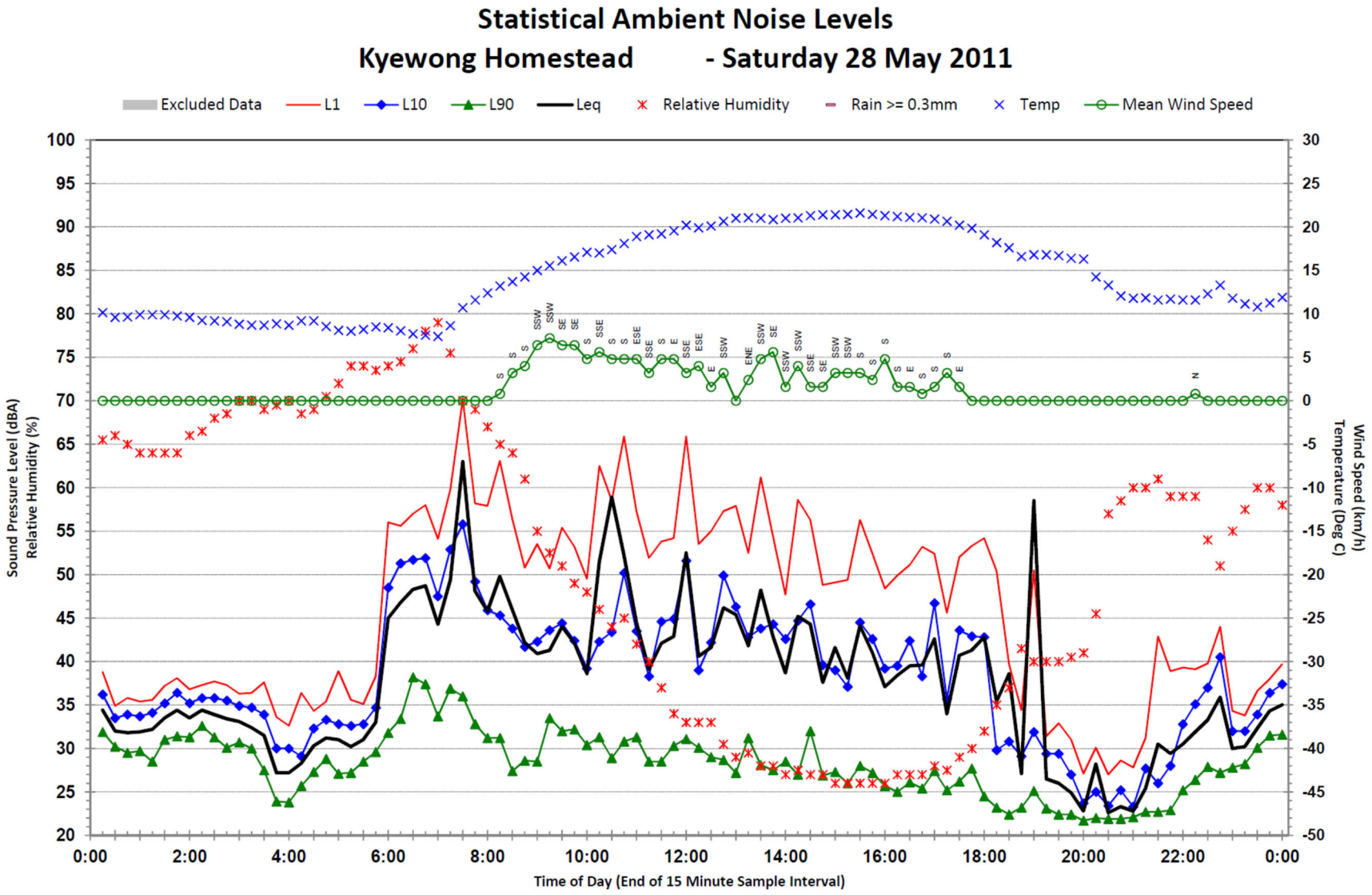
Appendix B

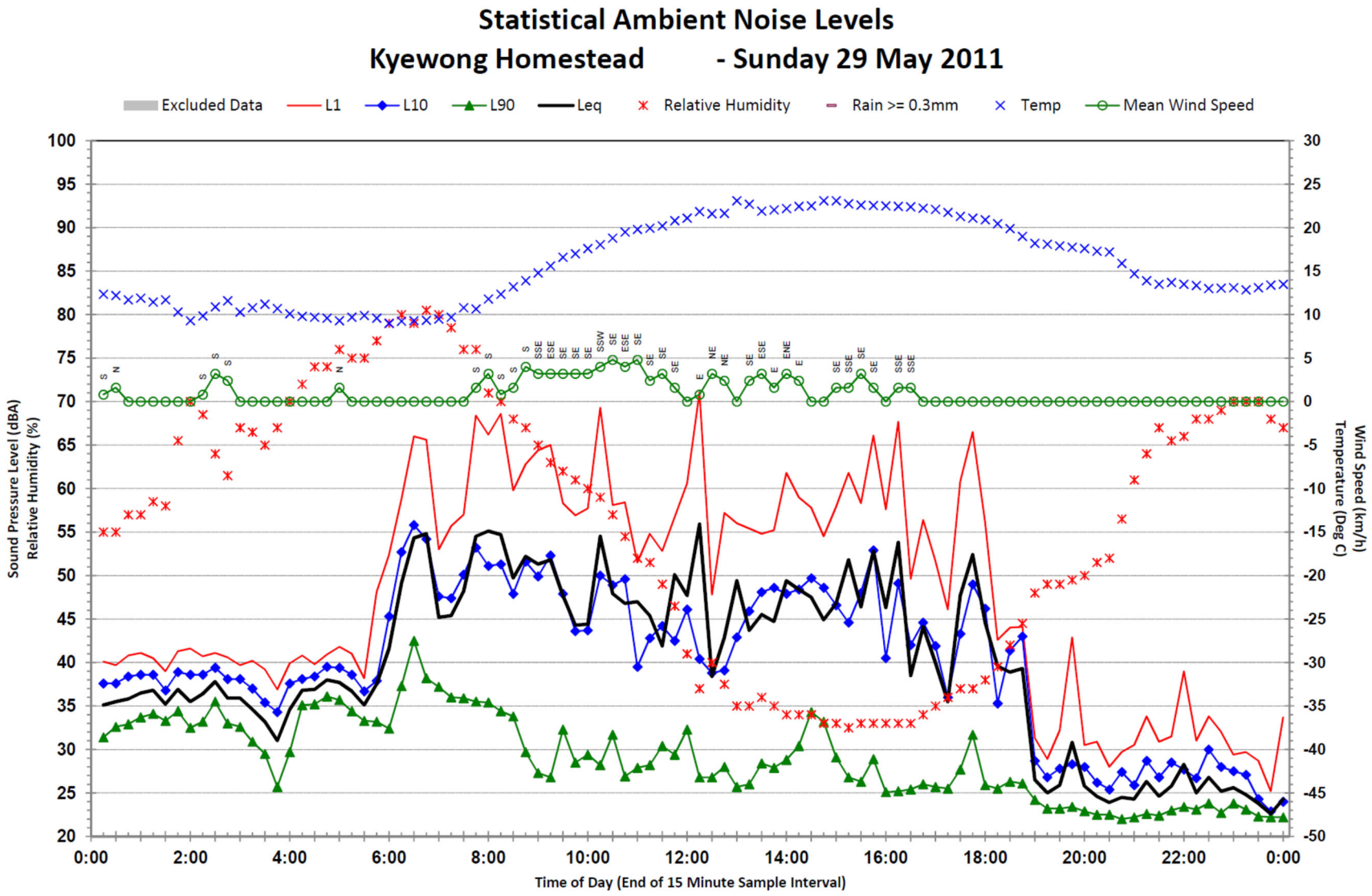
Background Noise Measurements

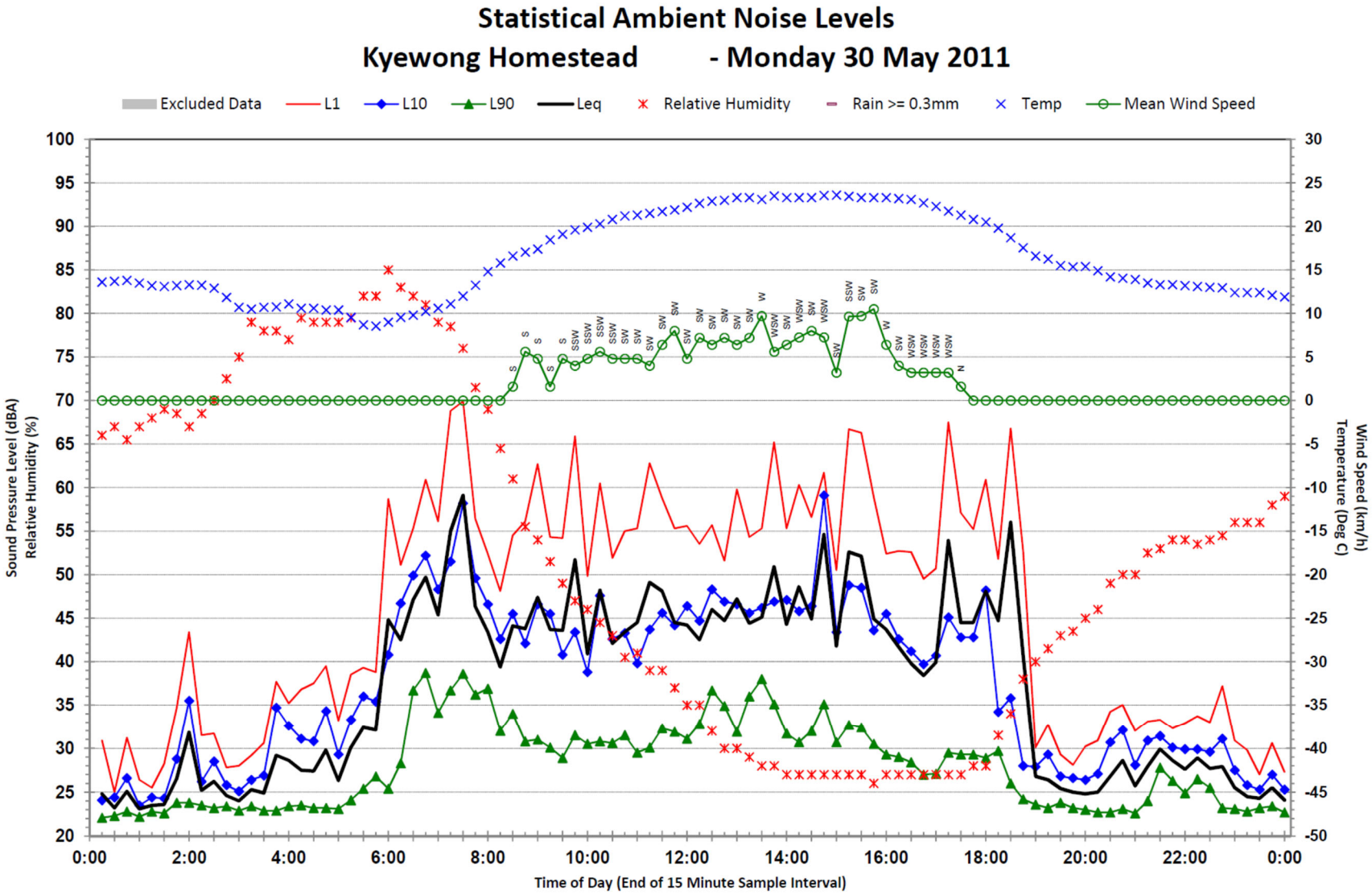

Statistical Ambient Noise Levels
Kyewong Homestead - Wednesday 25 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

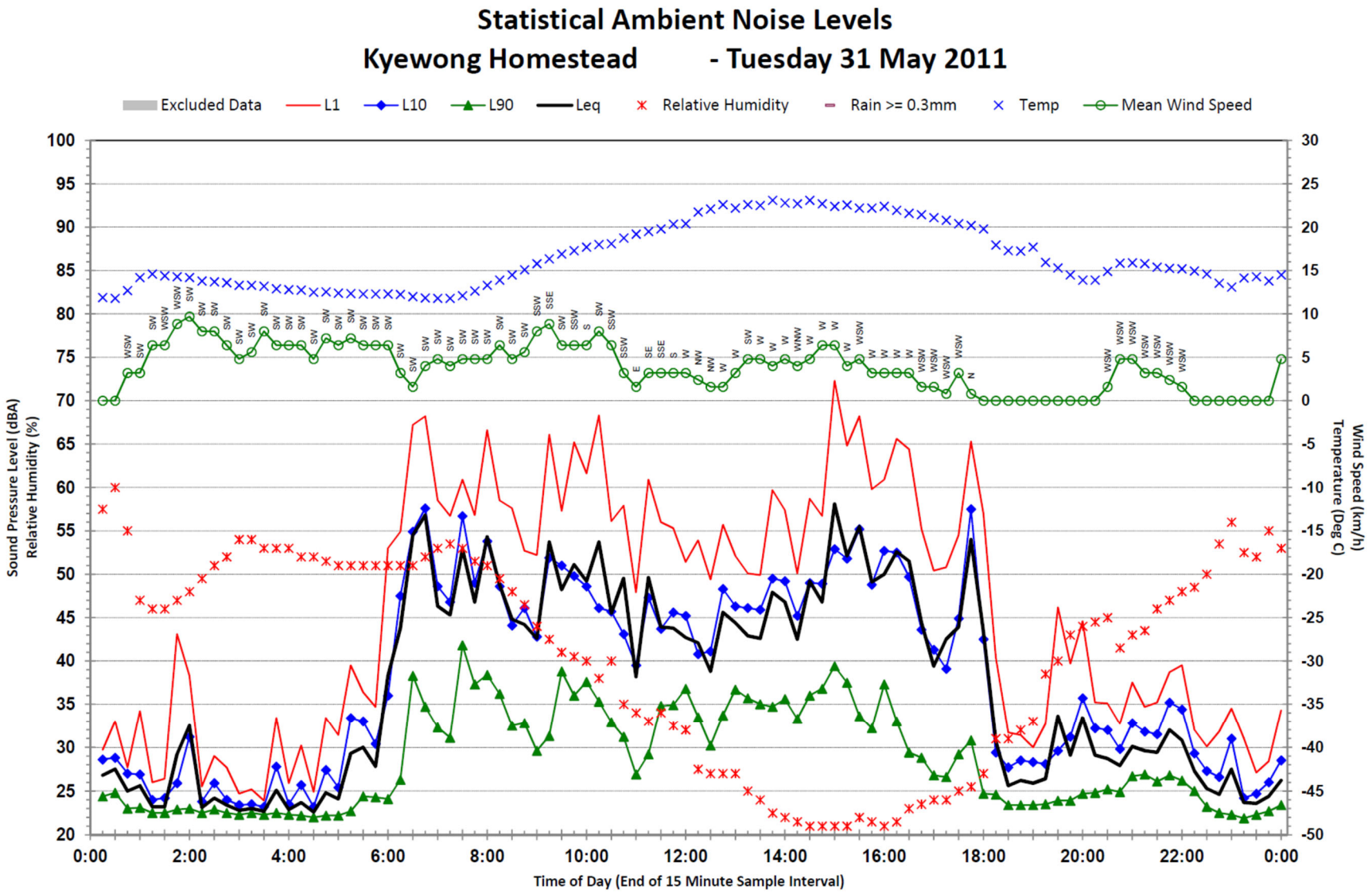

Statistical Ambient Noise Levels
Kyewong Homestead - Thursday 26 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
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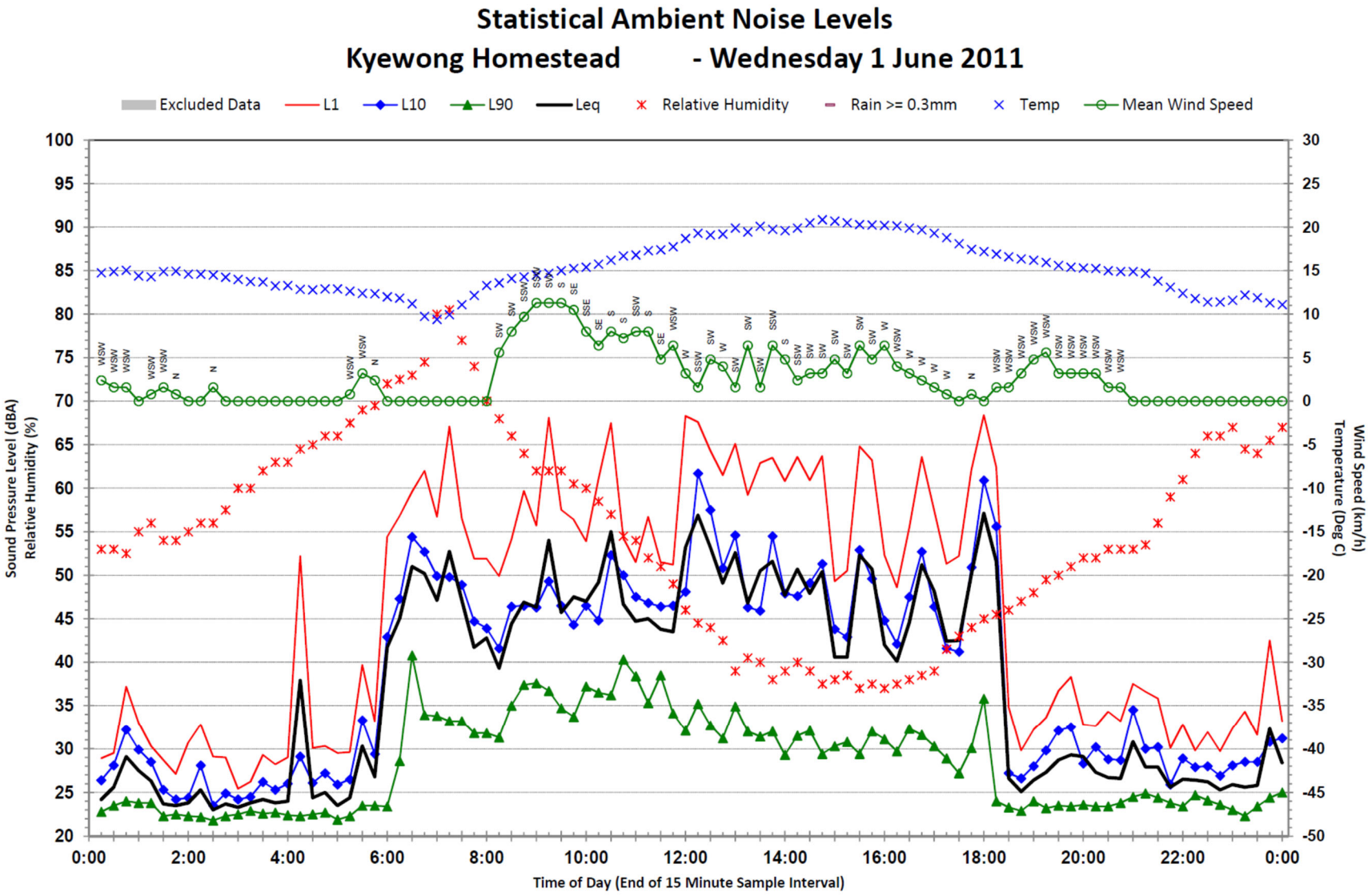

Statistical Ambient Noise Levels
Kyewong Homestead - Friday 27 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
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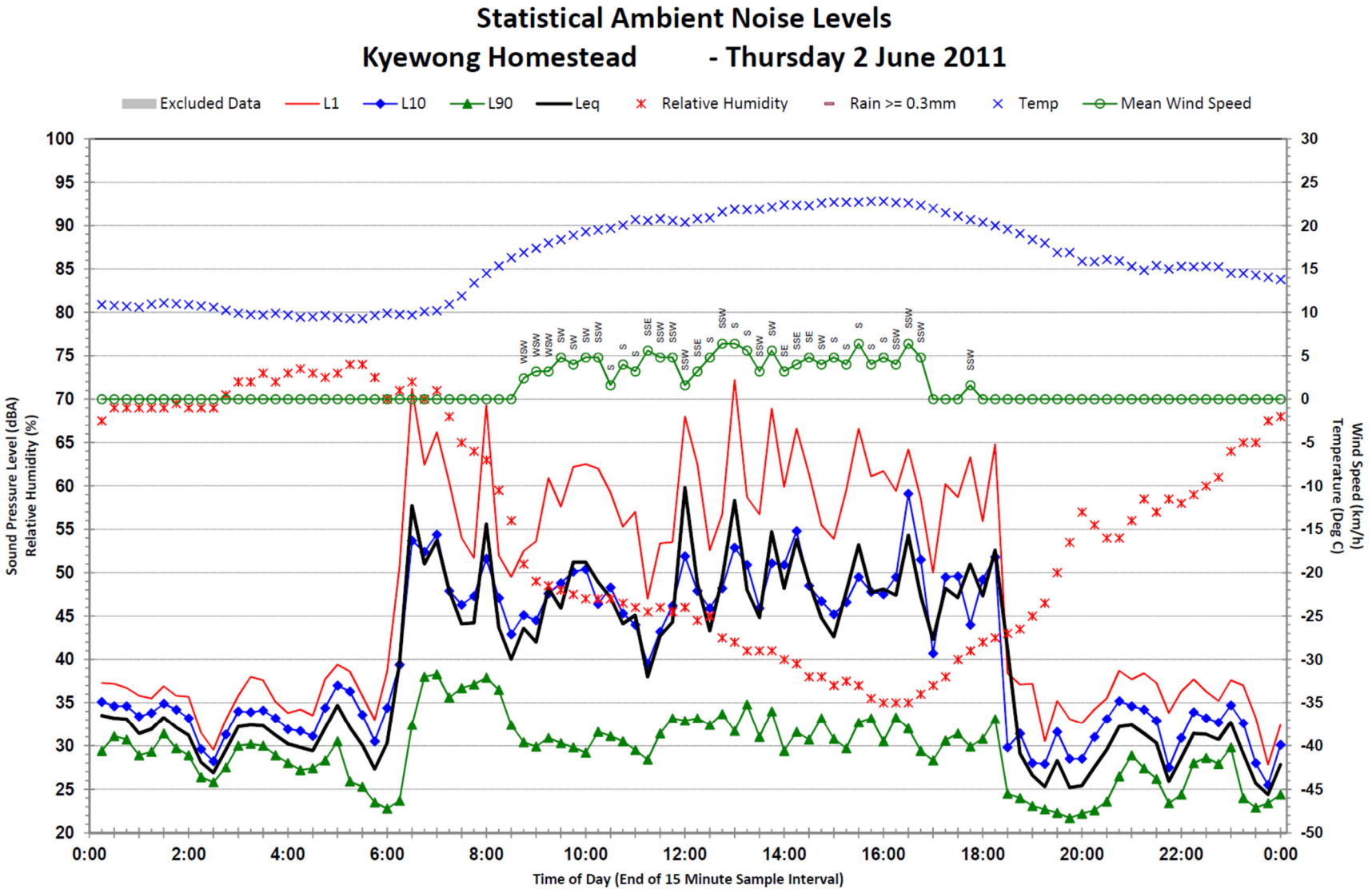

Statistical Ambient Noise Levels
Kyewong Homestead - Saturday 28 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
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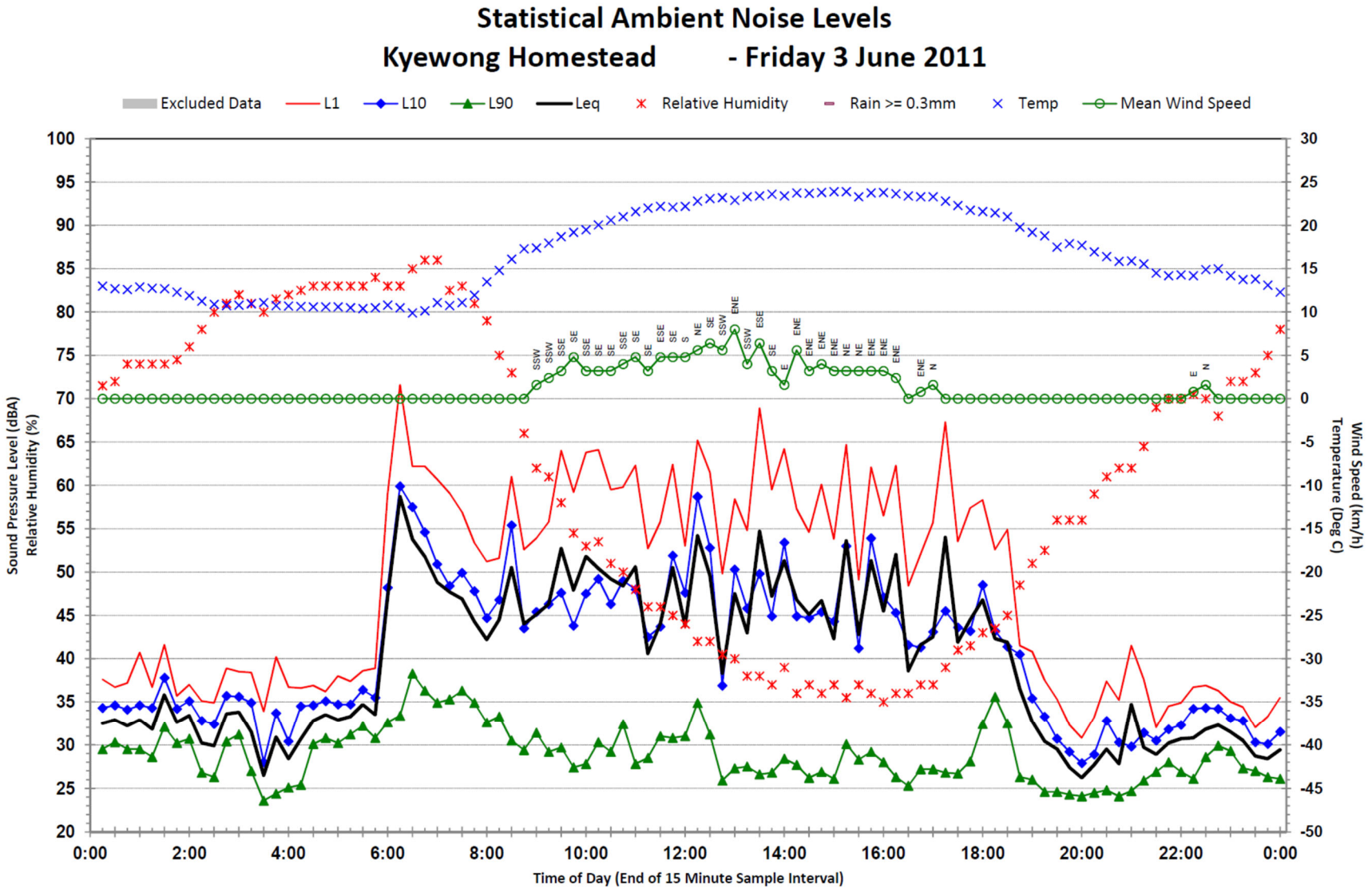

Statistical Ambient Noise Levels
Kyewong Homestead - Sunday 29 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
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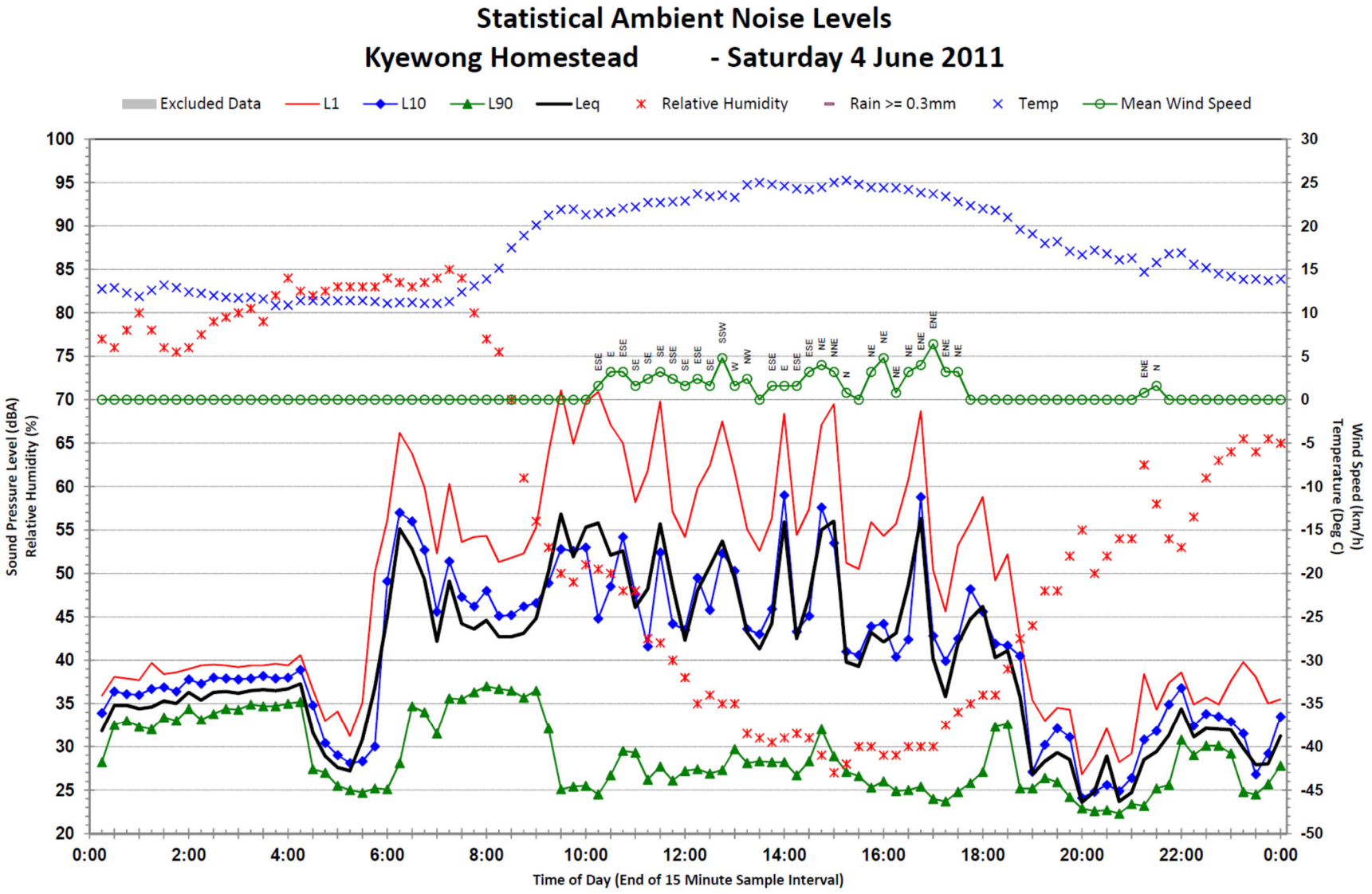

Statistical Ambient Noise Levels
Kyewong Homestead - Monday 30 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
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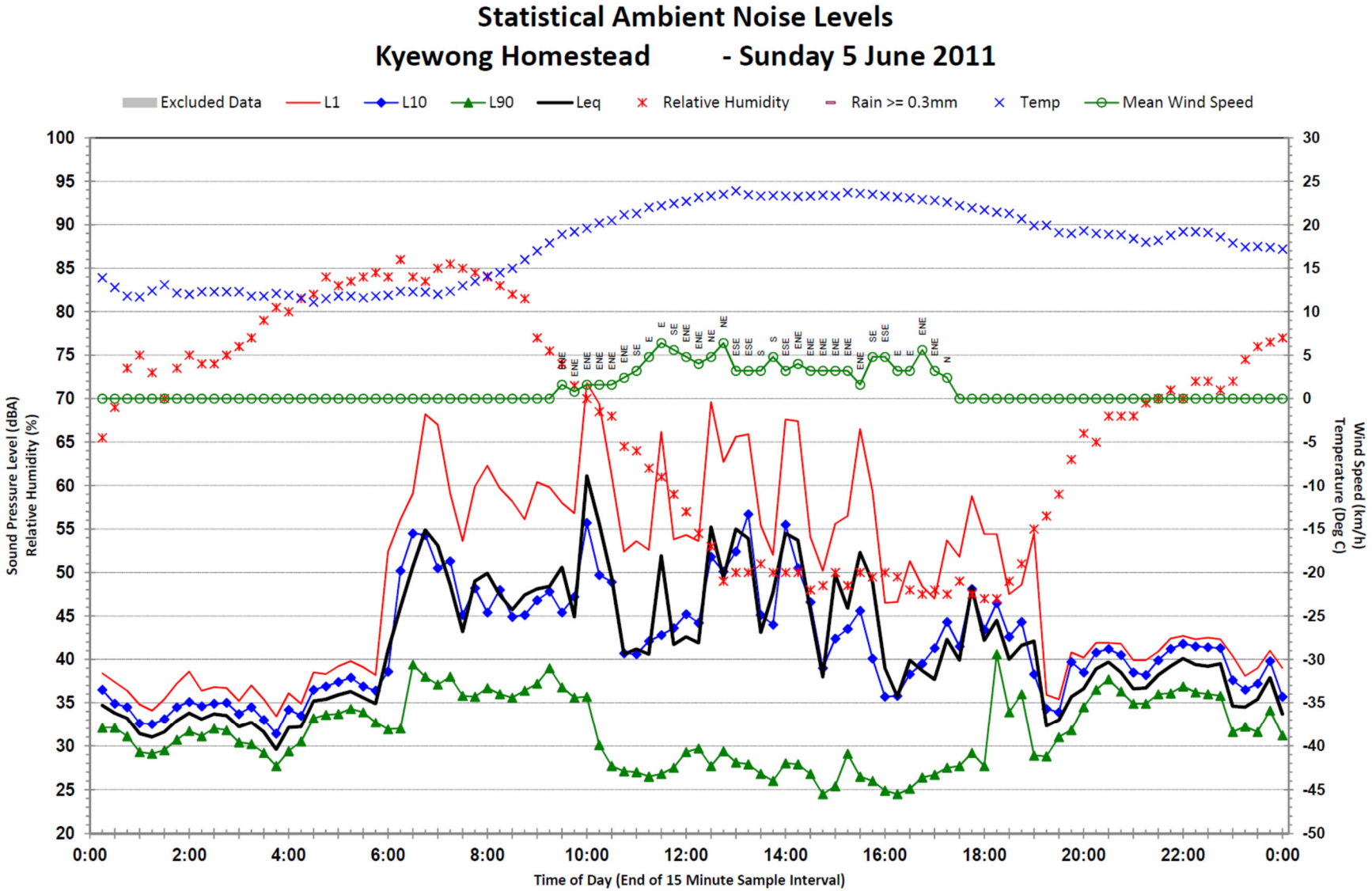

Statistical Ambient Noise Levels
Kyewong Homestead - Tuesday 31 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
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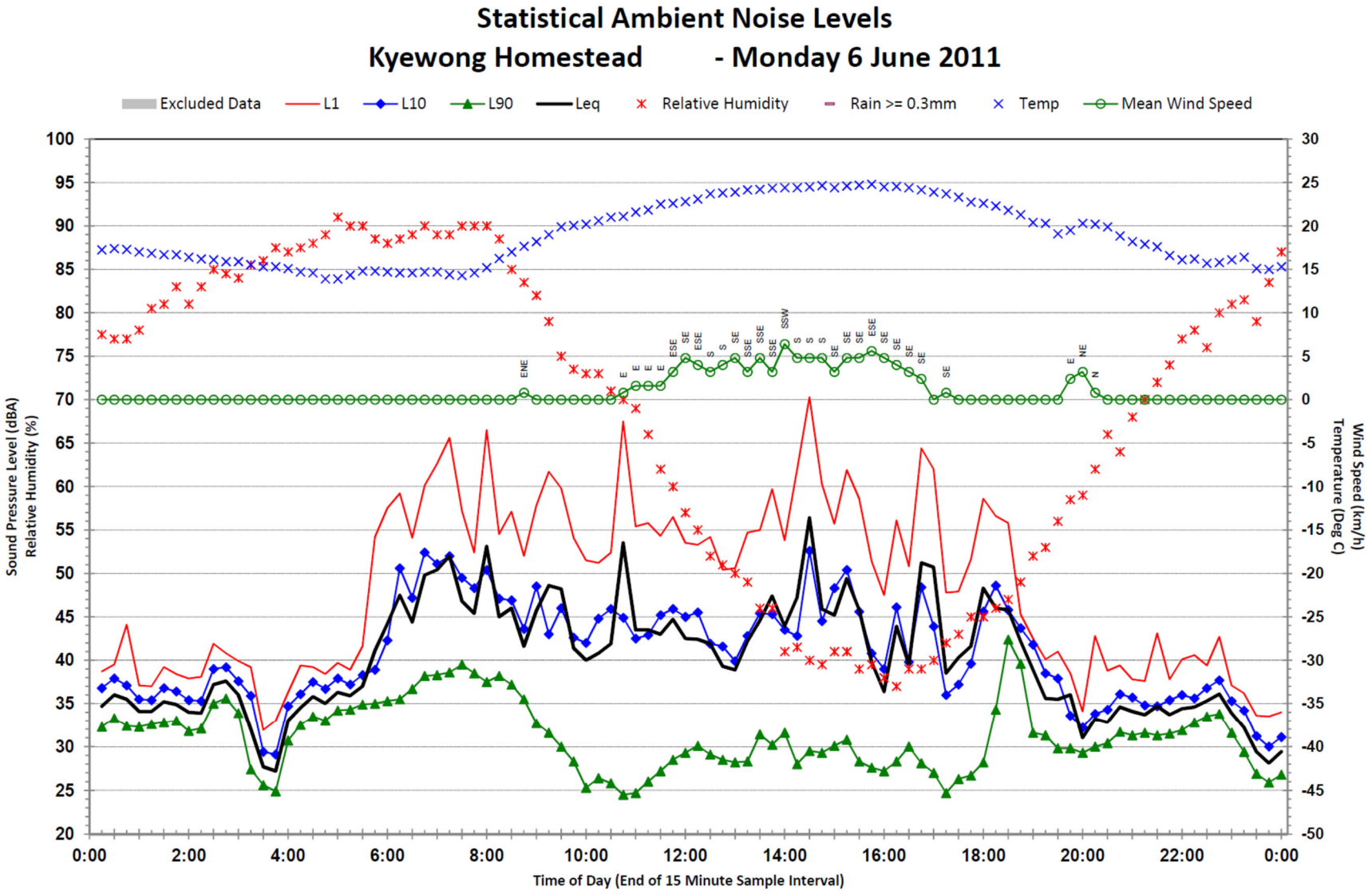

Statistical Ambient Noise Levels
Kyewong Homestead - Wednesday 1 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
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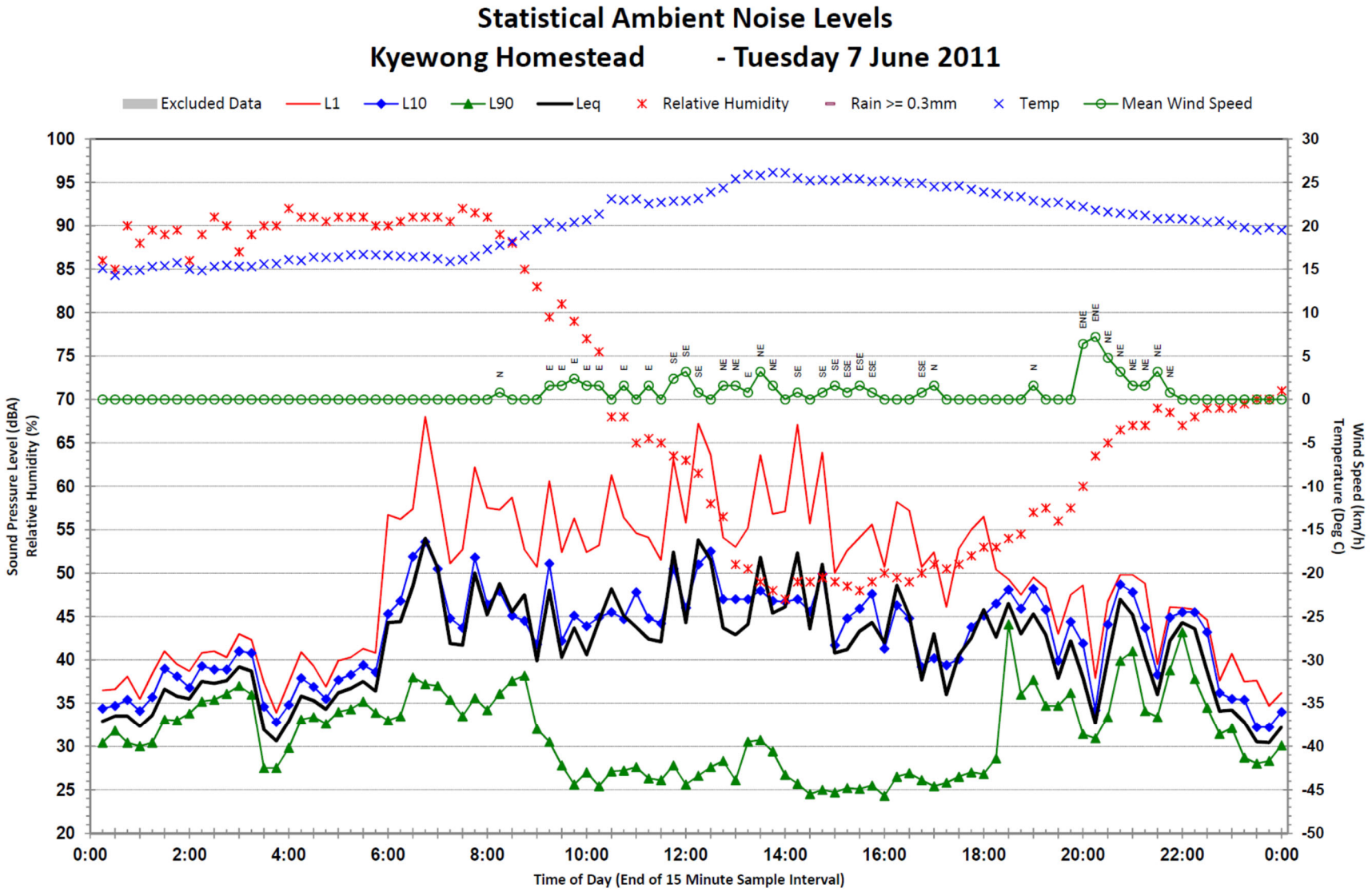

Statistical Ambient Noise Levels
Kyewong Homestead - Thursday 2 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
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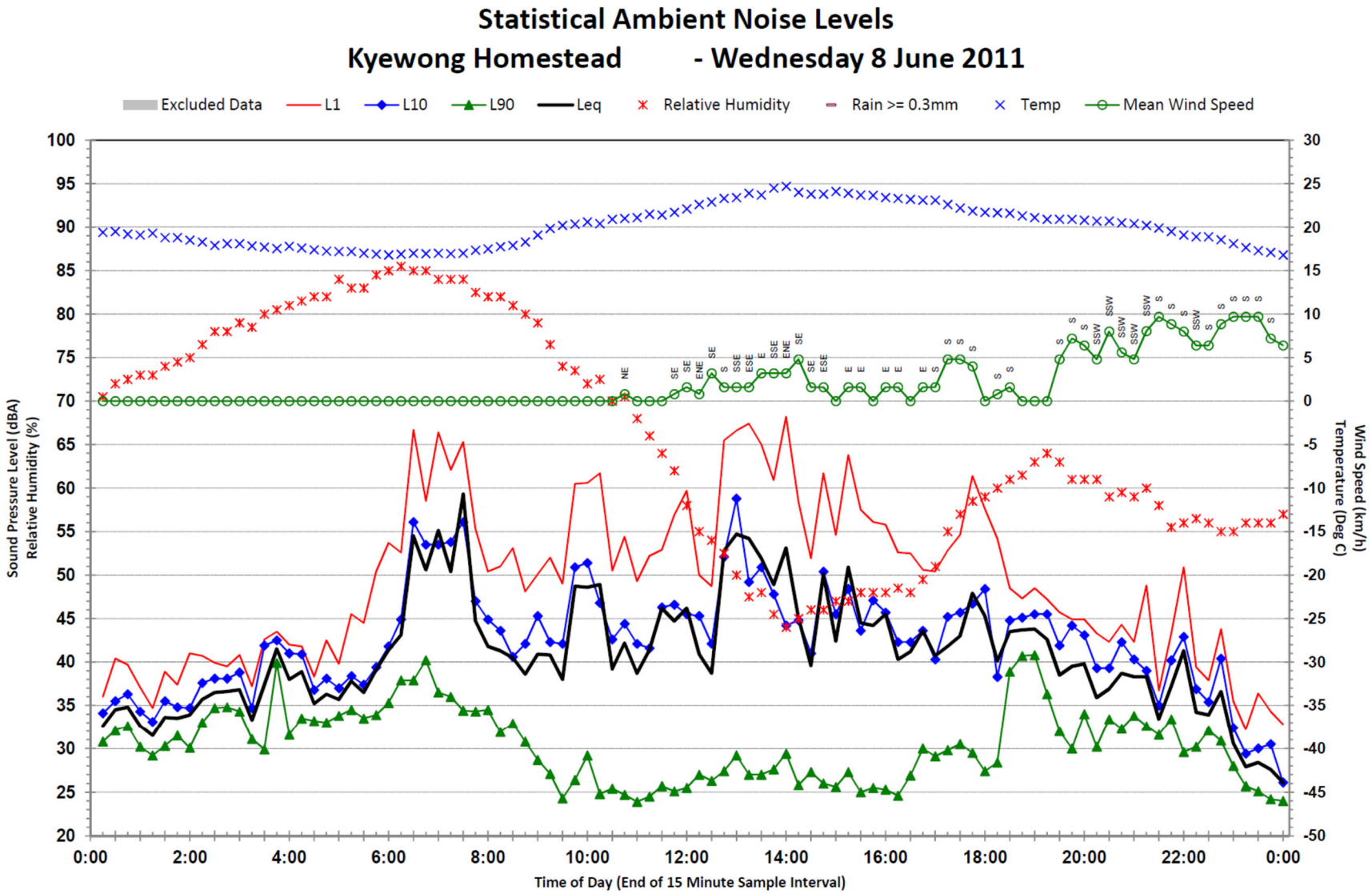

Statistical Ambient Noise Levels
Kyewong Homestead - Friday 3 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
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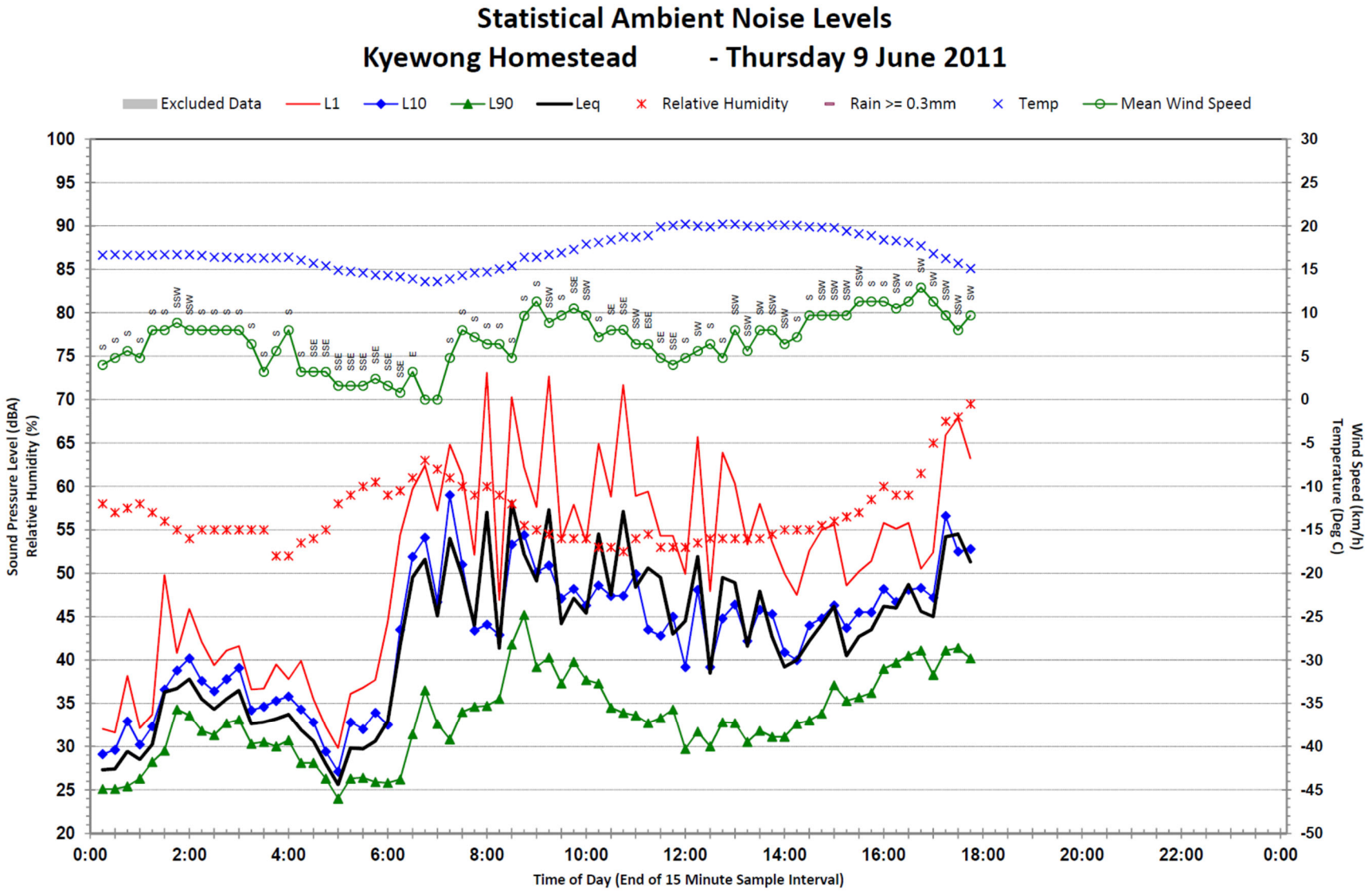

Statistical Ambient Noise Levels
Kyewong Homestead - Saturday 4 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
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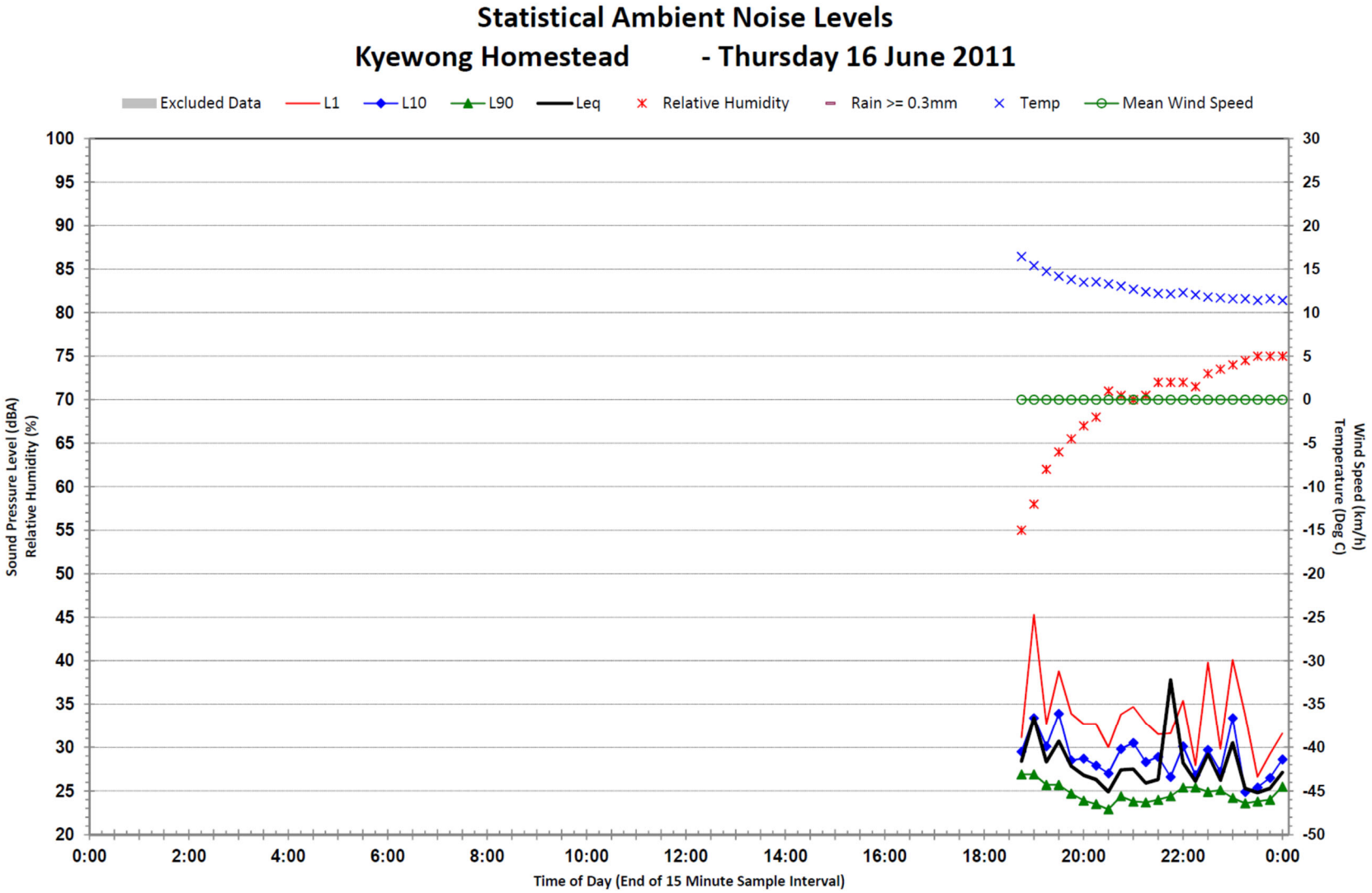

Statistical Ambient Noise Levels
Kyewong Homestead - Sunday 5 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
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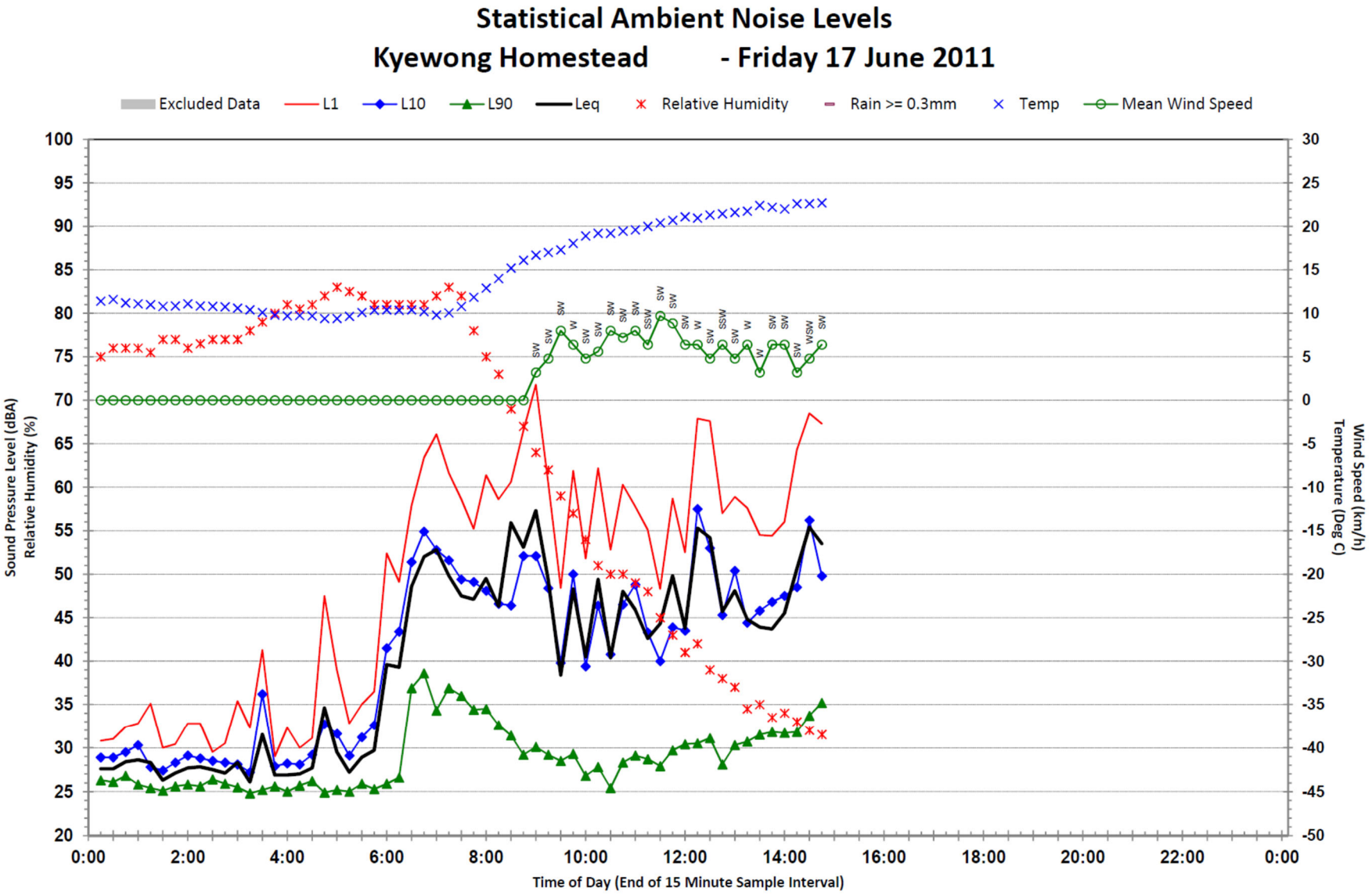

Statistical Ambient Noise Levels
Kyewong Homestead - Monday 6 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
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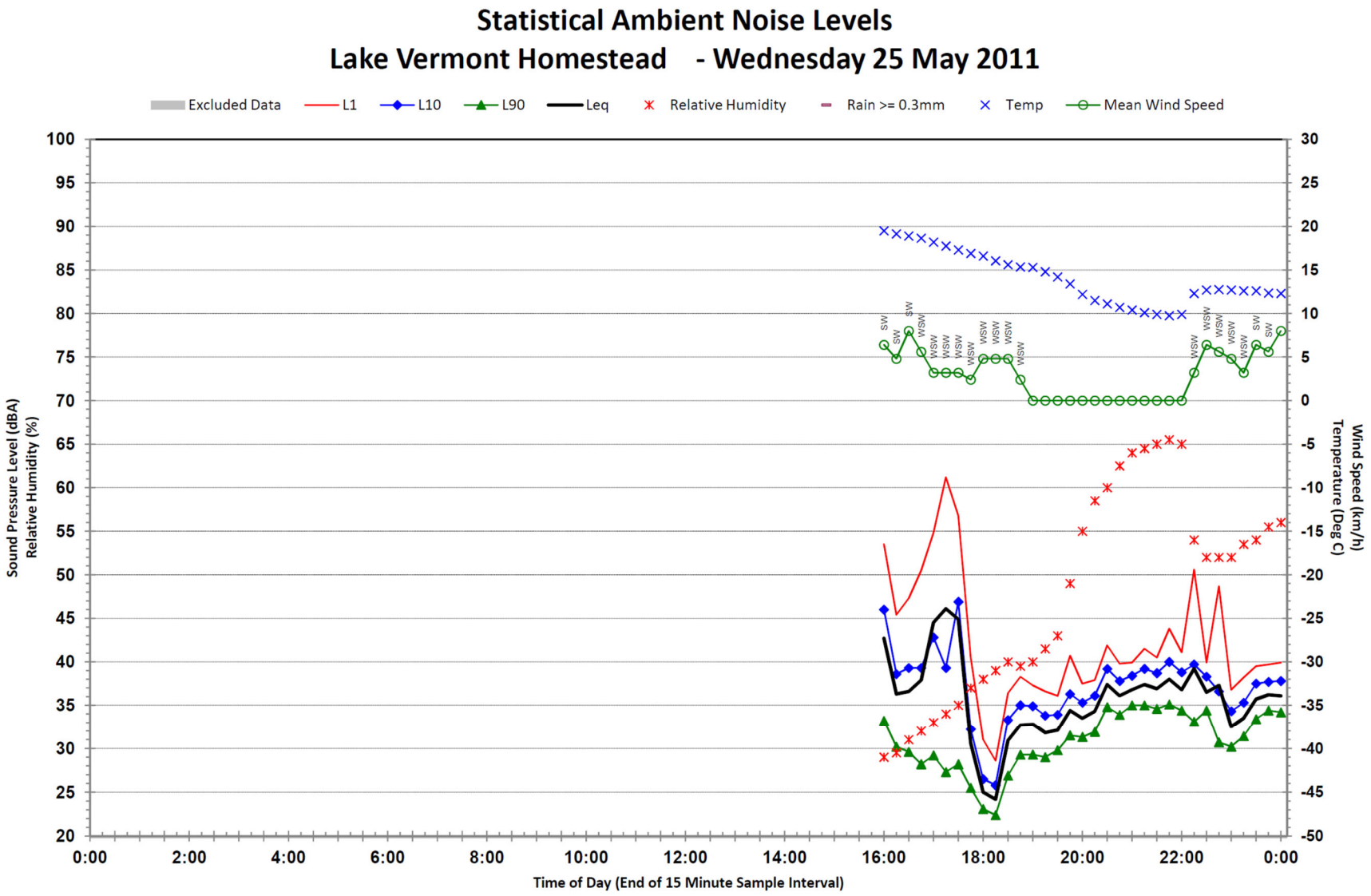

Statistical Ambient Noise Levels
Kyewong Homestead - Tuesday 7 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Kyewong Homestead - Wednesday 8 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
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20:00
22:00
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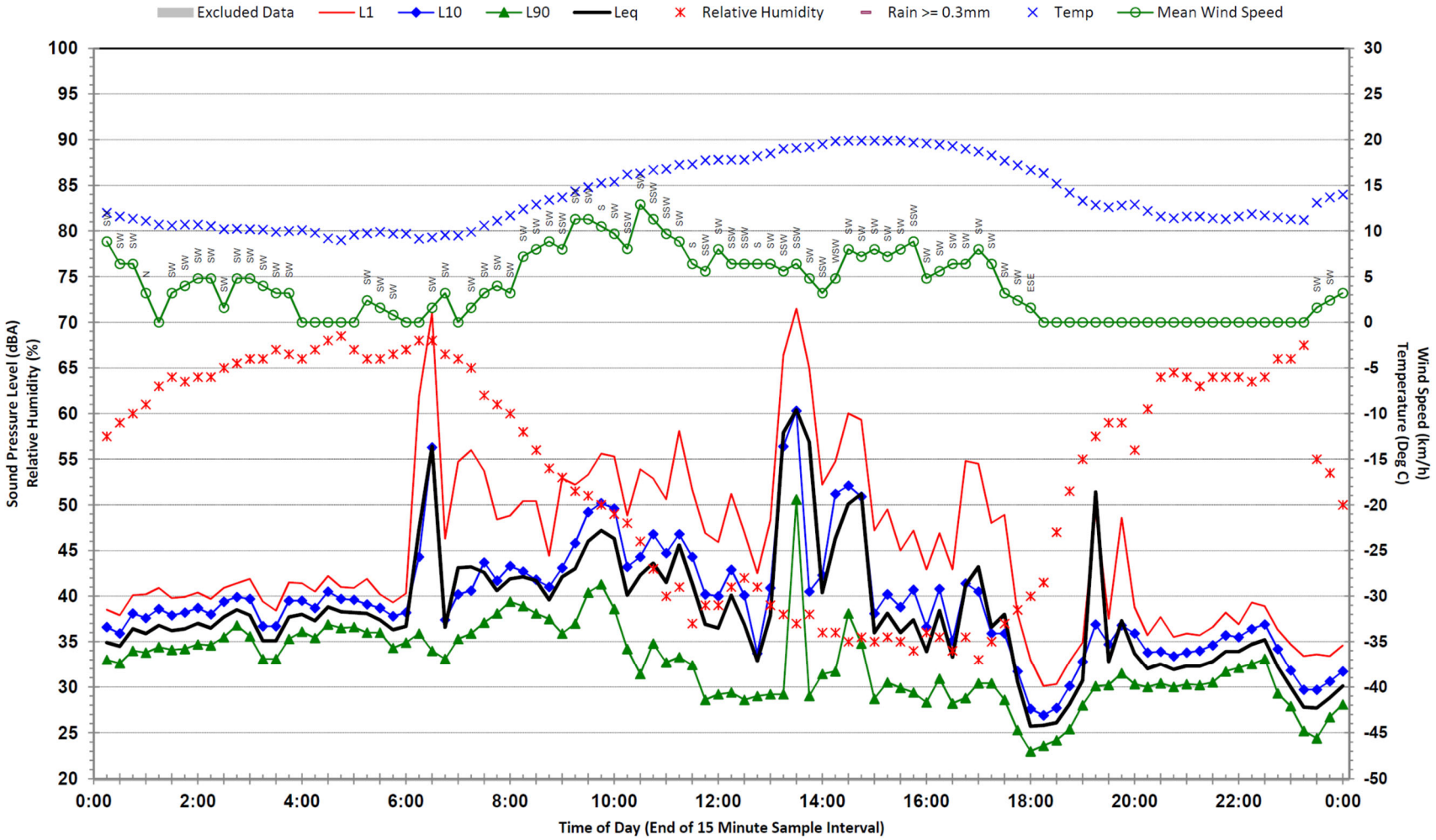

Statistical Ambient Noise Levels
Kyewong Homestead - Thursday 9 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

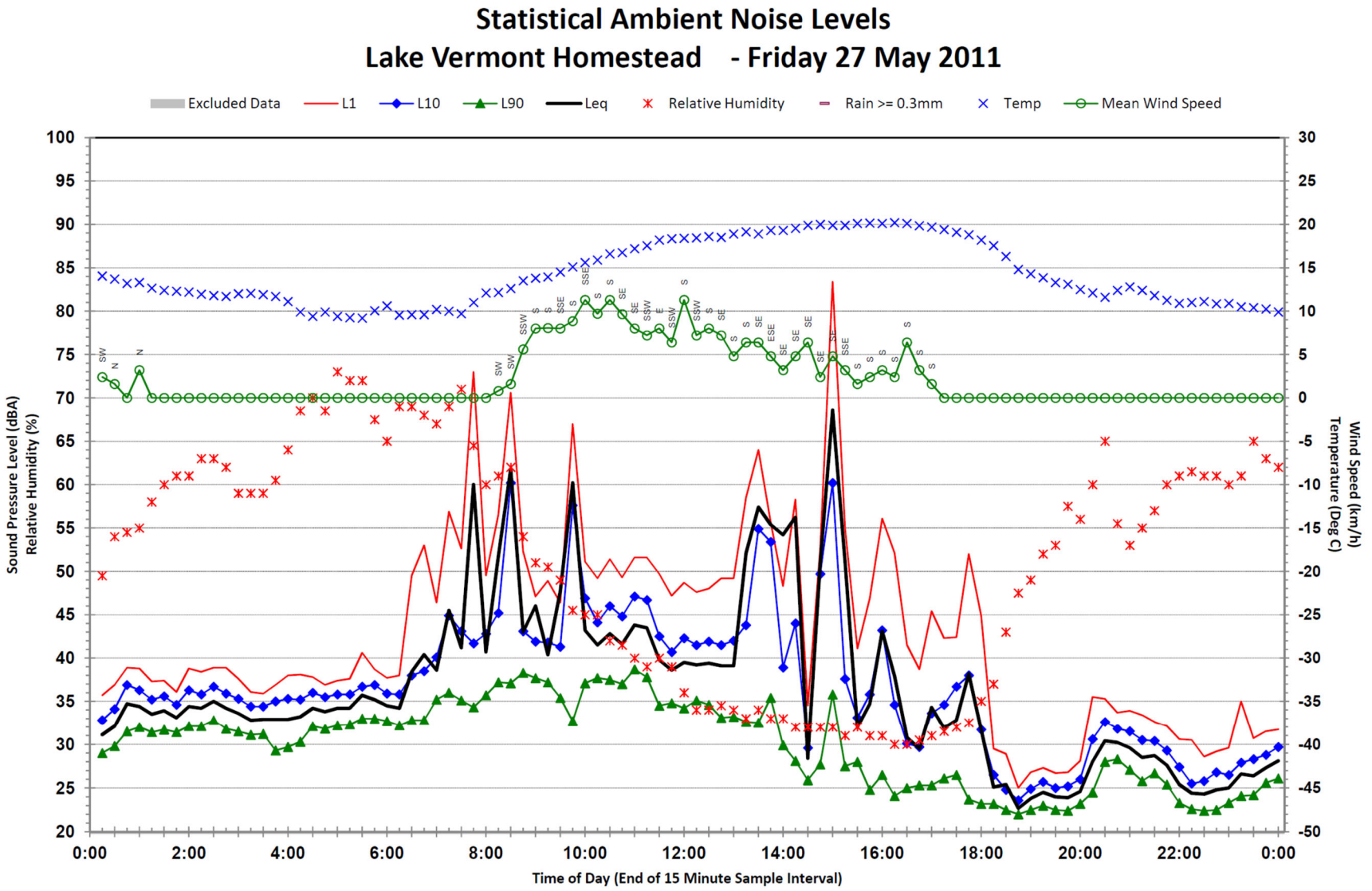

Statistical Ambient Noise Levels
Kyewong Homestead - Thursday 16 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

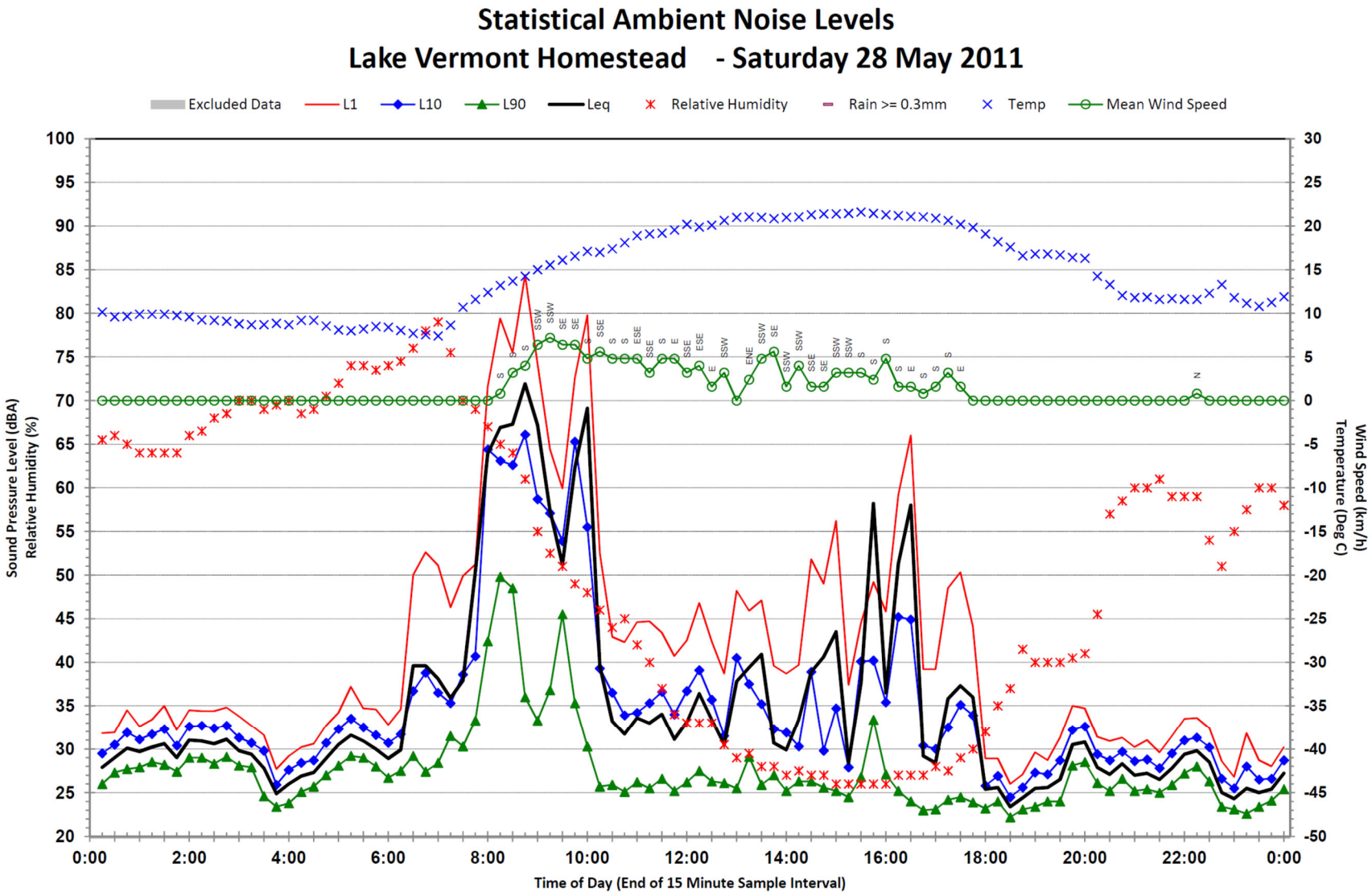

Statistical Ambient Noise Levels
Kyewong Homestead - Friday 17 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Lake Vermont Homestead - Wednesday 25 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

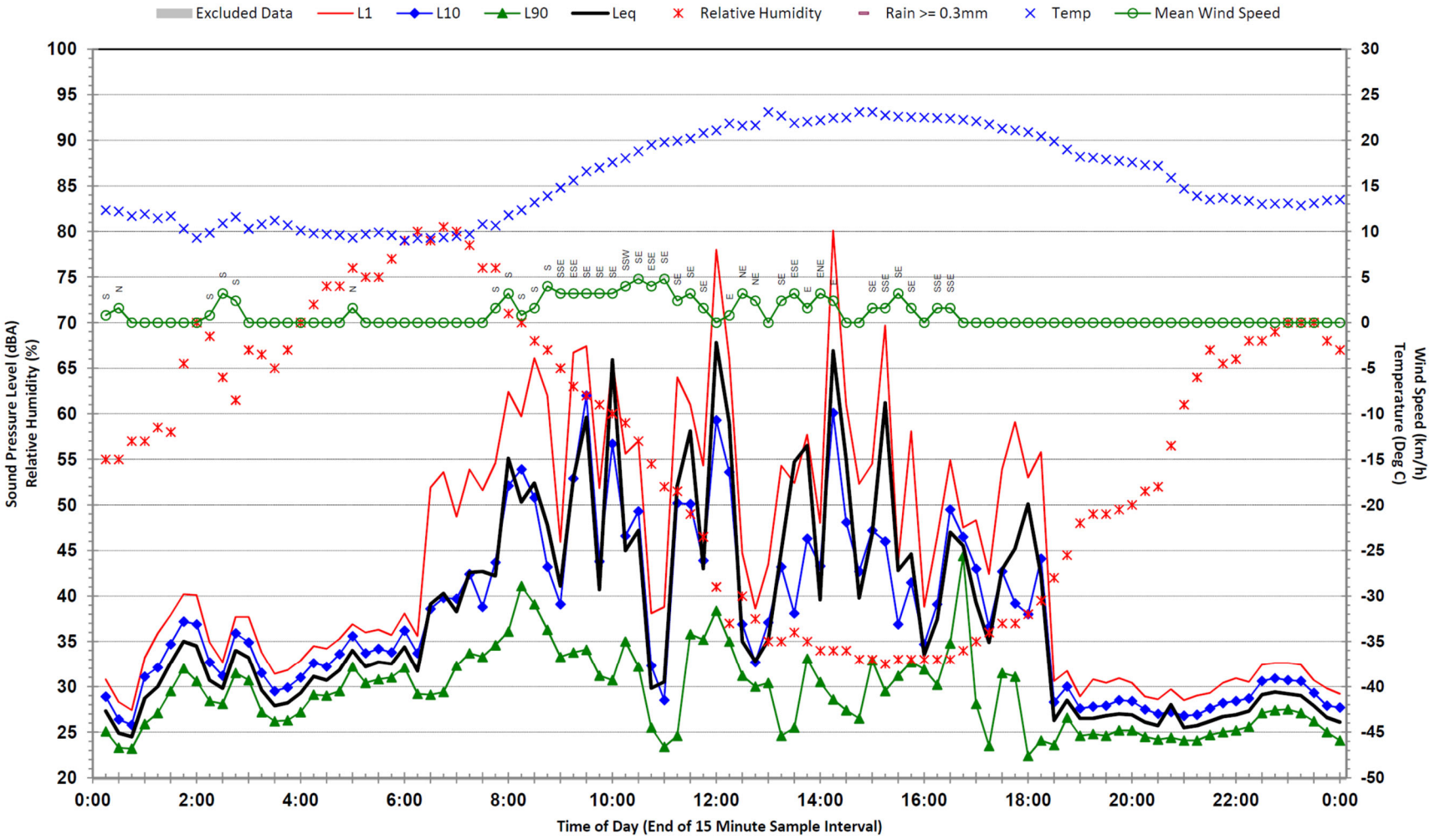
Statistical Ambient Noise Levels
Lake Vermont Homestead - Thursday 26 May 2011

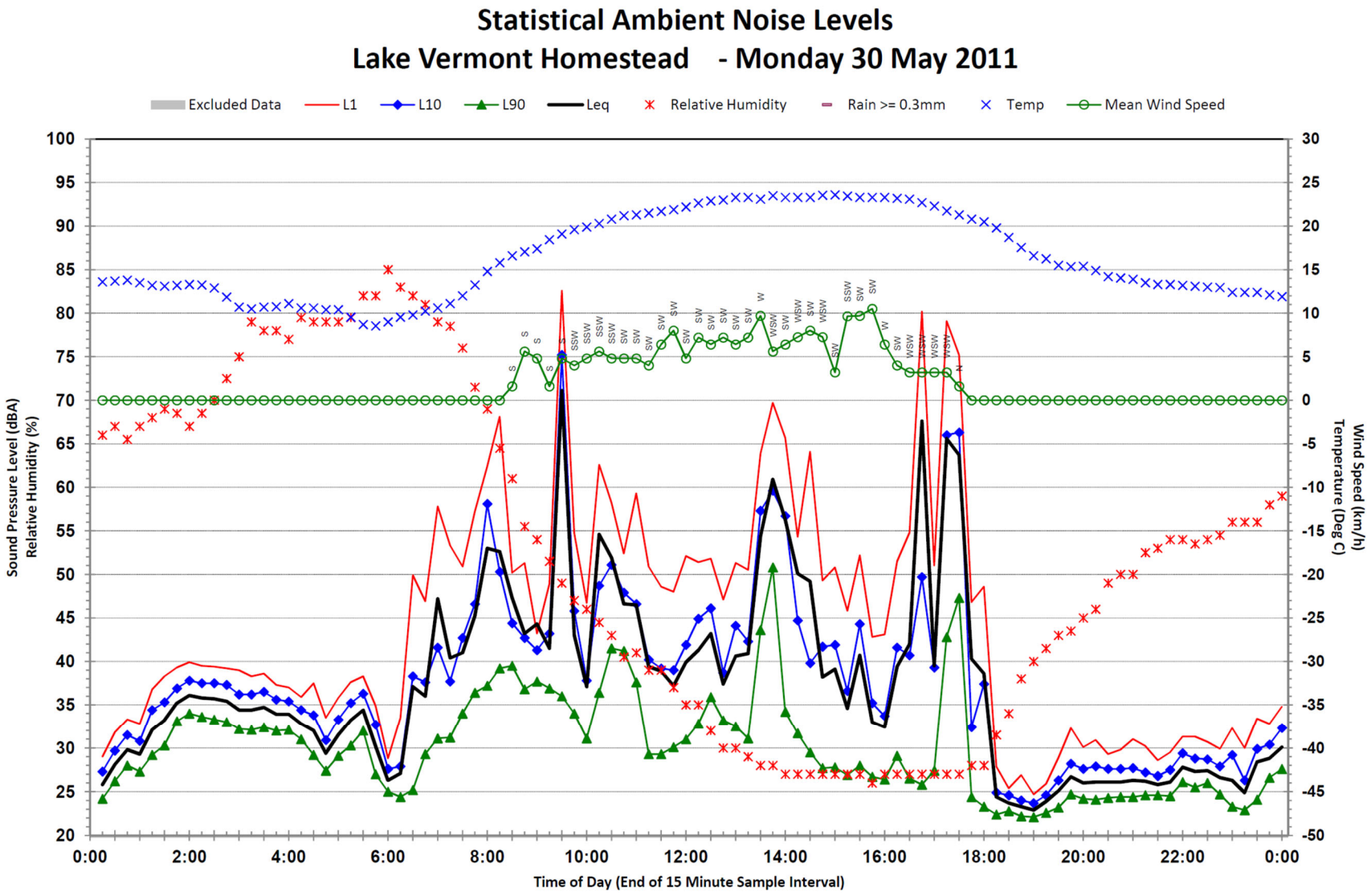


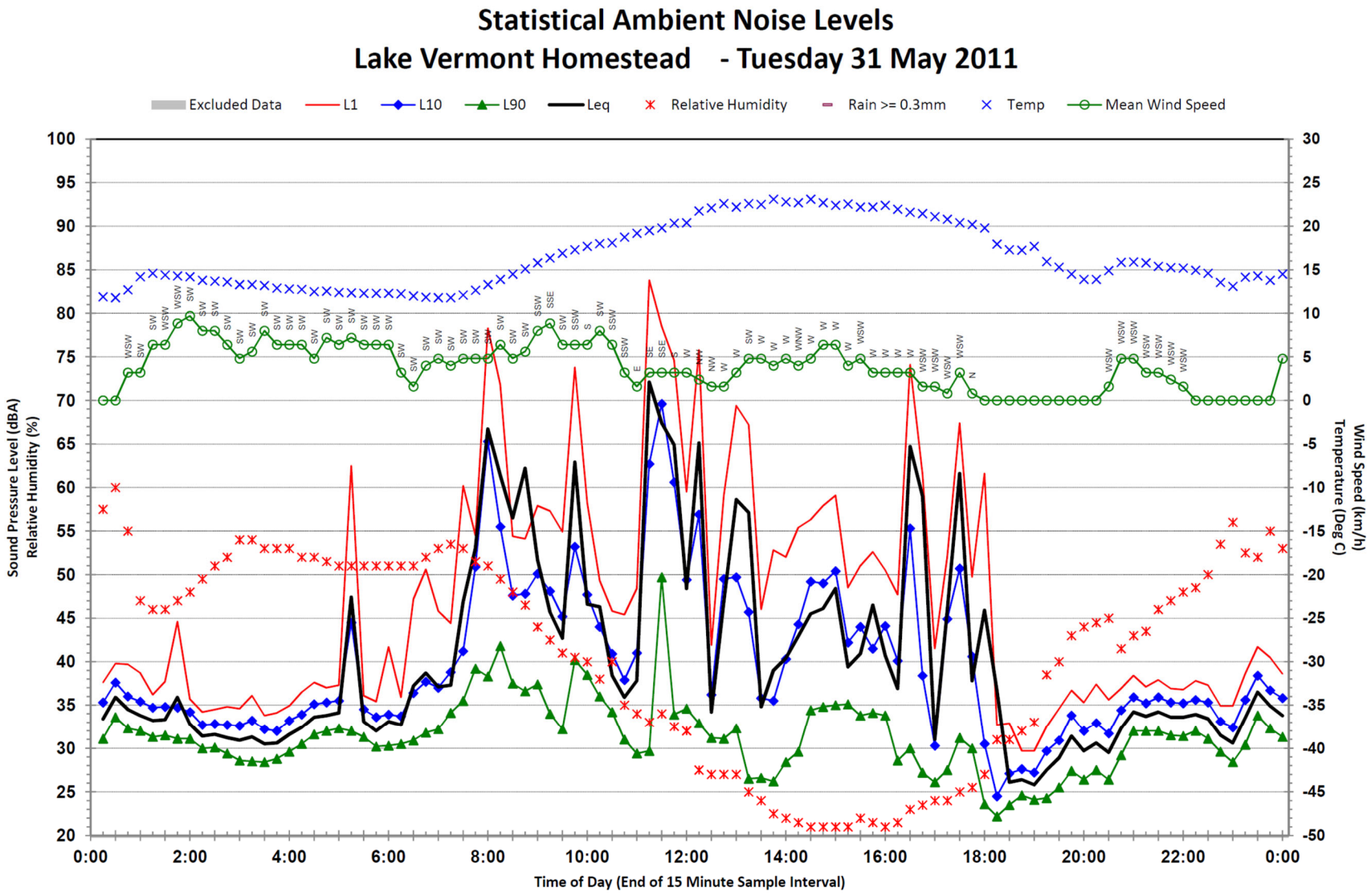

Statistical Ambient Noise Levels
Lake Vermont Homestead - Friday 27 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

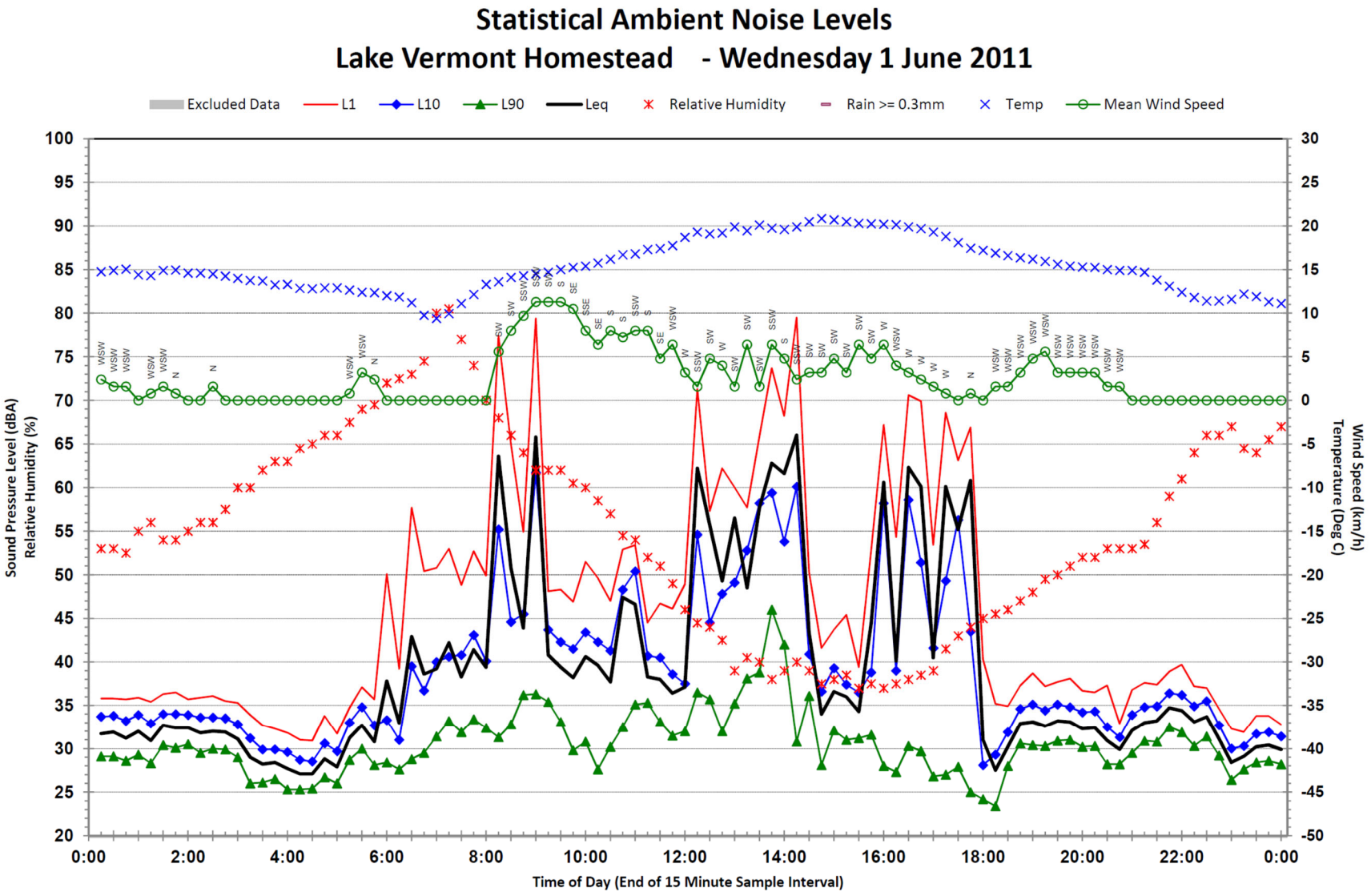

Statistical Ambient Noise Levels
Lake Vermont Homestead - Saturday 28 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

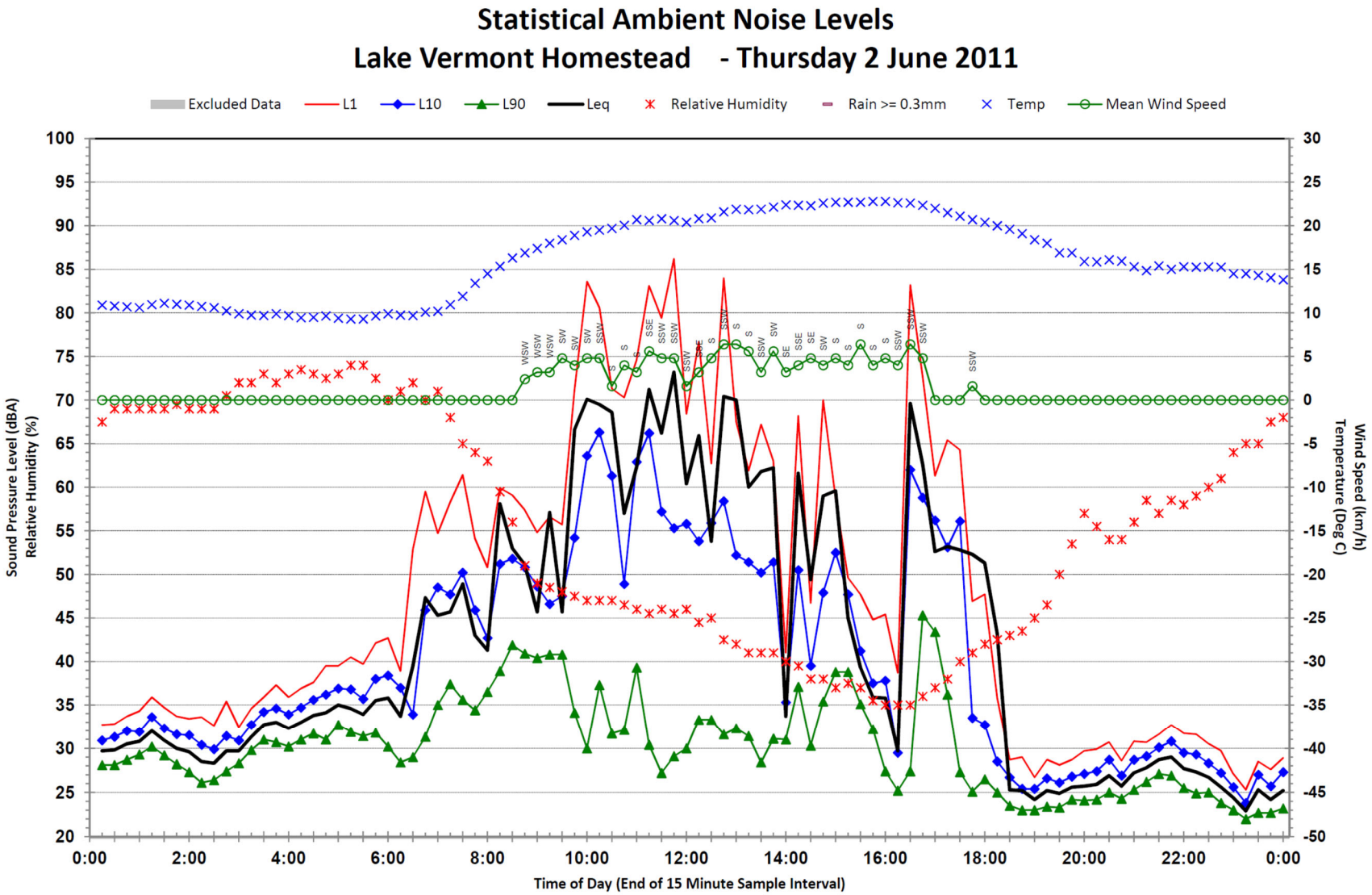
Statistical Ambient Noise Levels
Lake Vermont Homestead - Sunday 29 May 2011

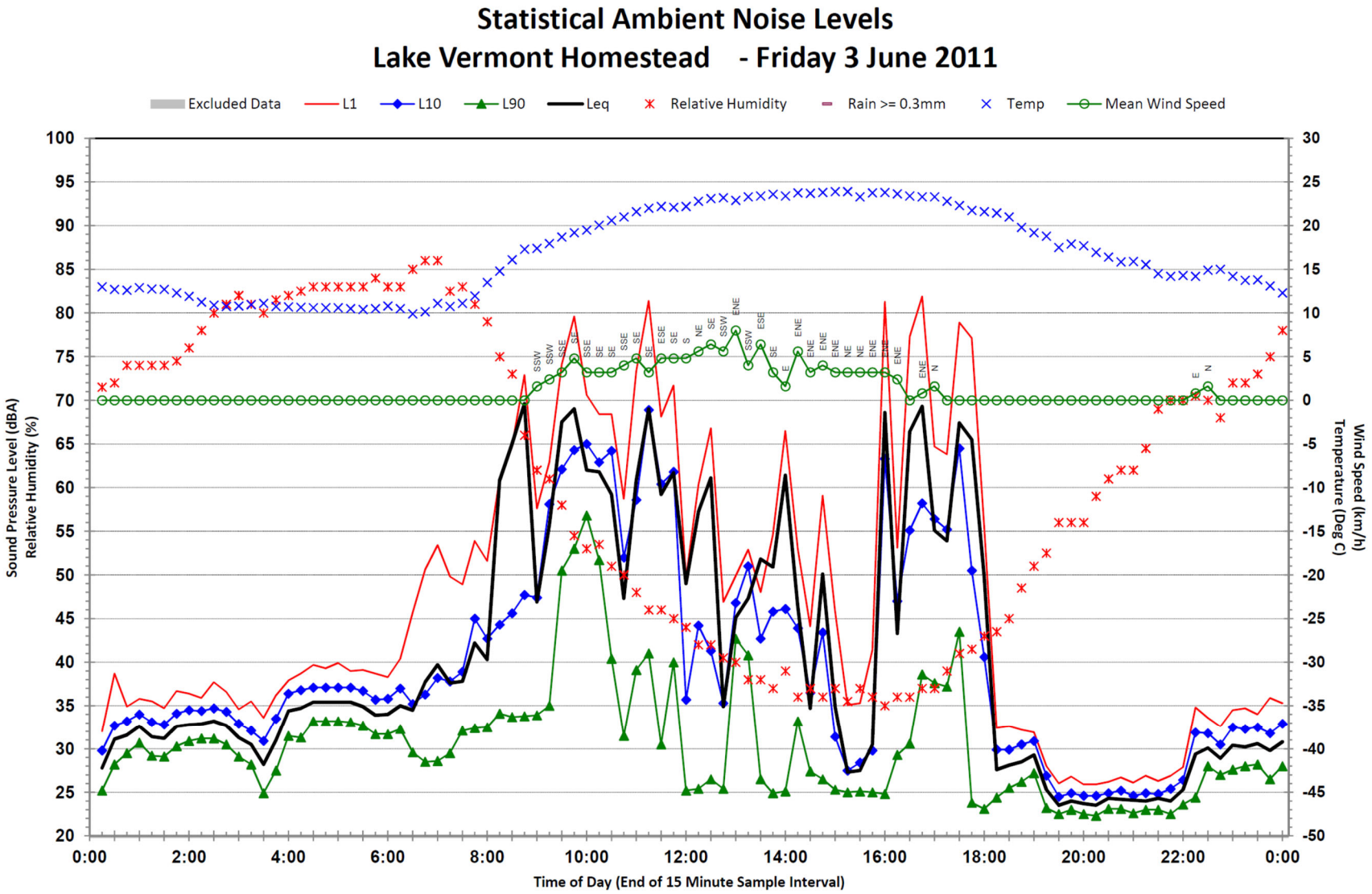


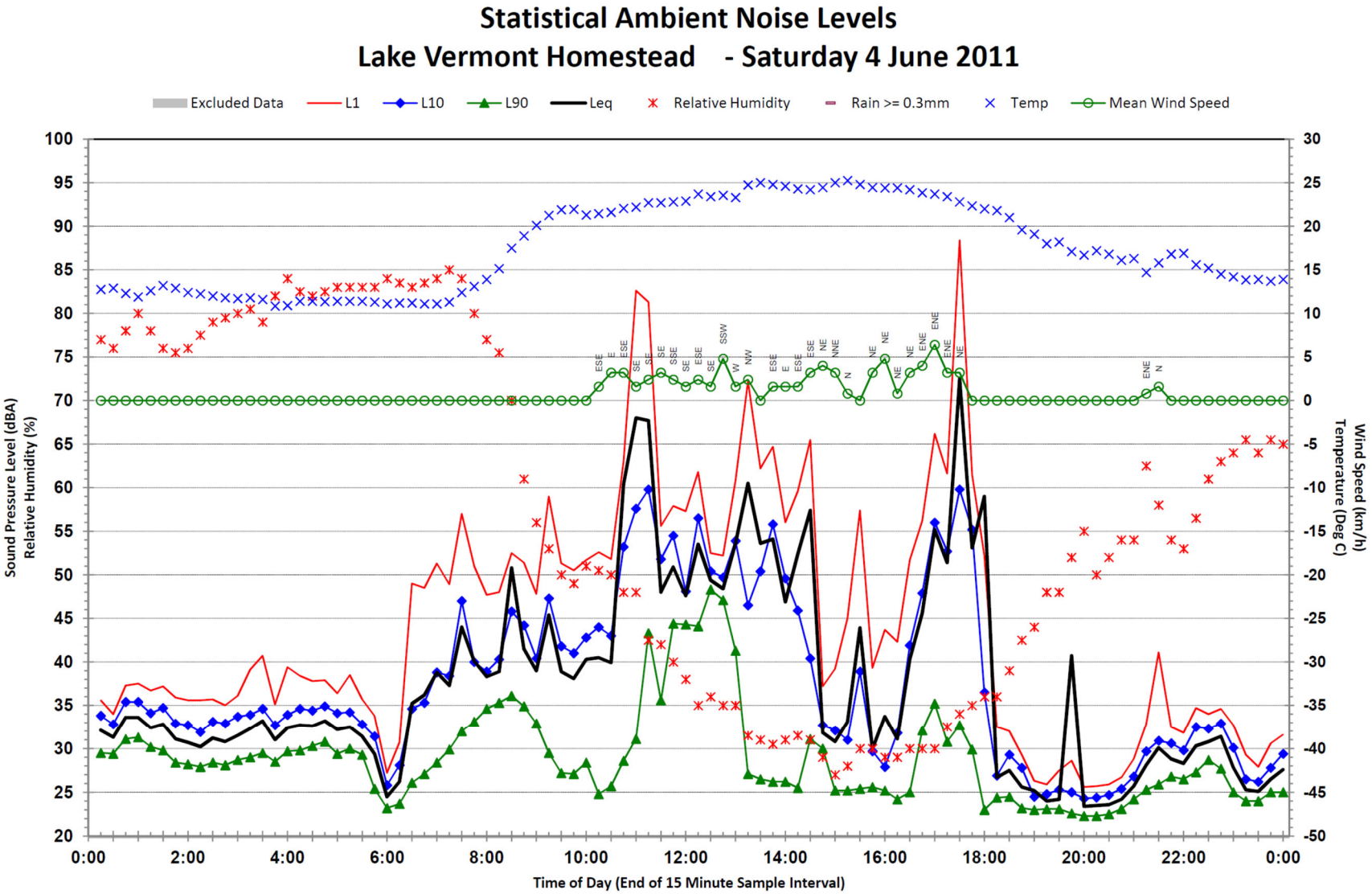

Statistical Ambient Noise Levels
Lake Vermont Homestead - Monday 30 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

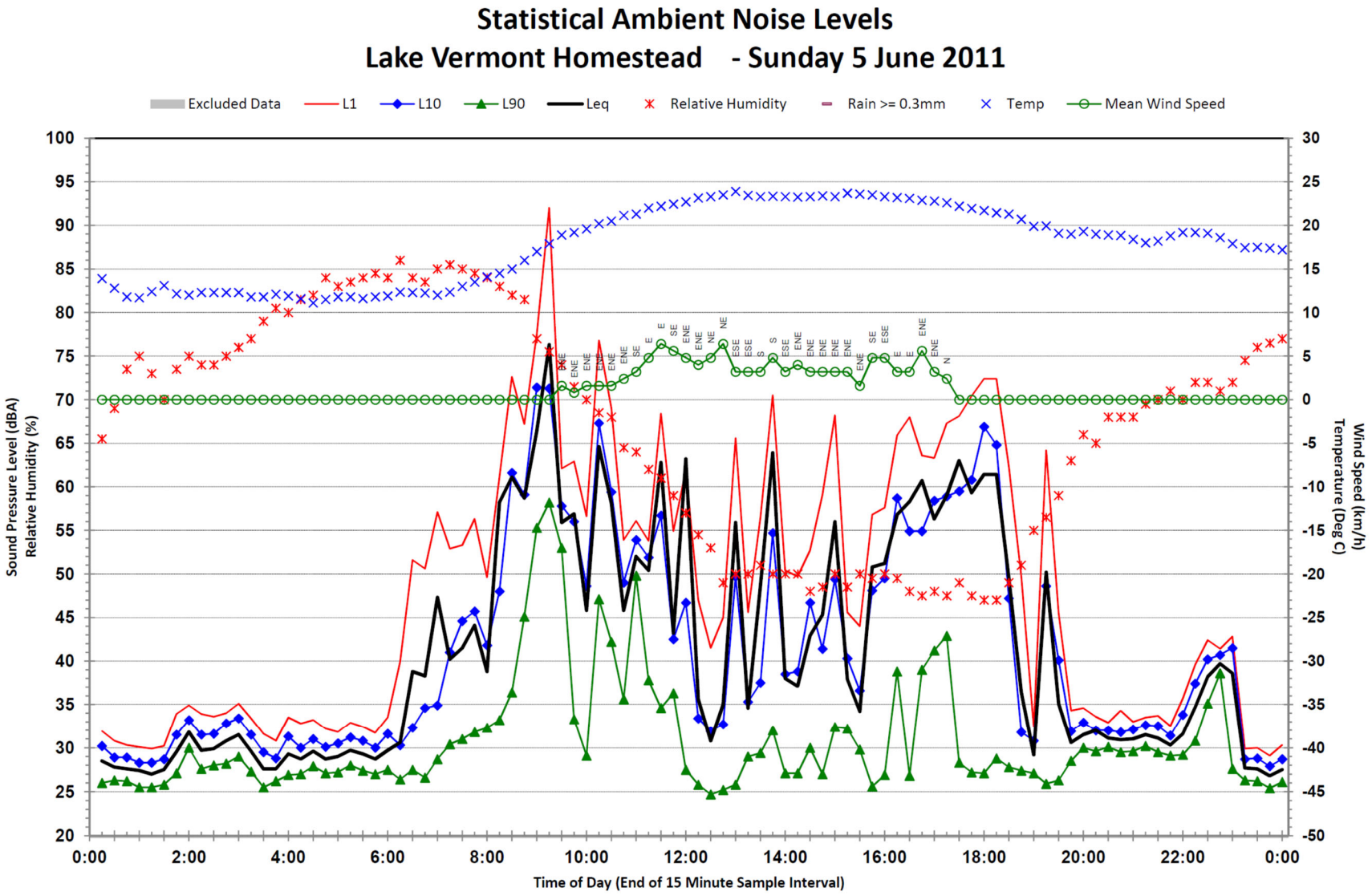

Statistical Ambient Noise Levels
Lake Vermont Homestead - Tuesday 31 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

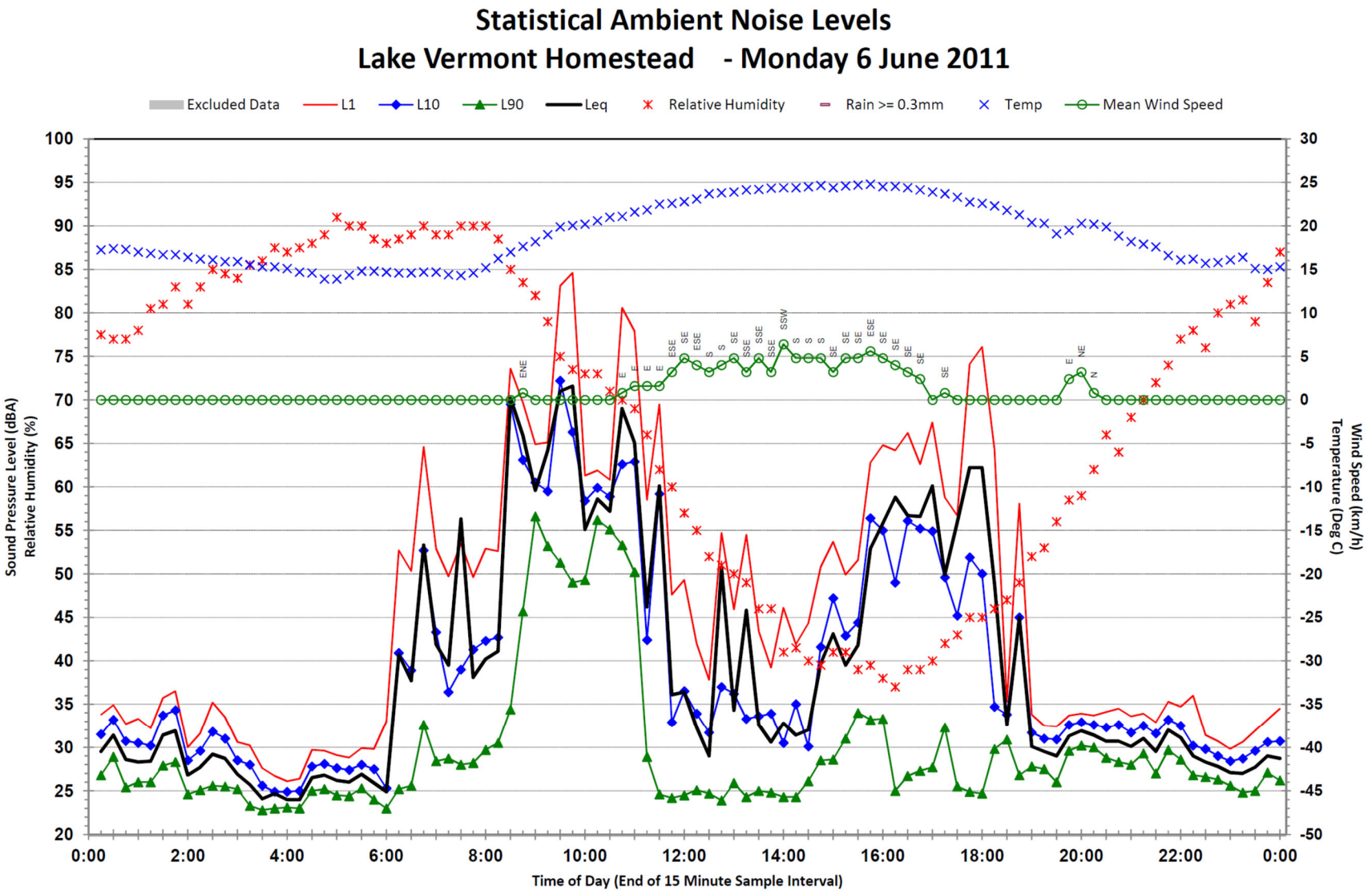

Statistical Ambient Noise Levels
Lake Vermont Homestead - Wednesday 1 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

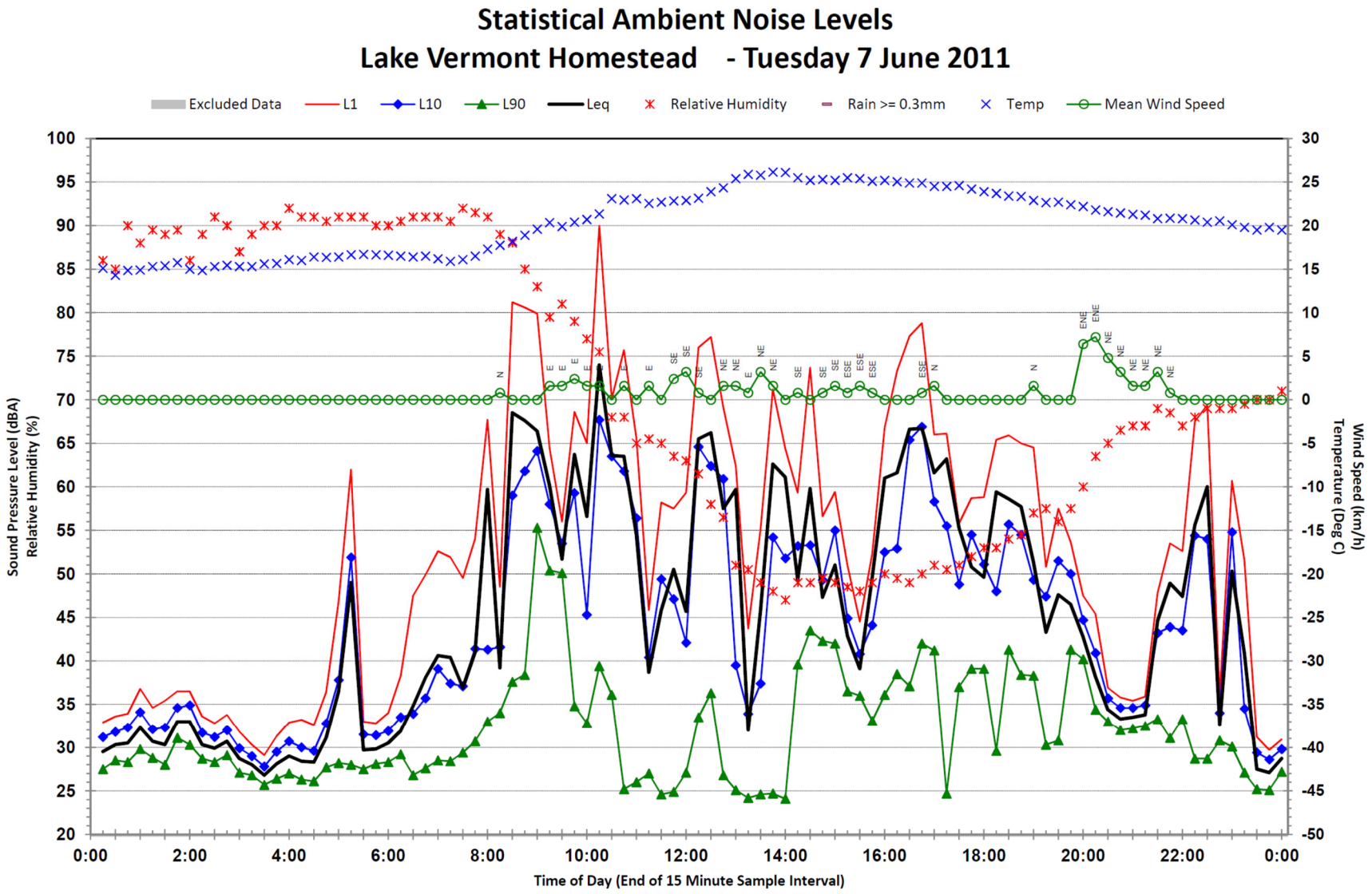

Statistical Ambient Noise Levels
Lake Vermont Homestead - Thursday 2 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

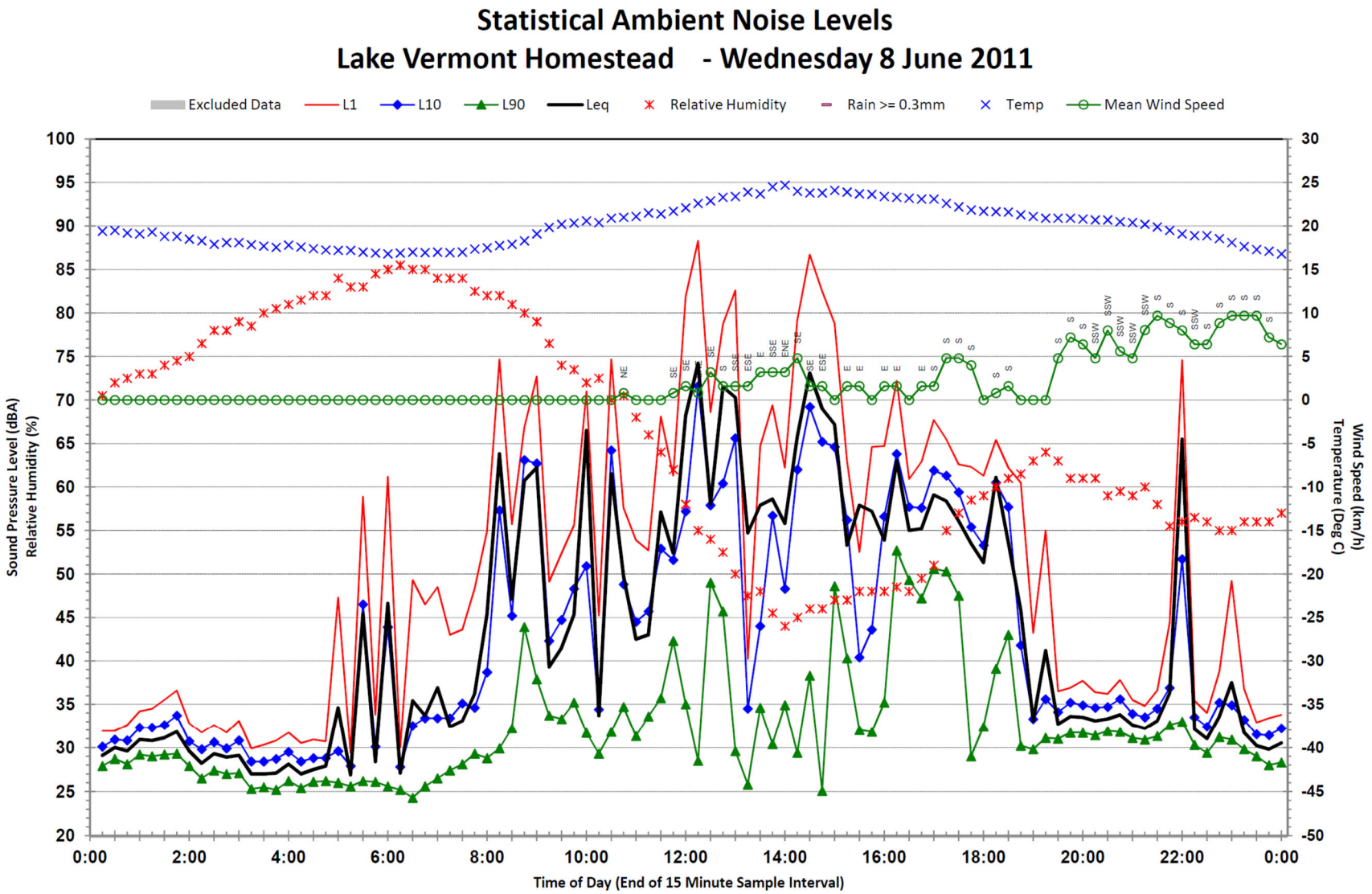

Statistical Ambient Noise Levels
Lake Vermont Homestead - Friday 3 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

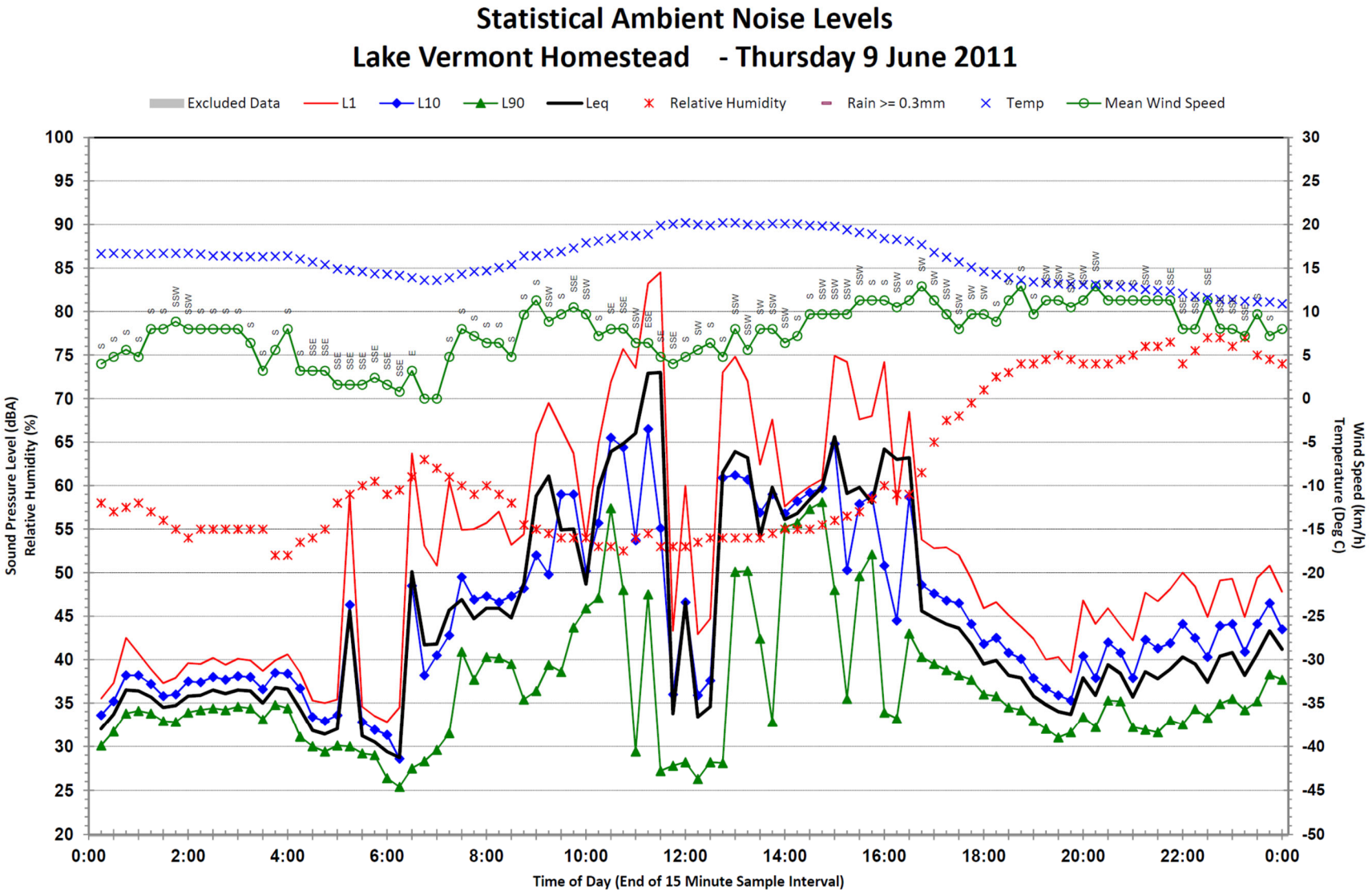

Statistical Ambient Noise Levels
Lake Vermont Homestead - Saturday 4 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

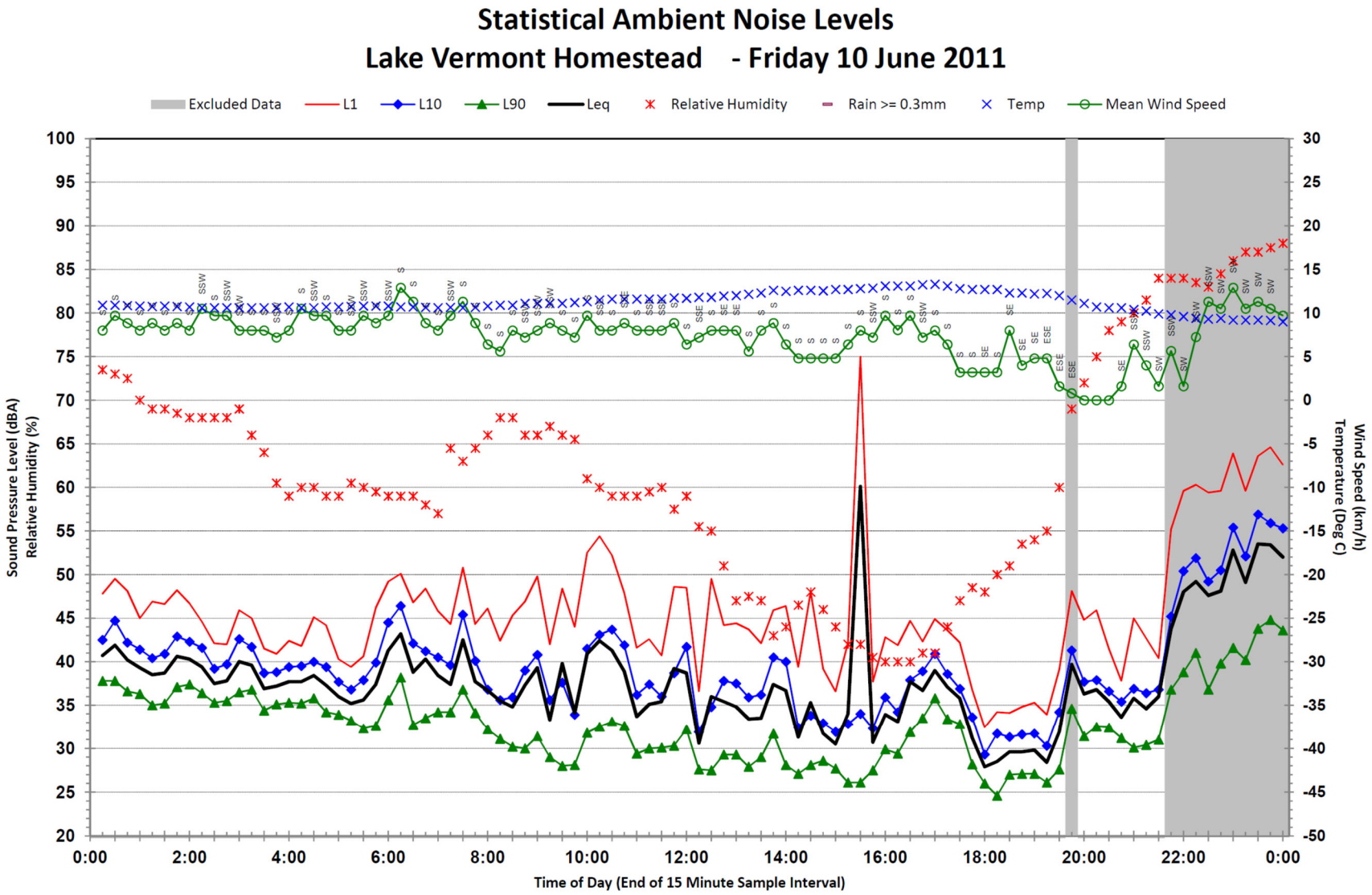

Statistical Ambient Noise Levels
Lake Vermont Homestead - Sunday 5 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

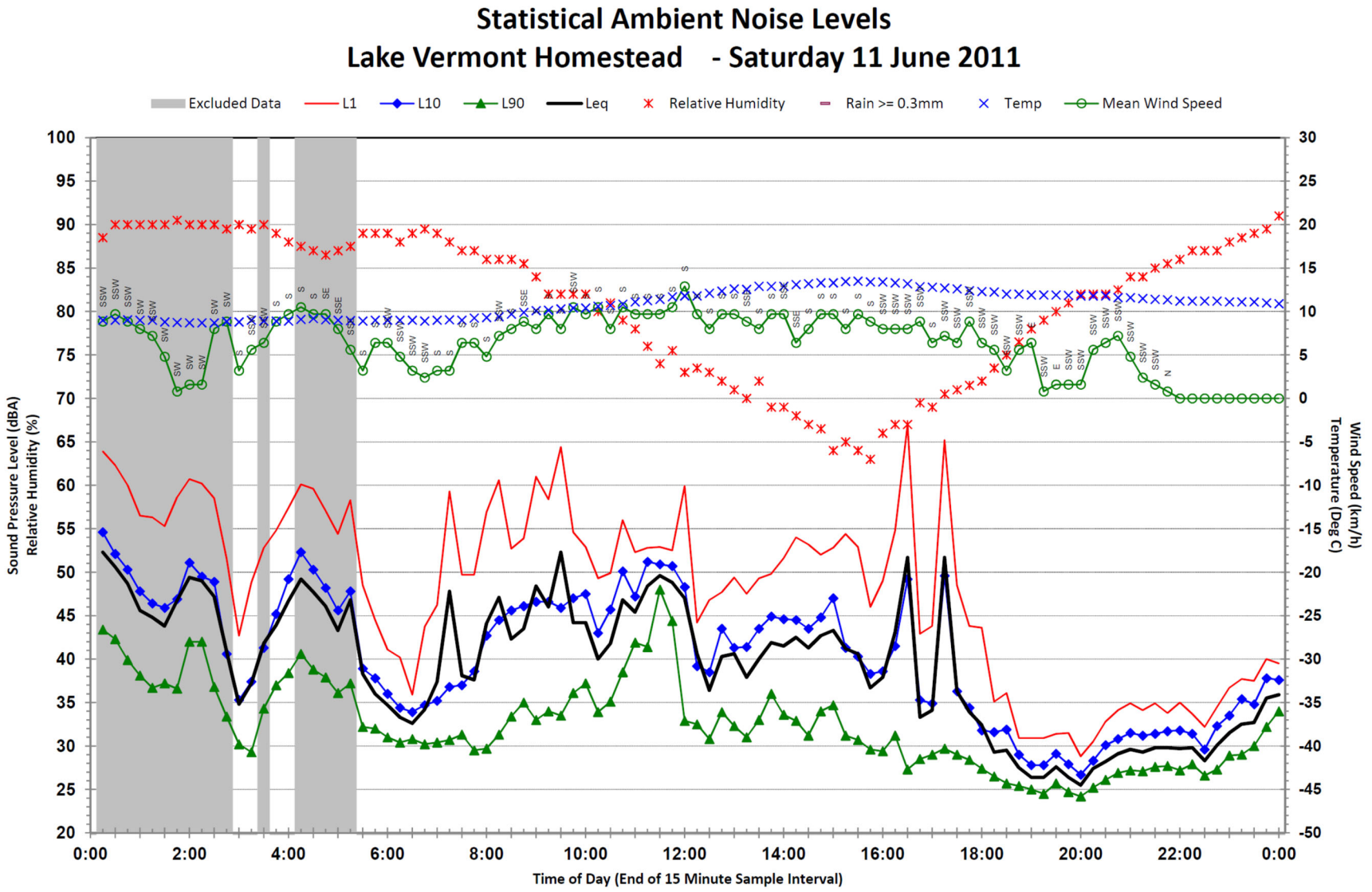

Statistical Ambient Noise Levels
Lake Vermont Homestead - Monday 6 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

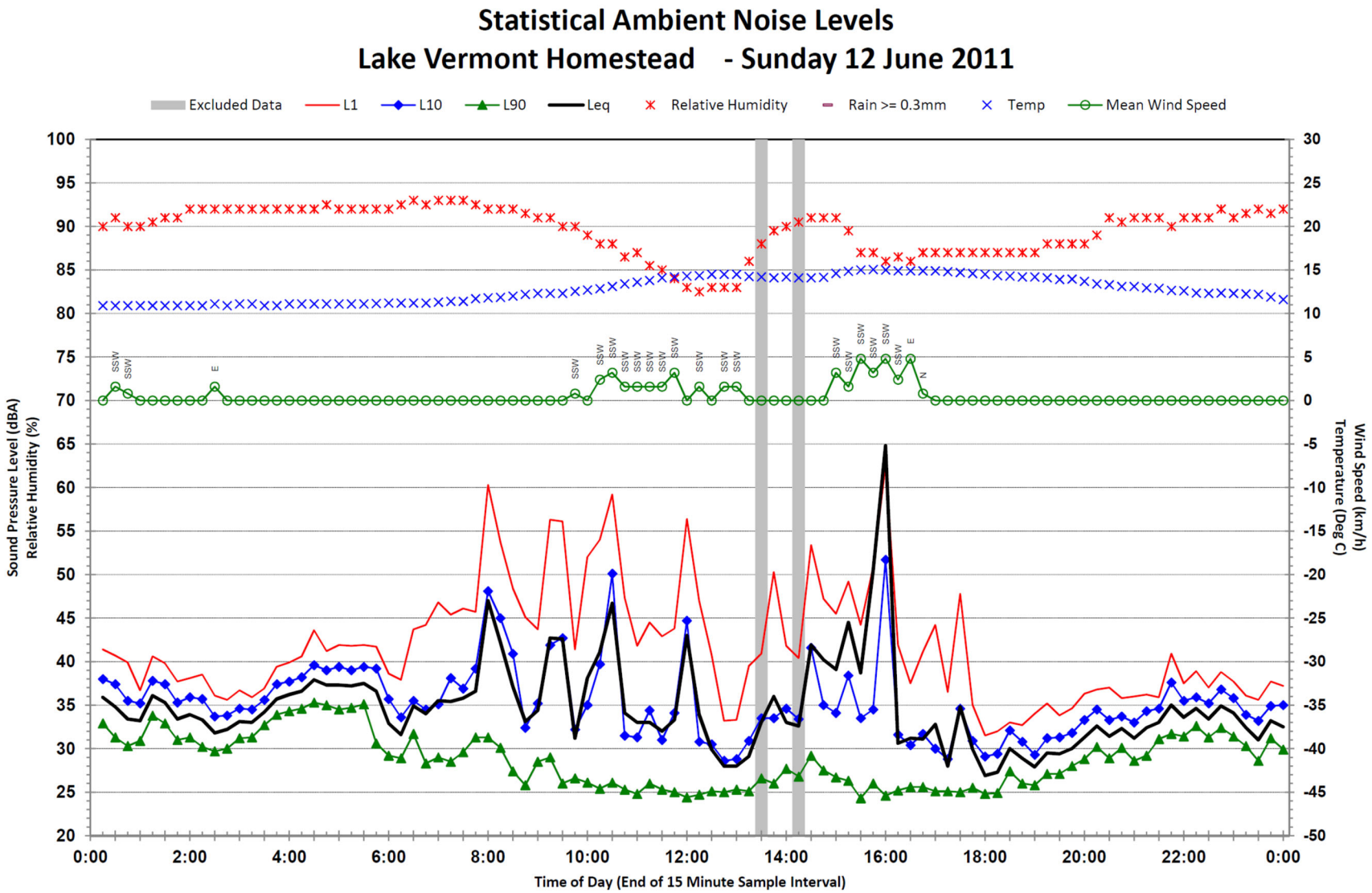

Statistical Ambient Noise Levels
Lake Vermont Homestead - Tuesday 7 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

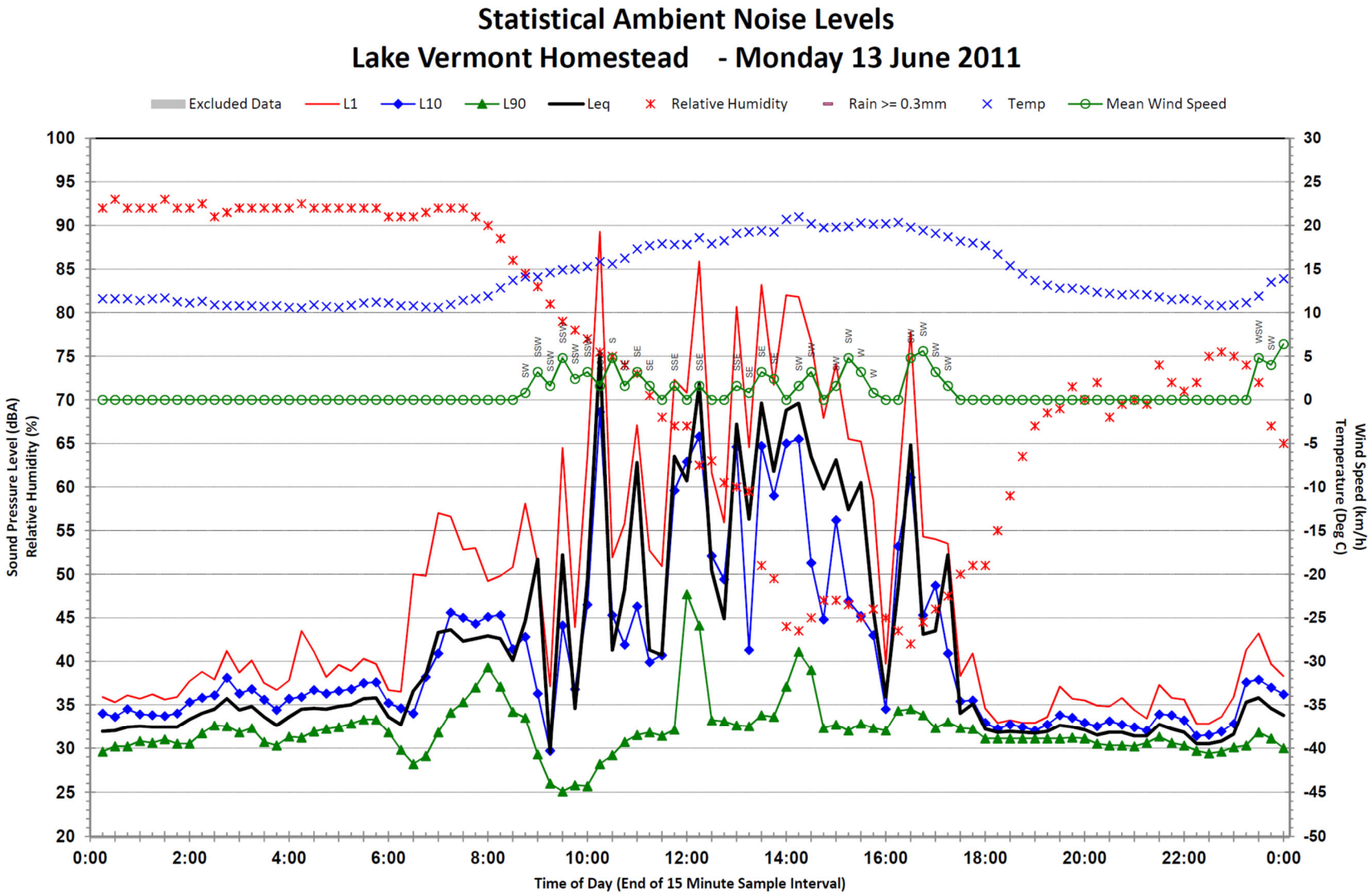

Statistical Ambient Noise Levels
Lake Vermont Homestead - Wednesday 8 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

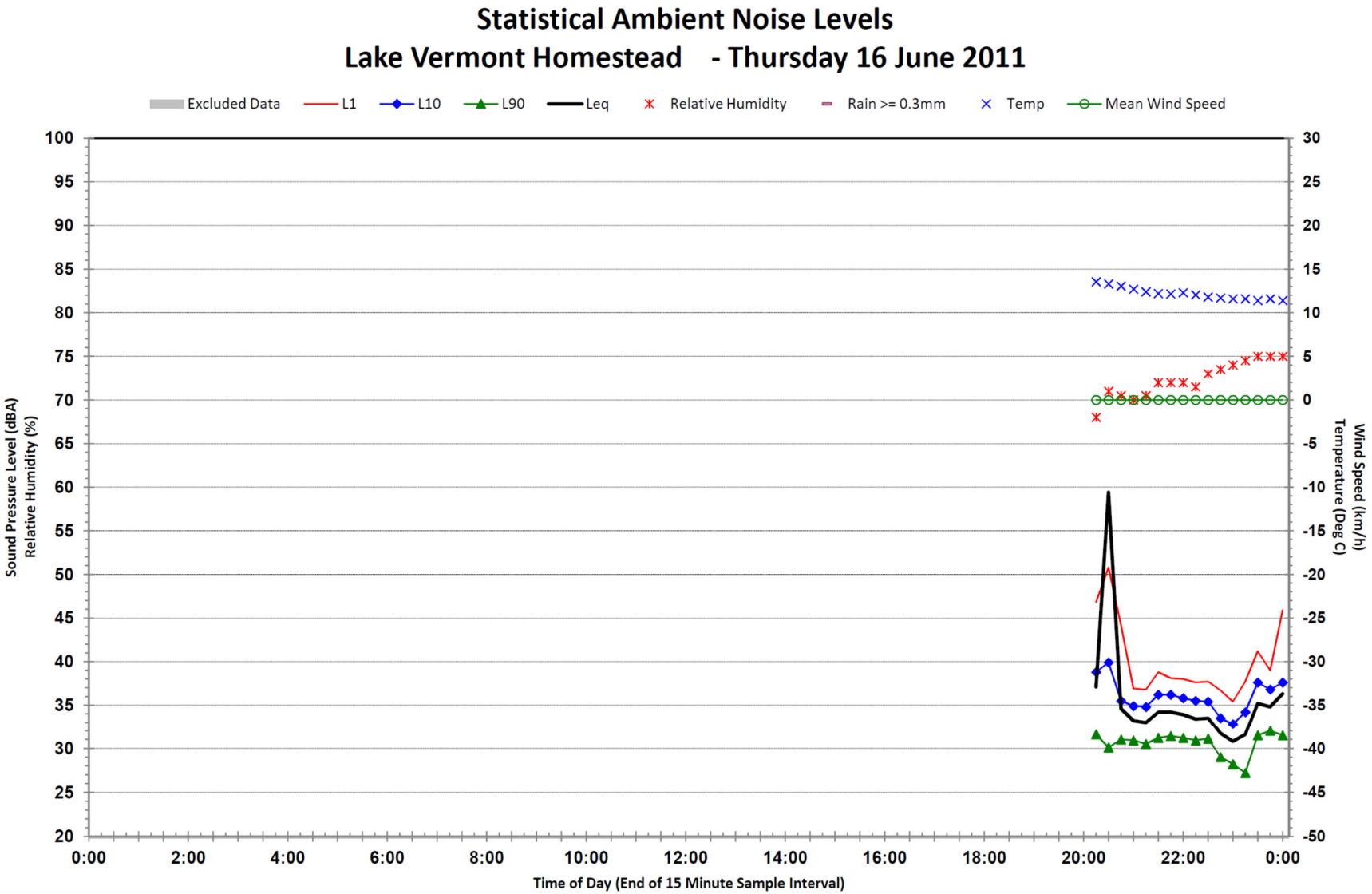

Statistical Ambient Noise Levels
Lake Vermont Homestead - Thursday 9 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

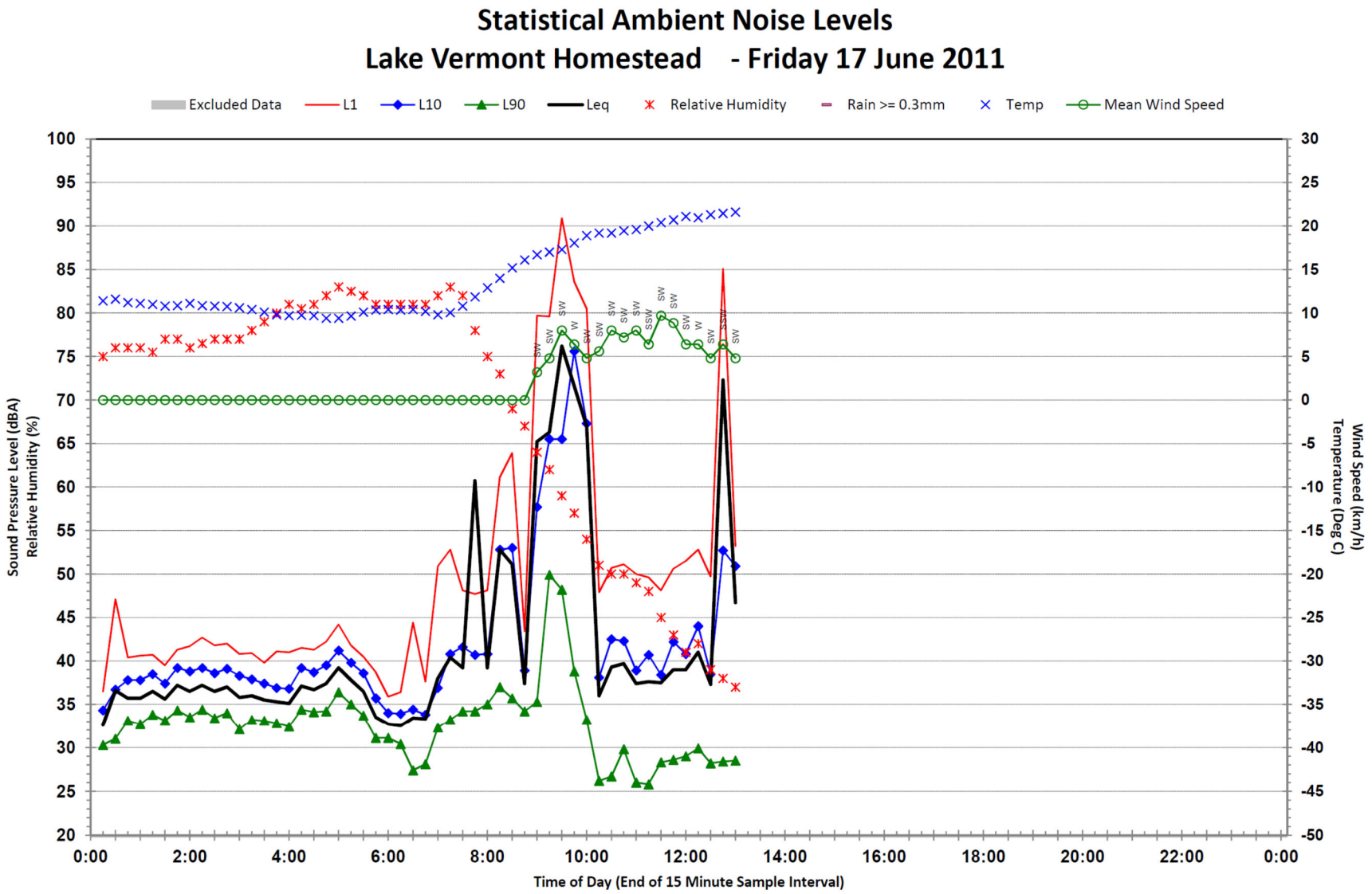

Statistical Ambient Noise Levels
Lake Vermont Homestead - Friday 10 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

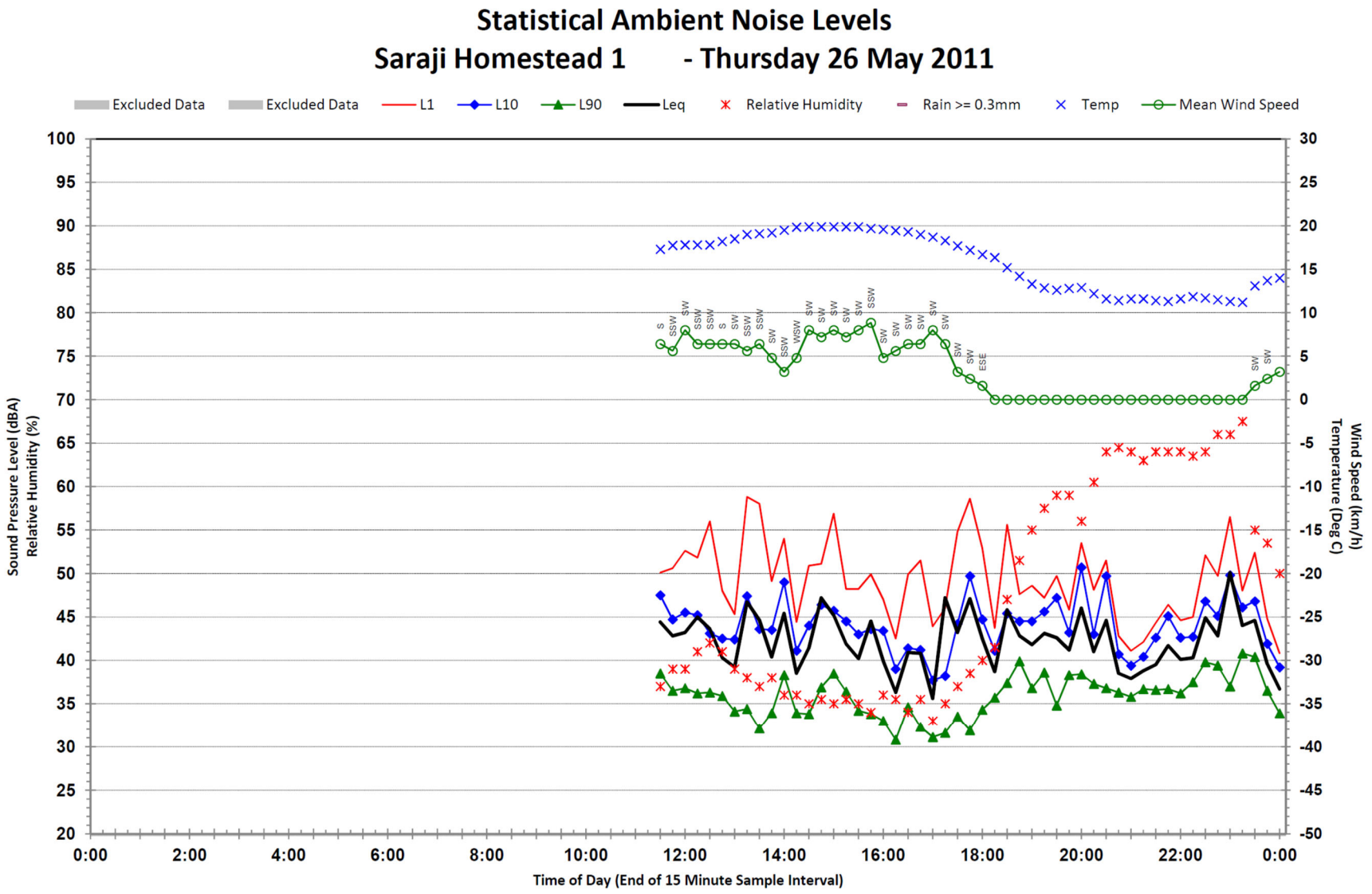

Statistical Ambient Noise Levels
Lake Vermont Homestead - Saturday 11 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

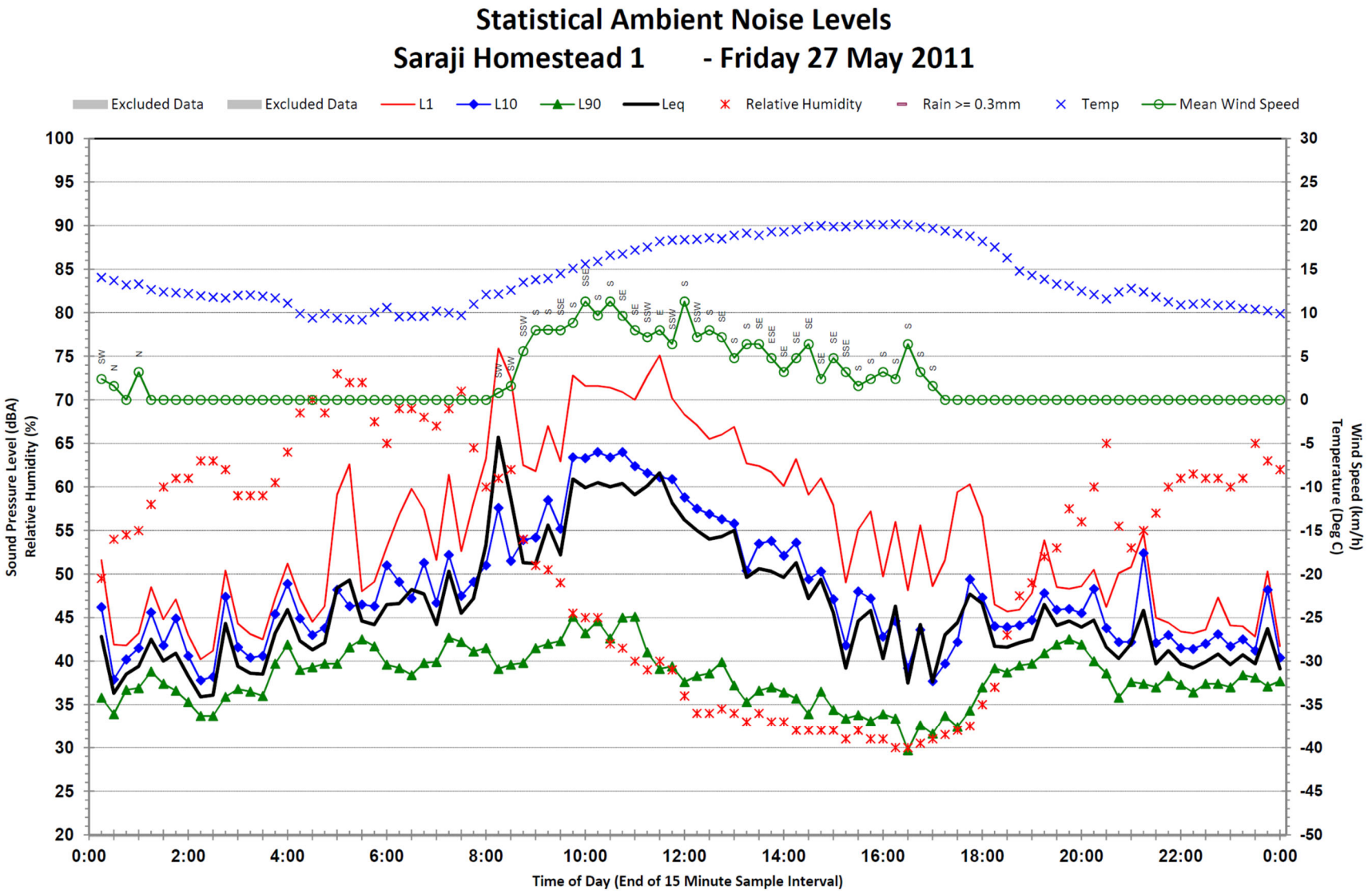

Statistical Ambient Noise Levels
Lake Vermont Homestead - Sunday 12 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

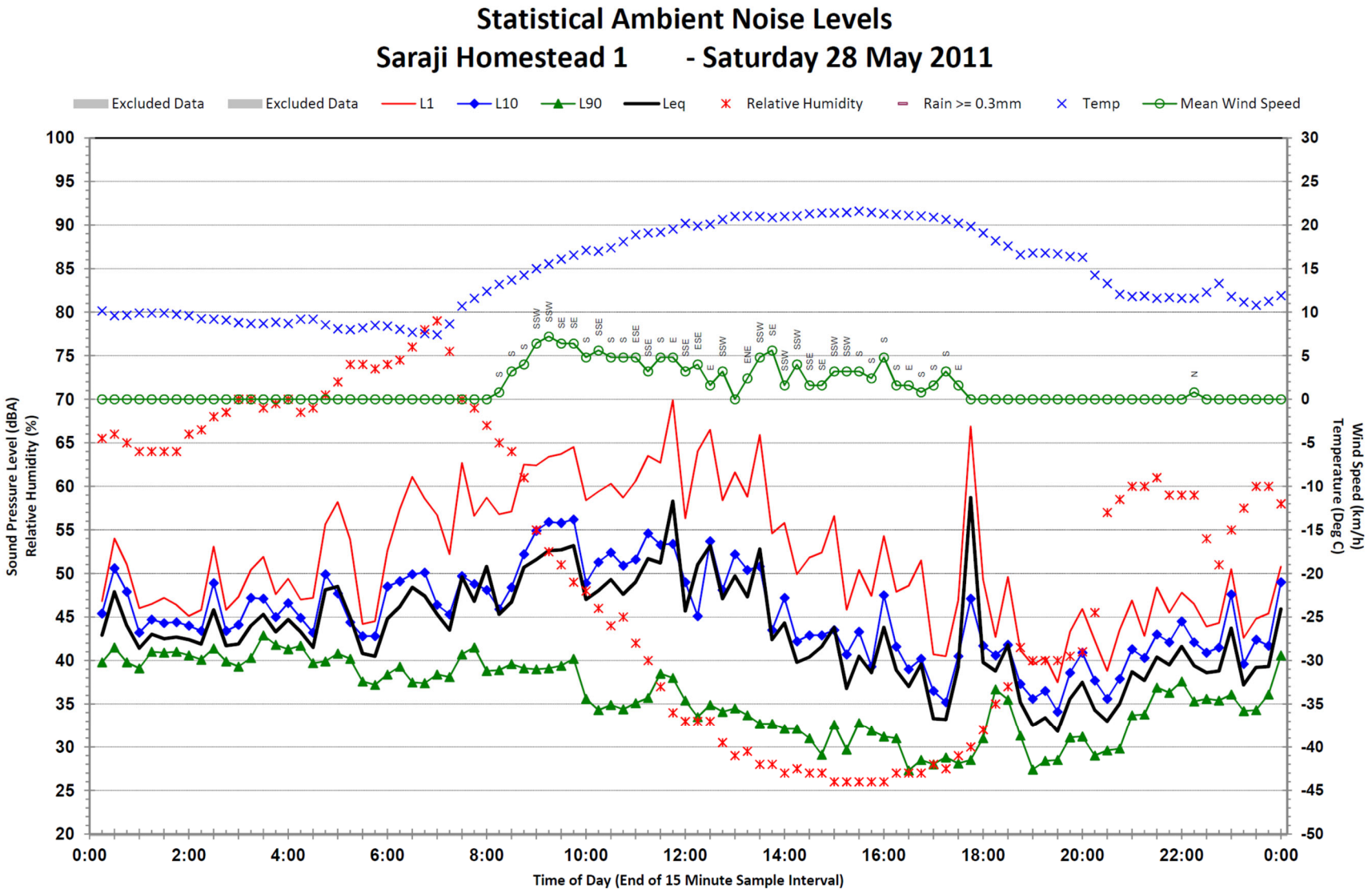

Statistical Ambient Noise Levels
Lake Vermont Homestead - Monday 13 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

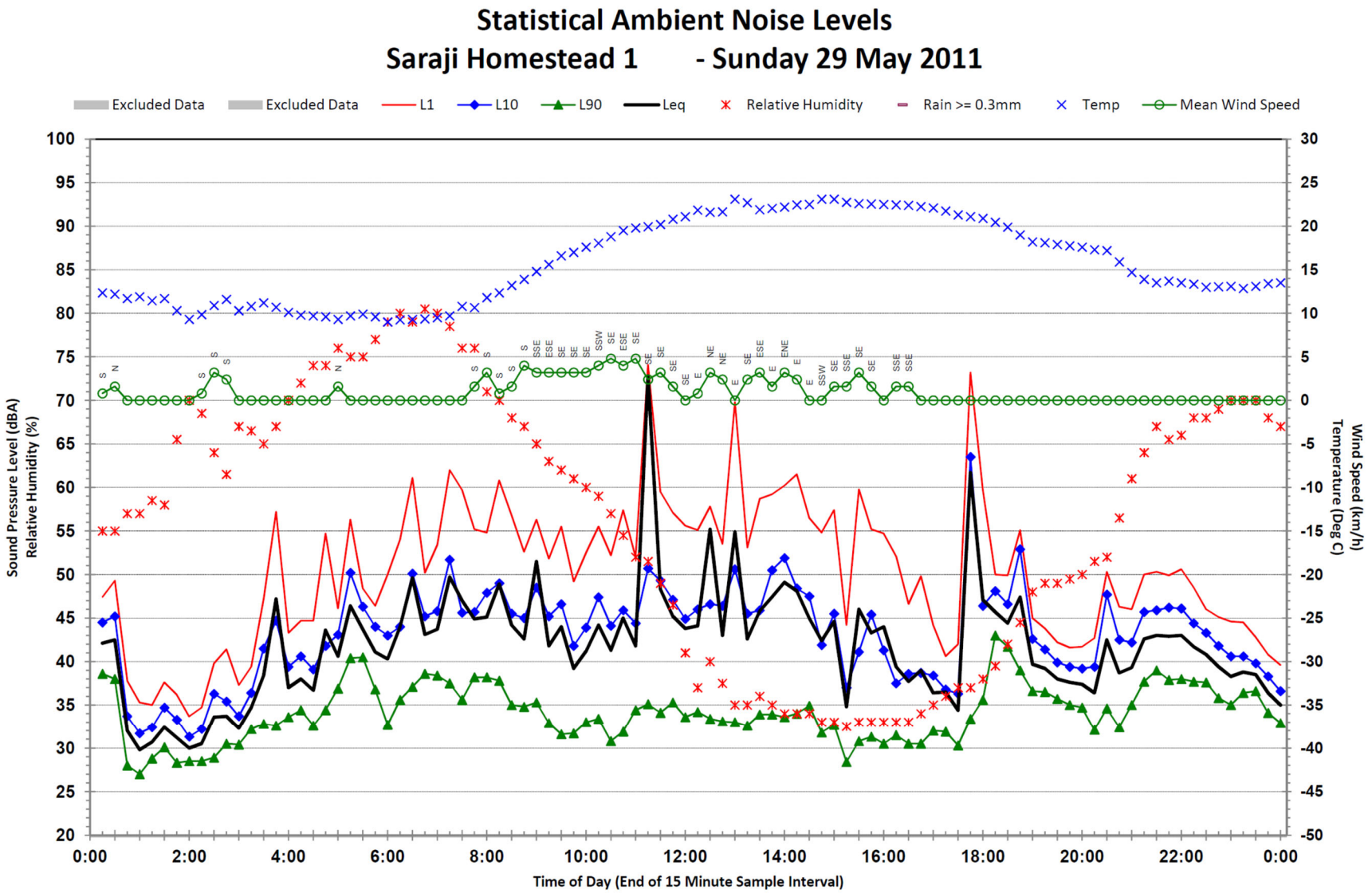

Statistical Ambient Noise Levels
Lake Vermont Homestead - Thursday 16 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

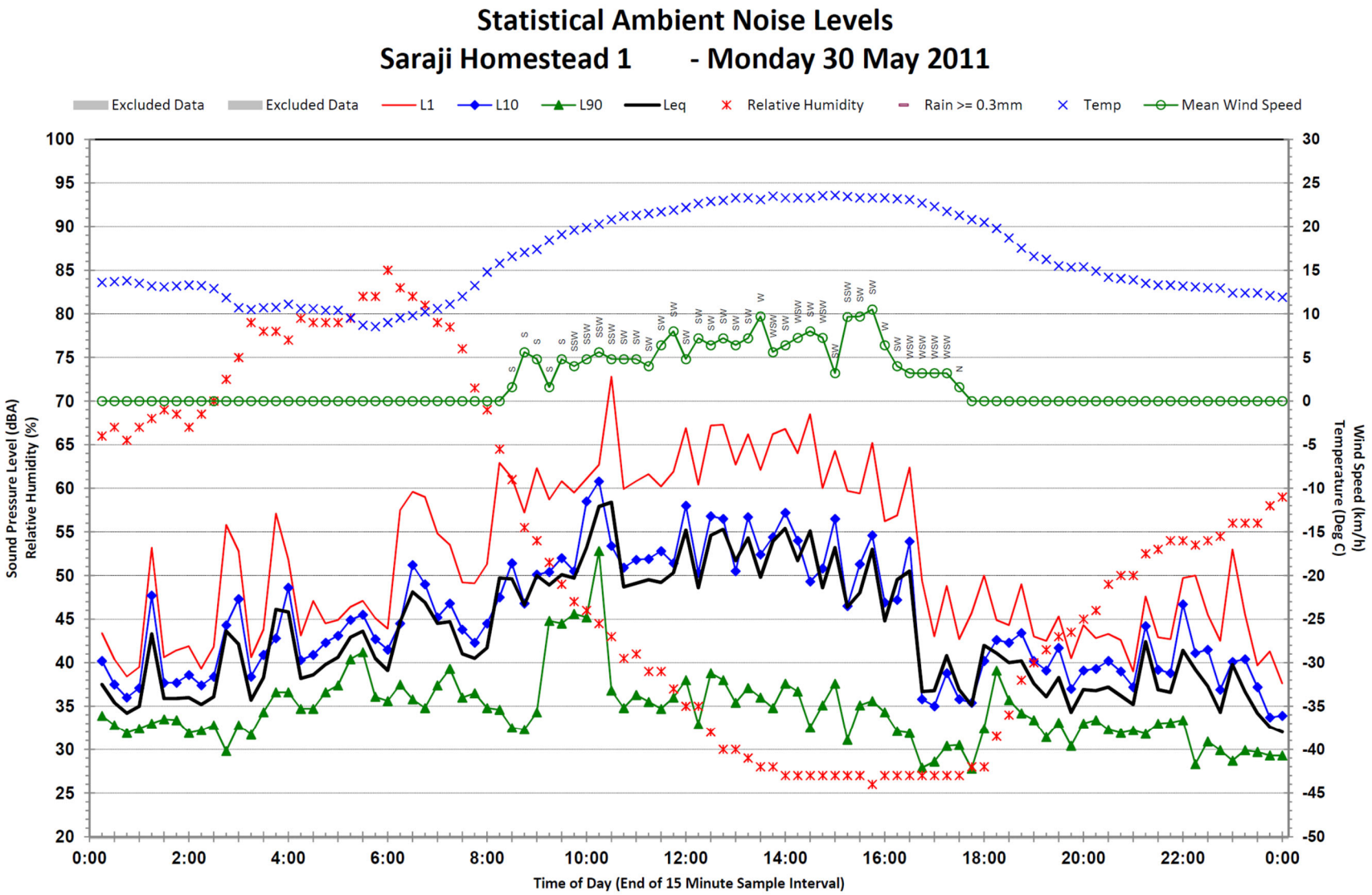

Statistical Ambient Noise Levels
Lake Vermont Homestead - Friday 17 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Saraji Homestead 1 - Thursday 26 May 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
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16:00
18:00
20:00
22:00
0:00

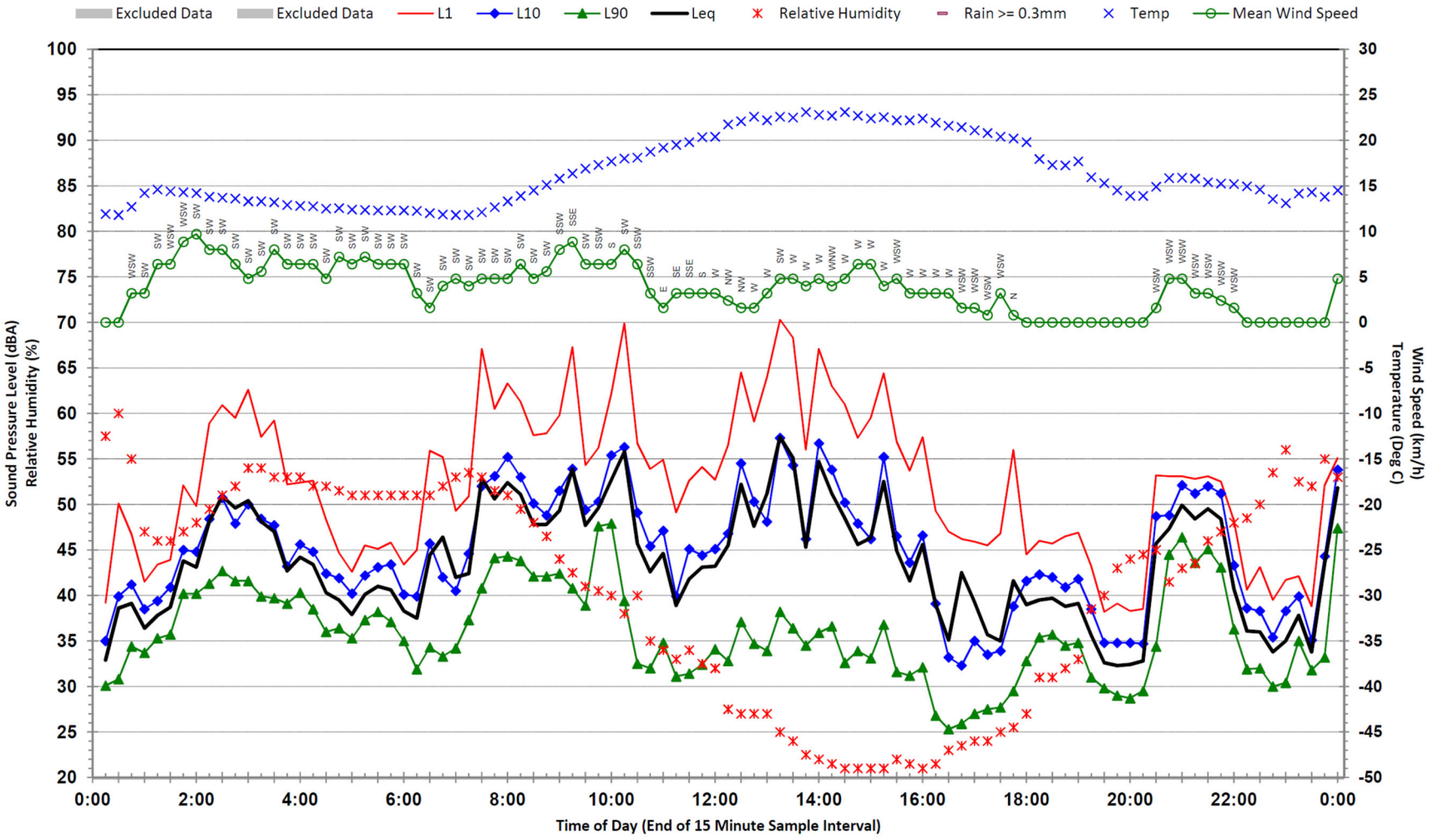

Statistical Ambient Noise Levels
Saraji Homestead 1 - Friday 27 May 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Saraji Homestead 1 - Saturday 28 May 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
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16:00
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20:00
22:00
0:00

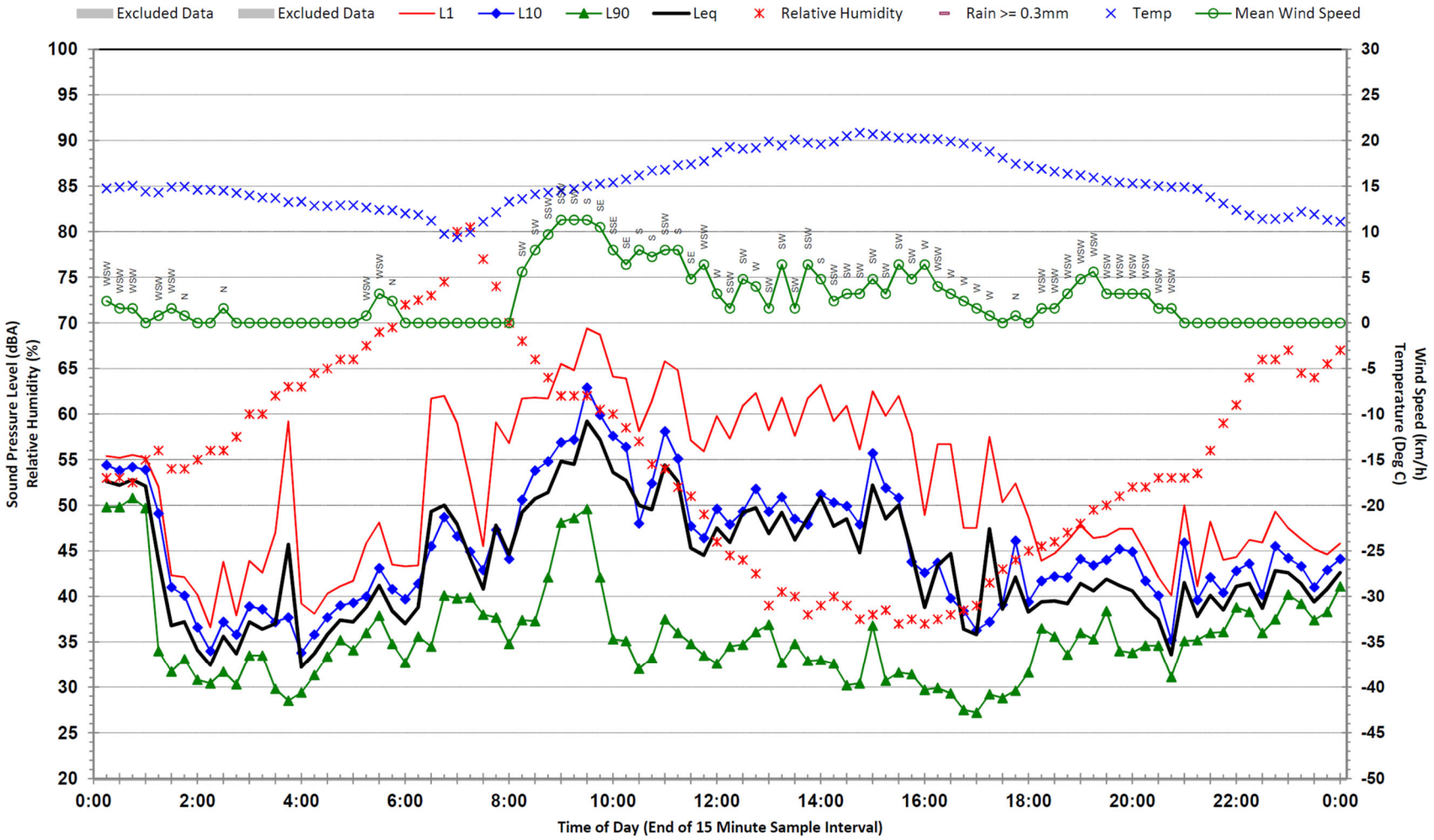

Statistical Ambient Noise Levels
Saraji Homestead 1 - Sunday 29 May 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

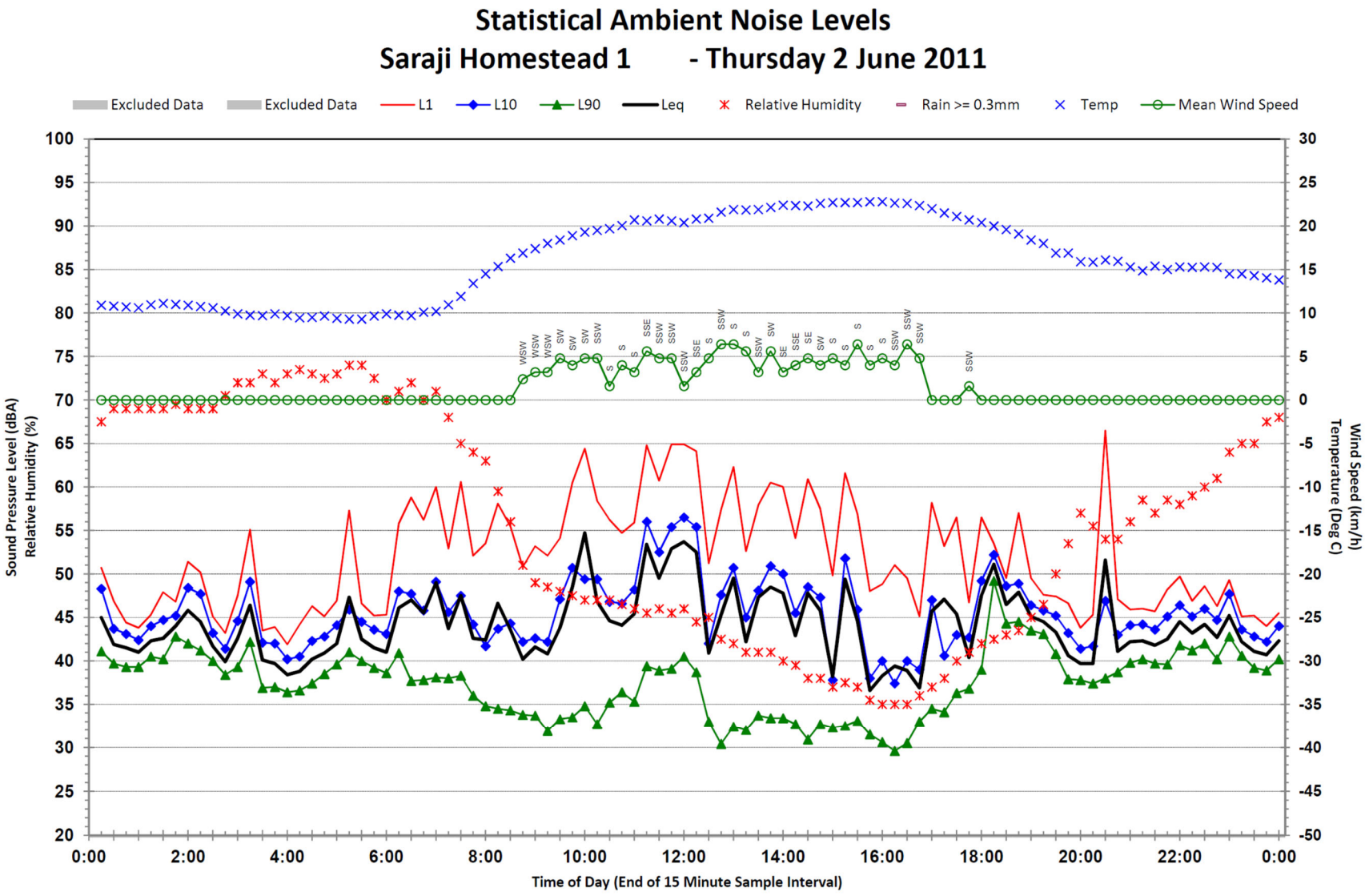

Statistical Ambient Noise Levels
Saraji Homestead 1 - Monday 30 May 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

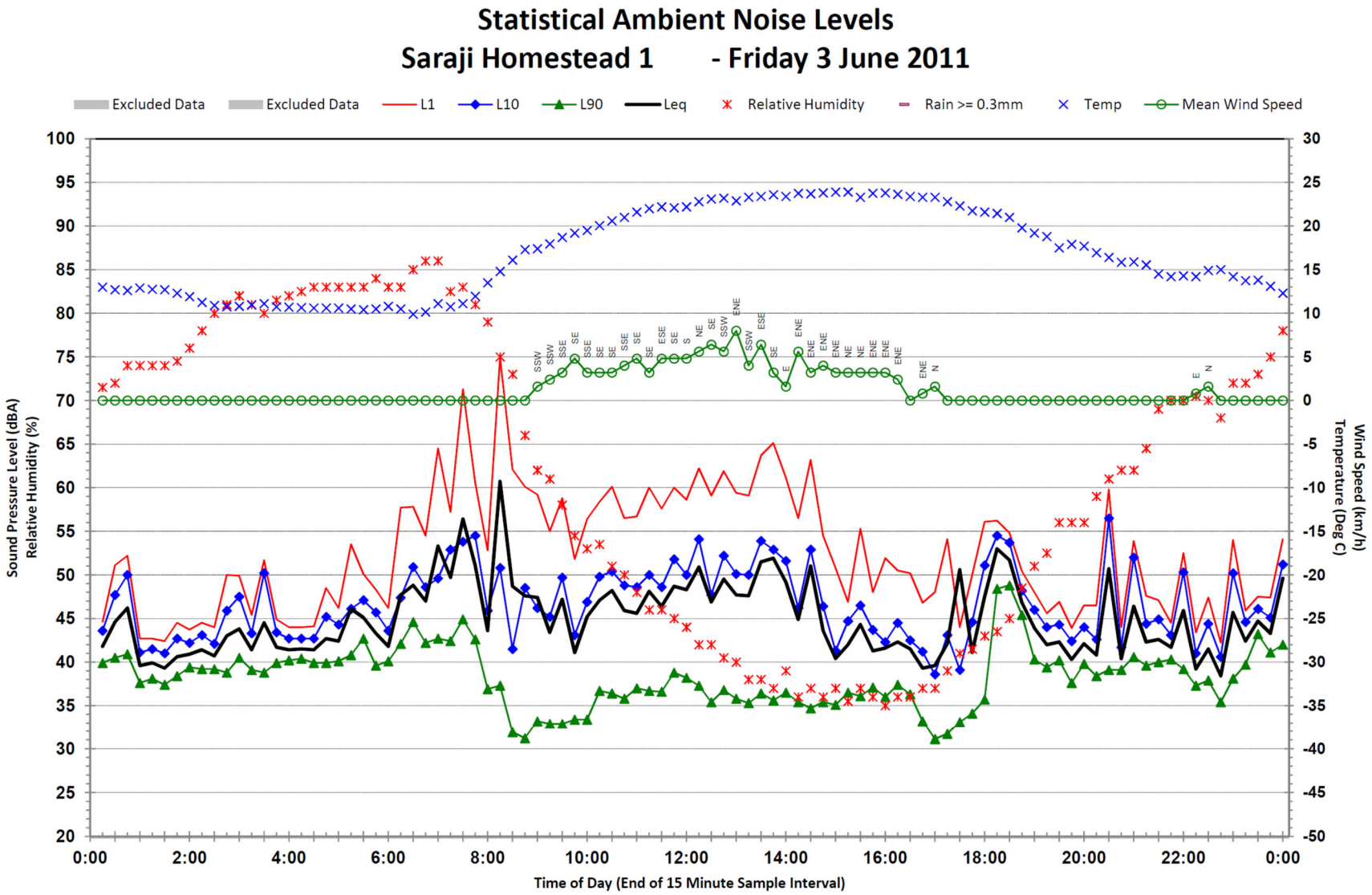
Statistical Ambient Noise Levels
Saraji Homestead 1 - Tuesday 31 May 2011

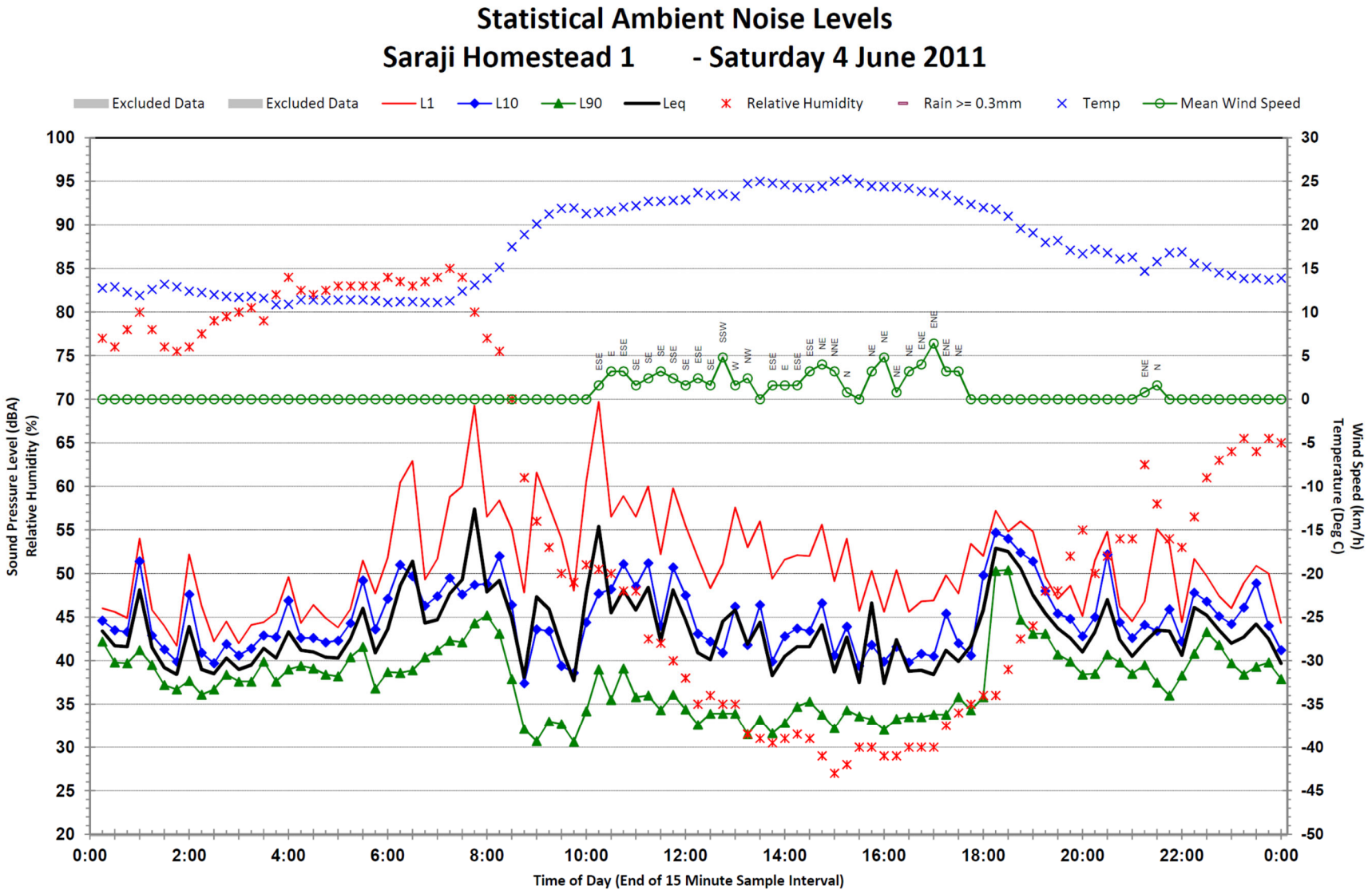


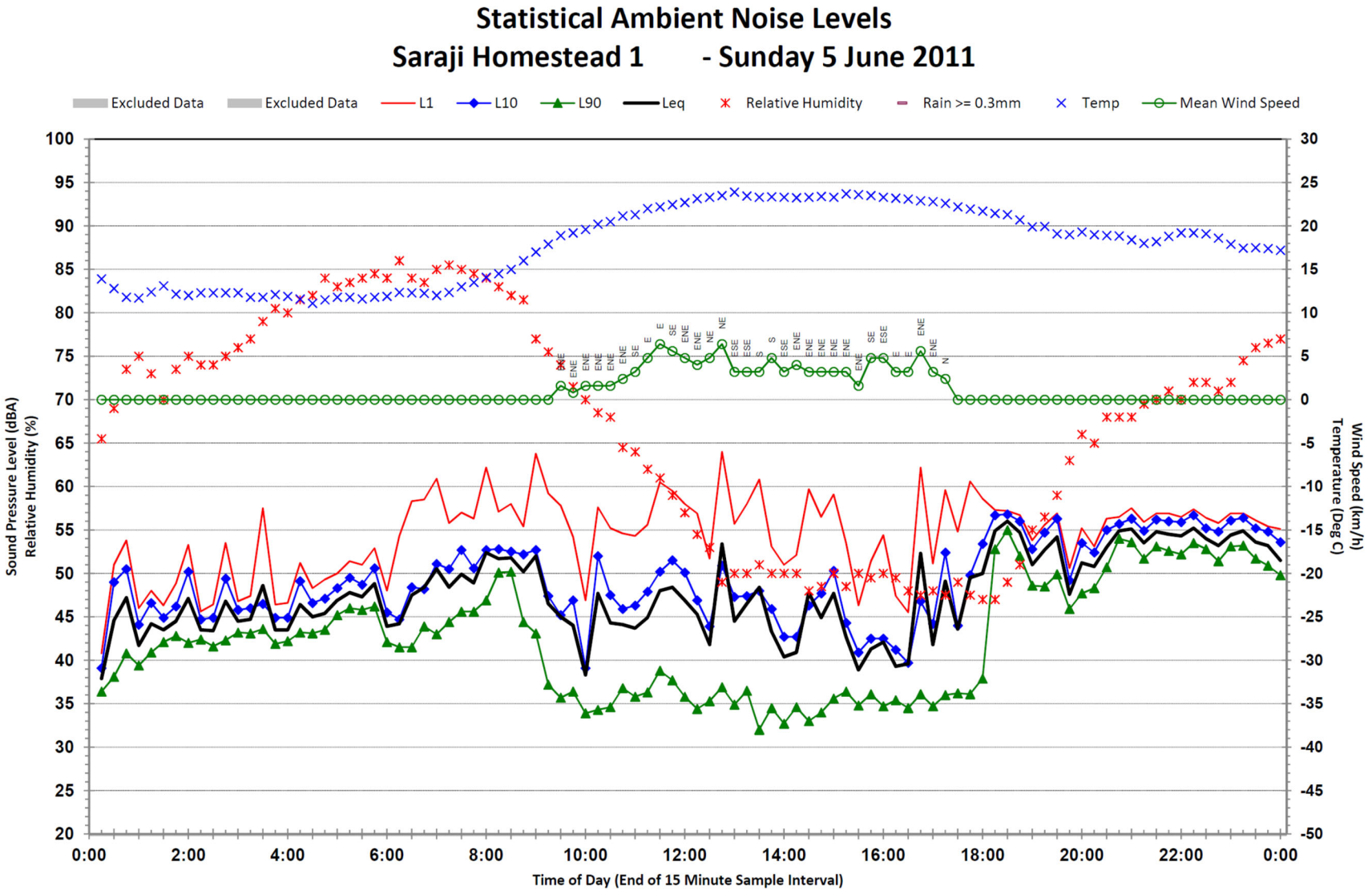
Statistical Ambient Noise Levels
Saraji Homestead 1 - Wednesday 1 June 2011

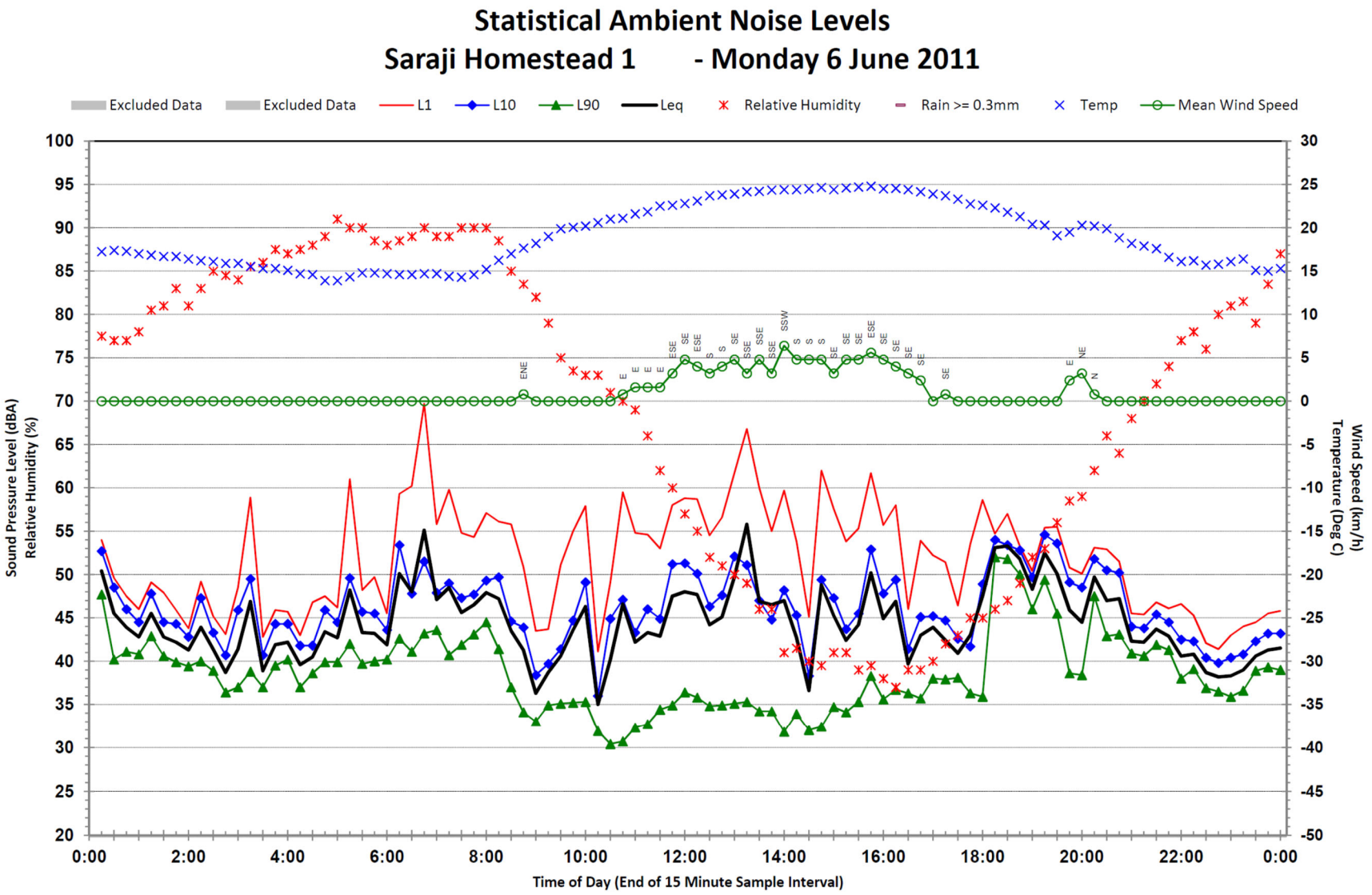


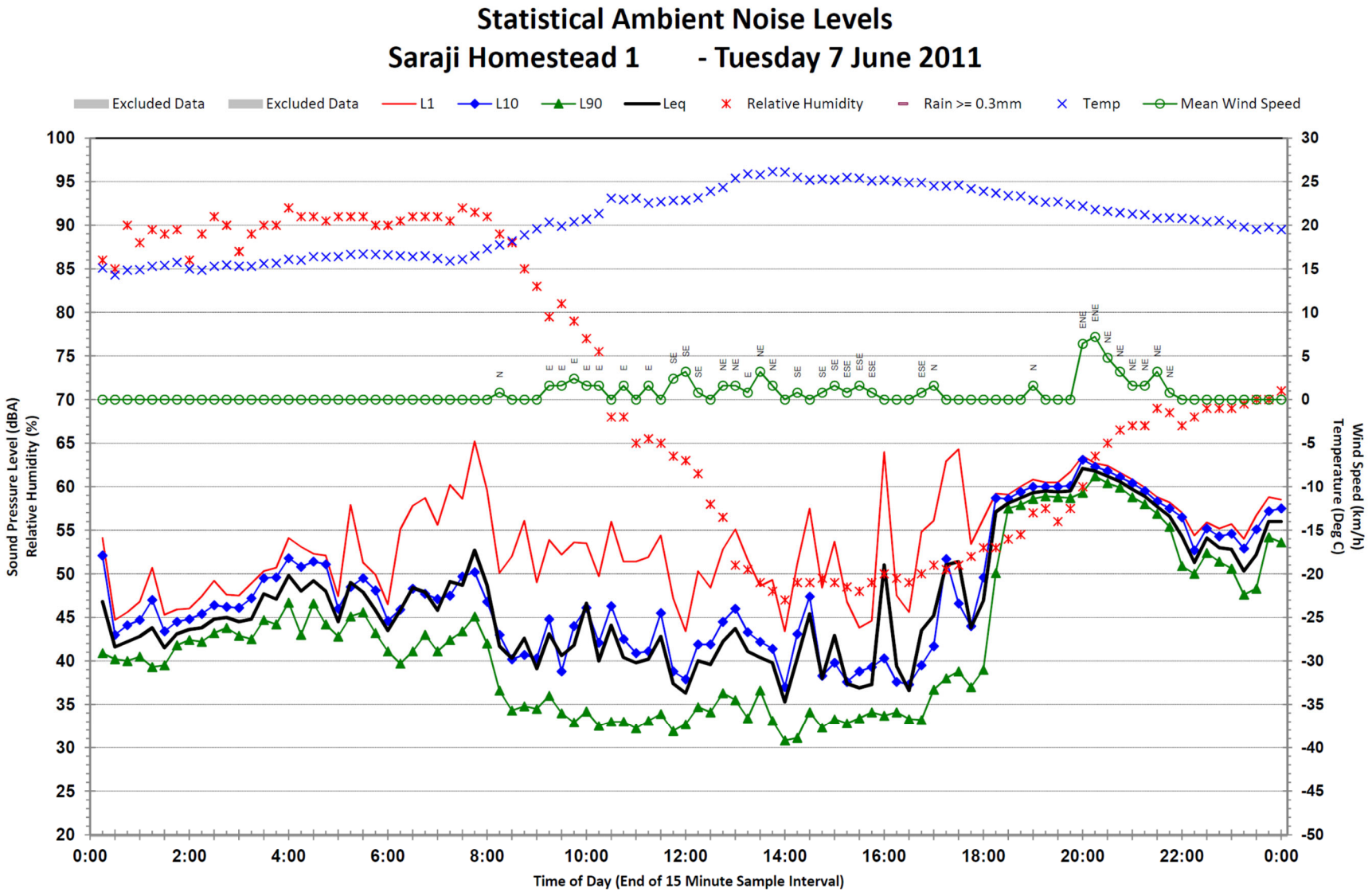

Statistical Ambient Noise Levels
Saraji Homestead 1 - Thursday 2 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Saraji Homestead 1 - Friday 3 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

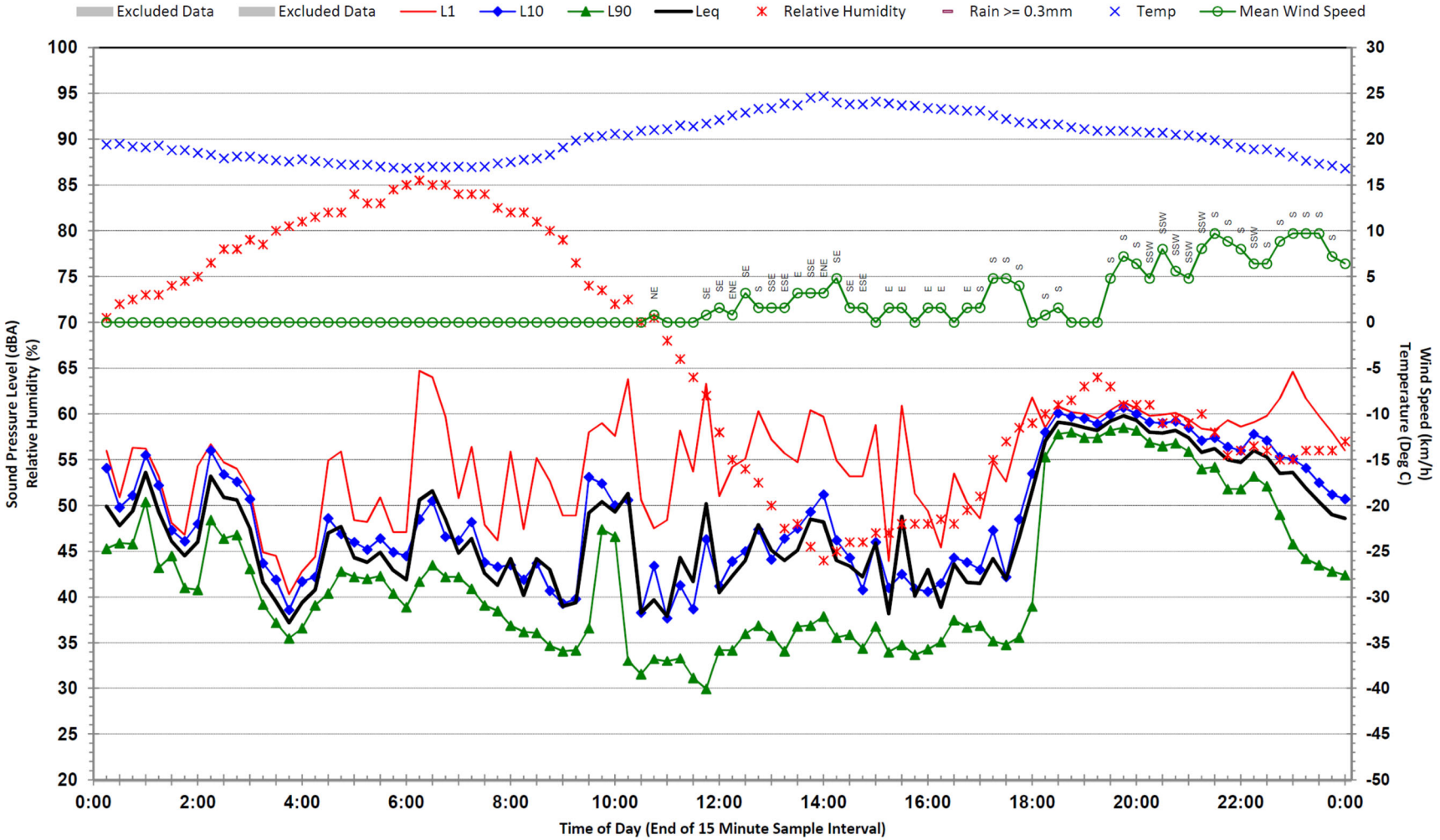

Statistical Ambient Noise Levels
Saraji Homestead 1 - Saturday 4 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

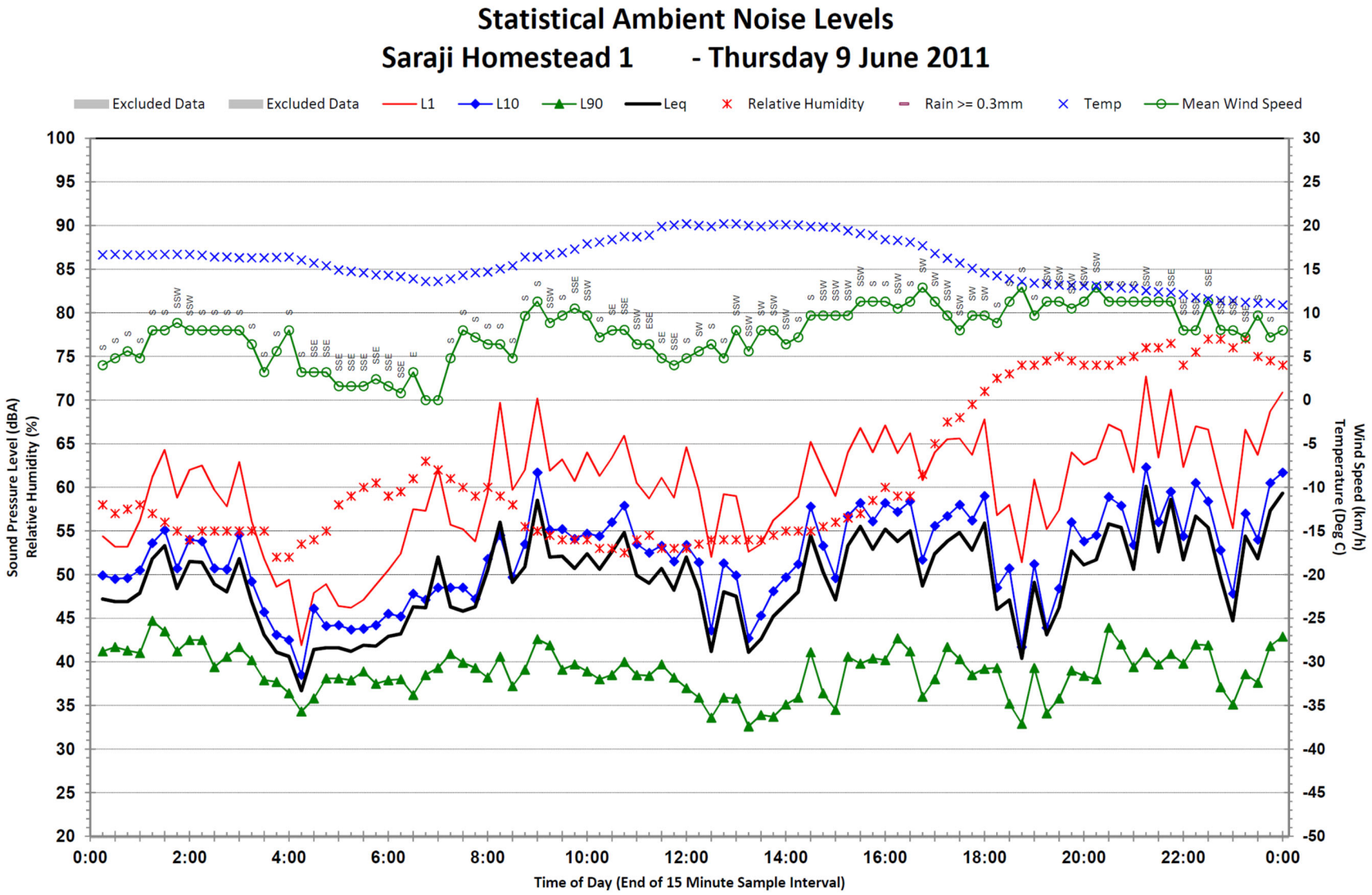

Statistical Ambient Noise Levels
Saraji Homestead 1 - Sunday 5 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

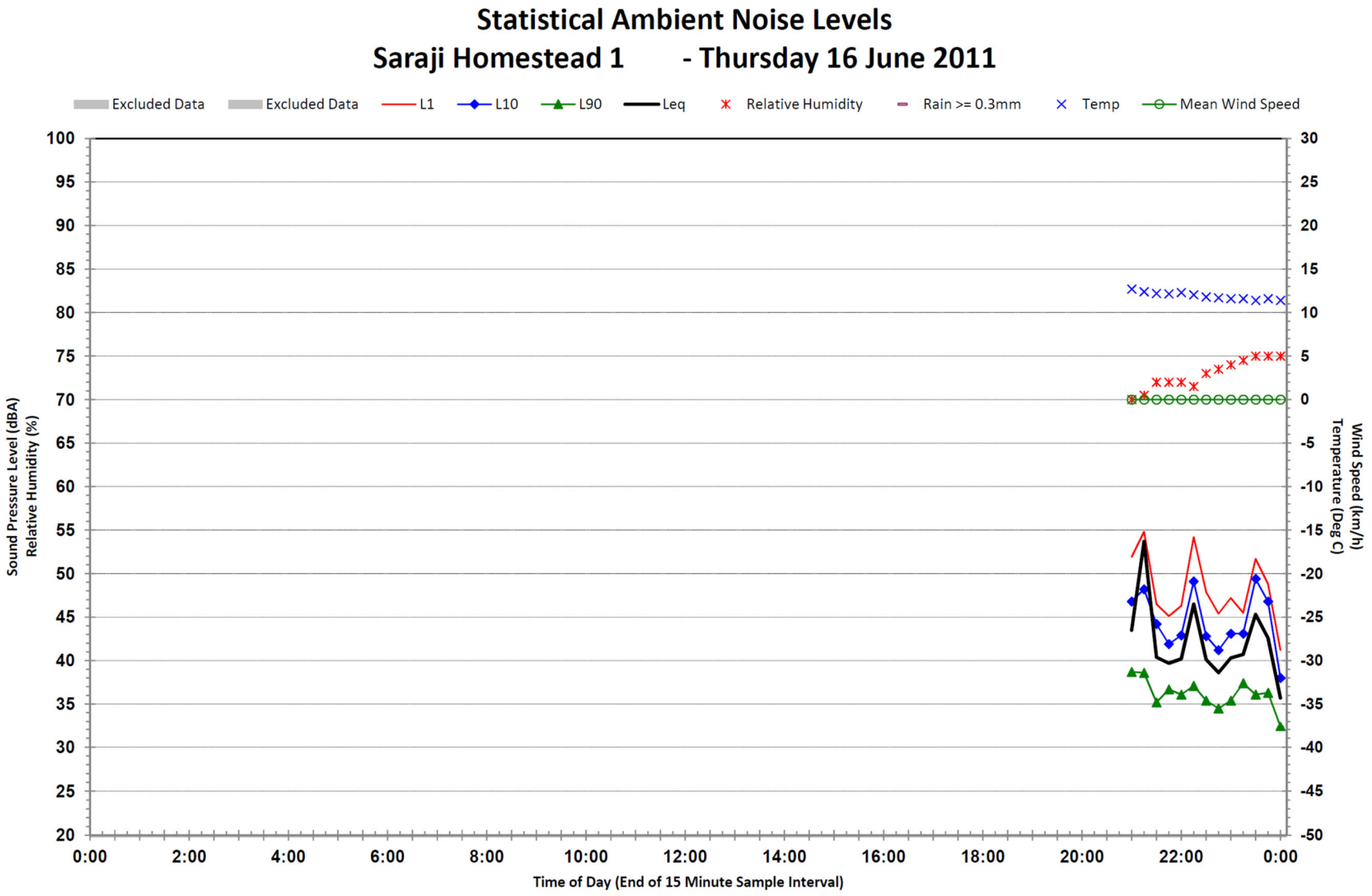

Statistical Ambient Noise Levels
Saraji Homestead 1 - Monday 6 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

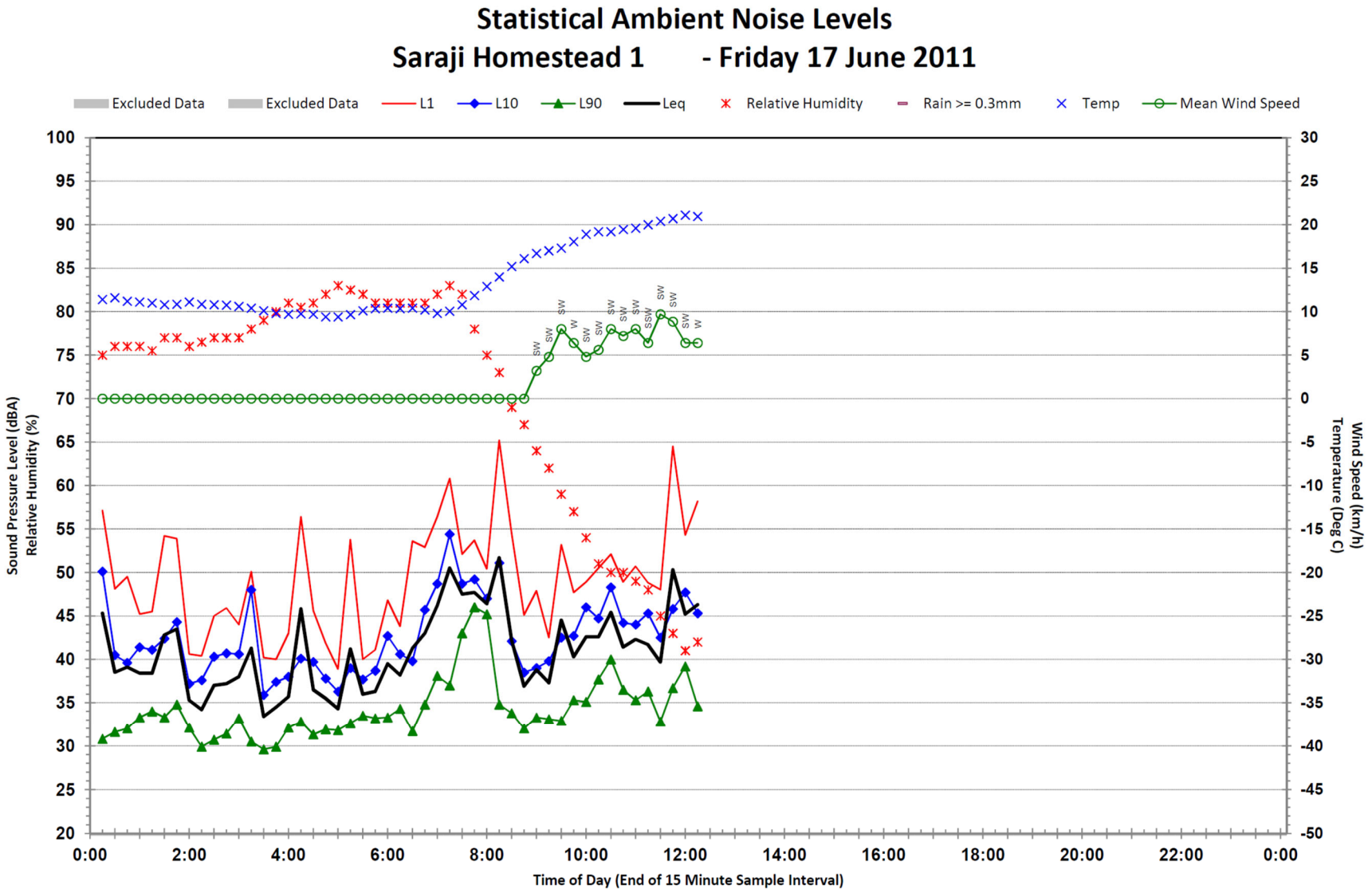

Statistical Ambient Noise Levels
Saraji Homestead 1 - Tuesday 7 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

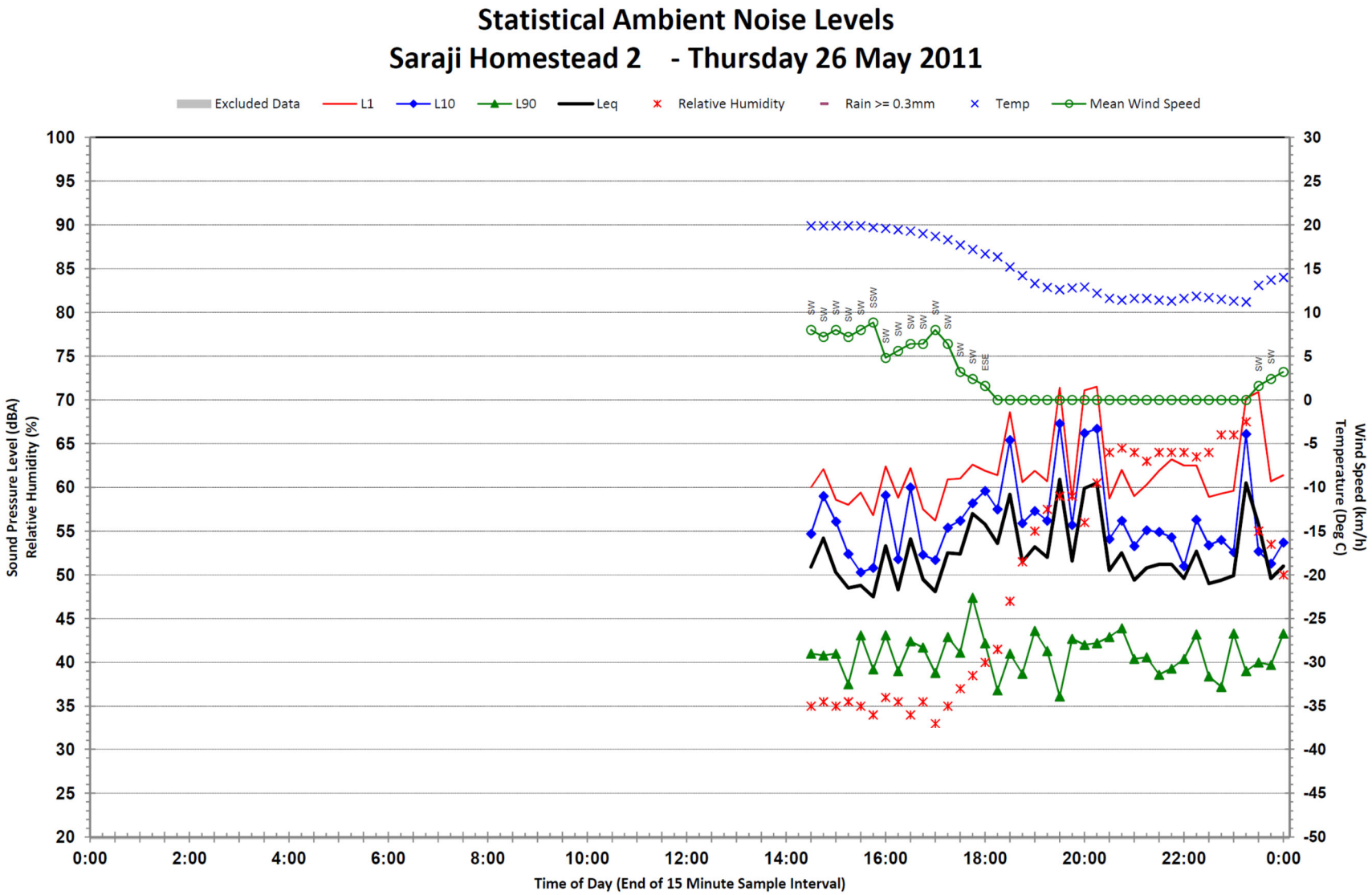
Statistical Ambient Noise Levels
Saraji Homestead 1 - Wednesday 8 June 2011

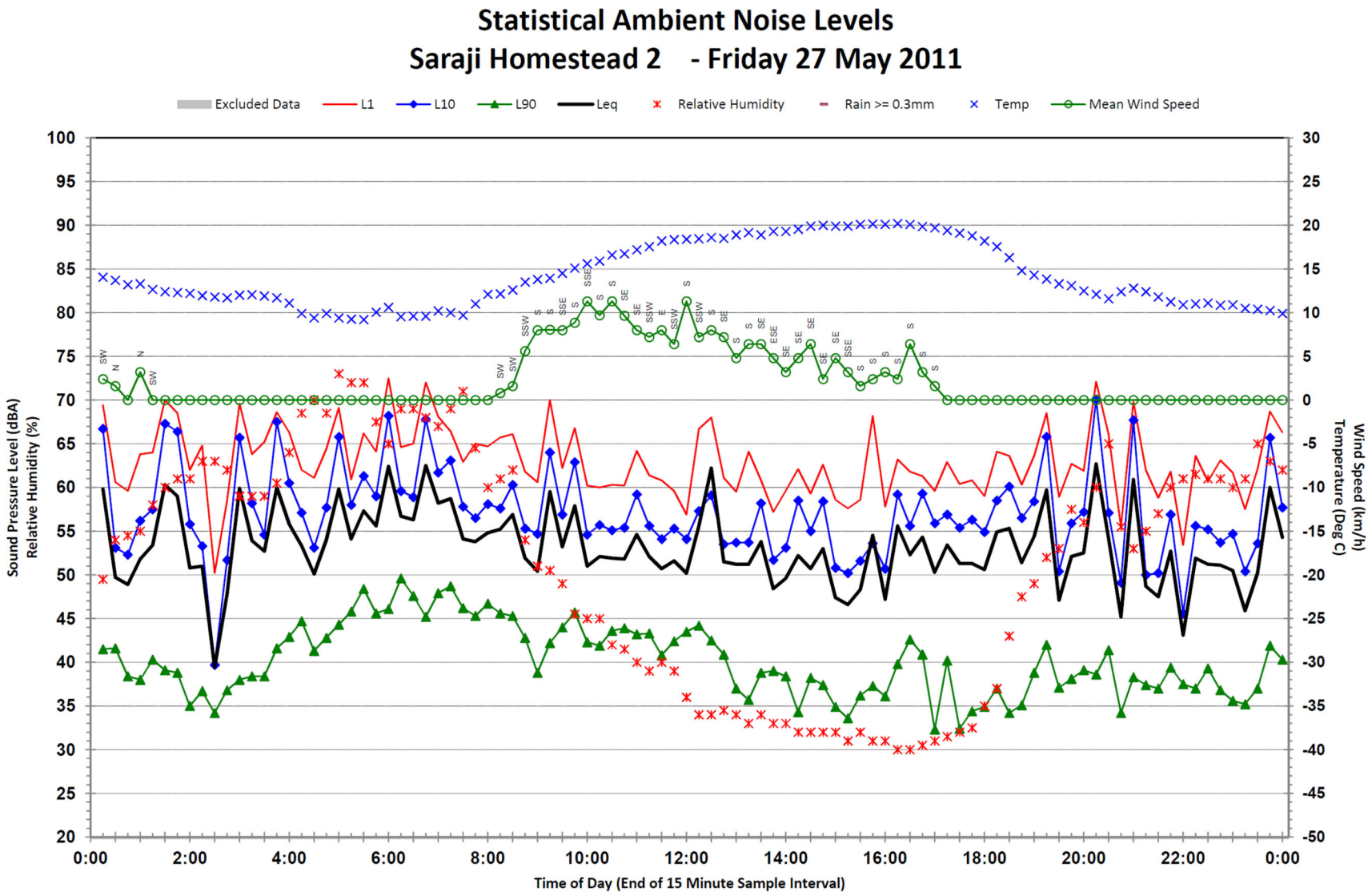


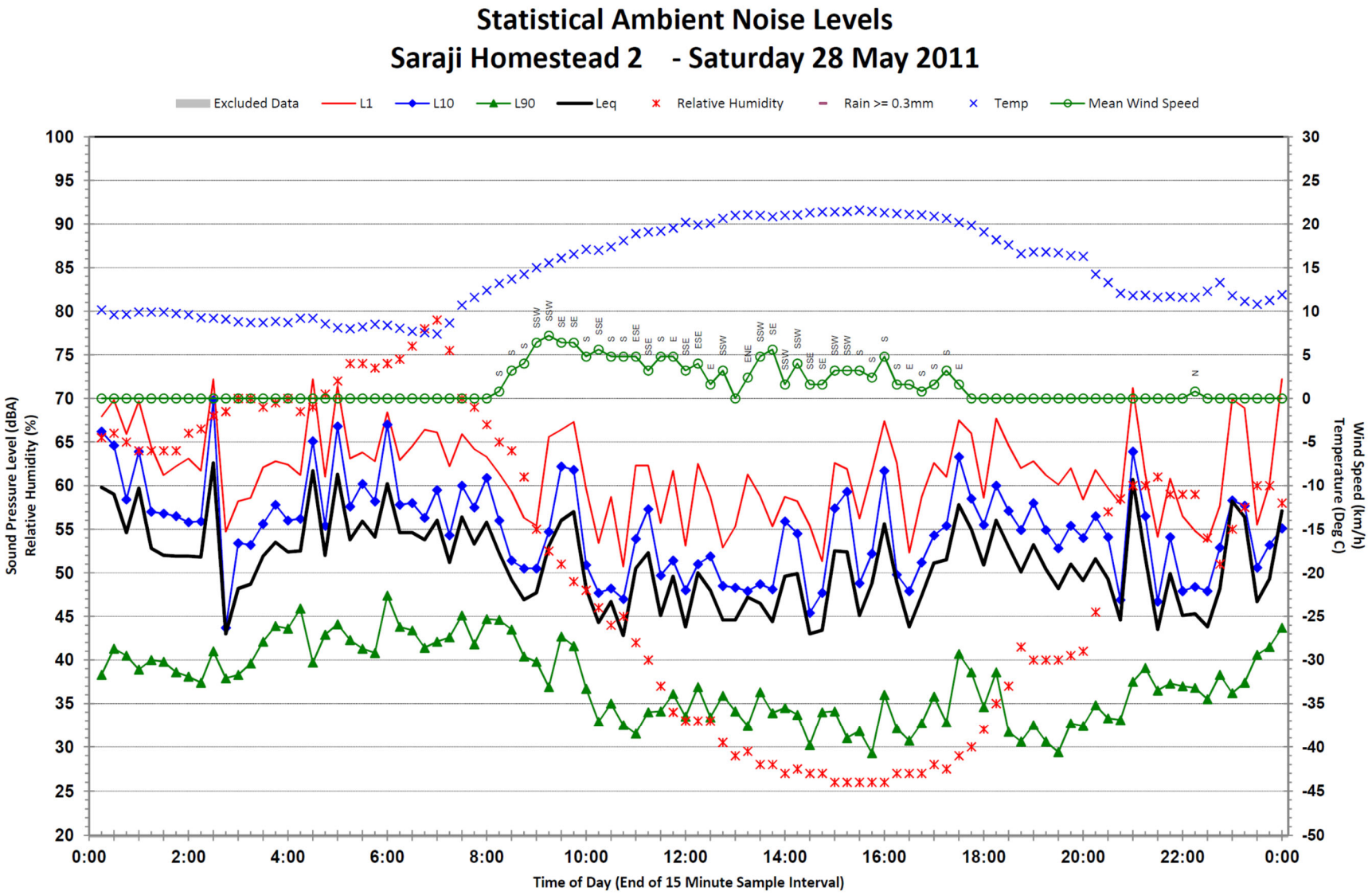

Statistical Ambient Noise Levels
Saraji Homestead 1 - Thursday 9 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

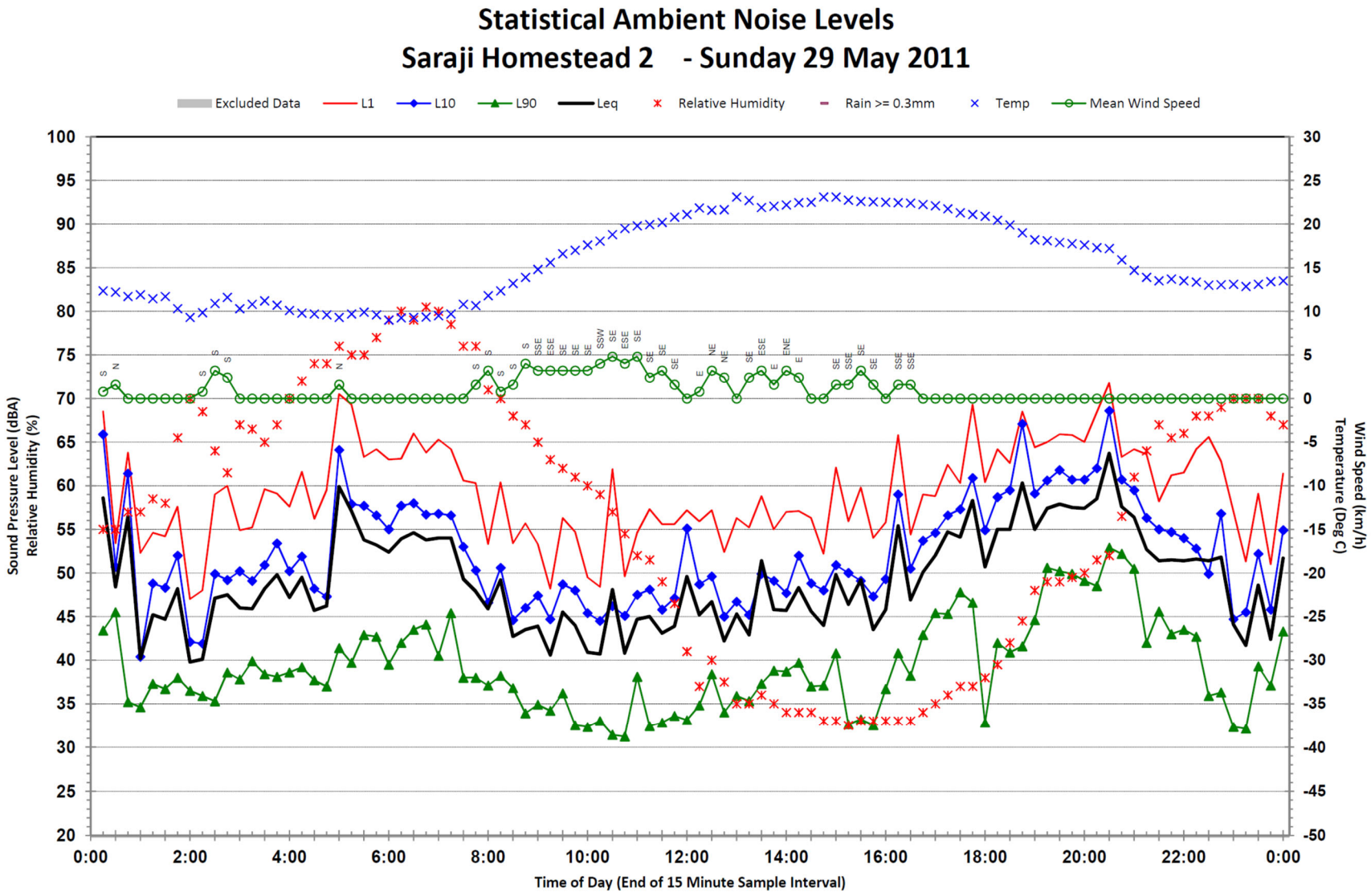

Statistical Ambient Noise Levels
Saraji Homestead 1 - Thursday 16 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

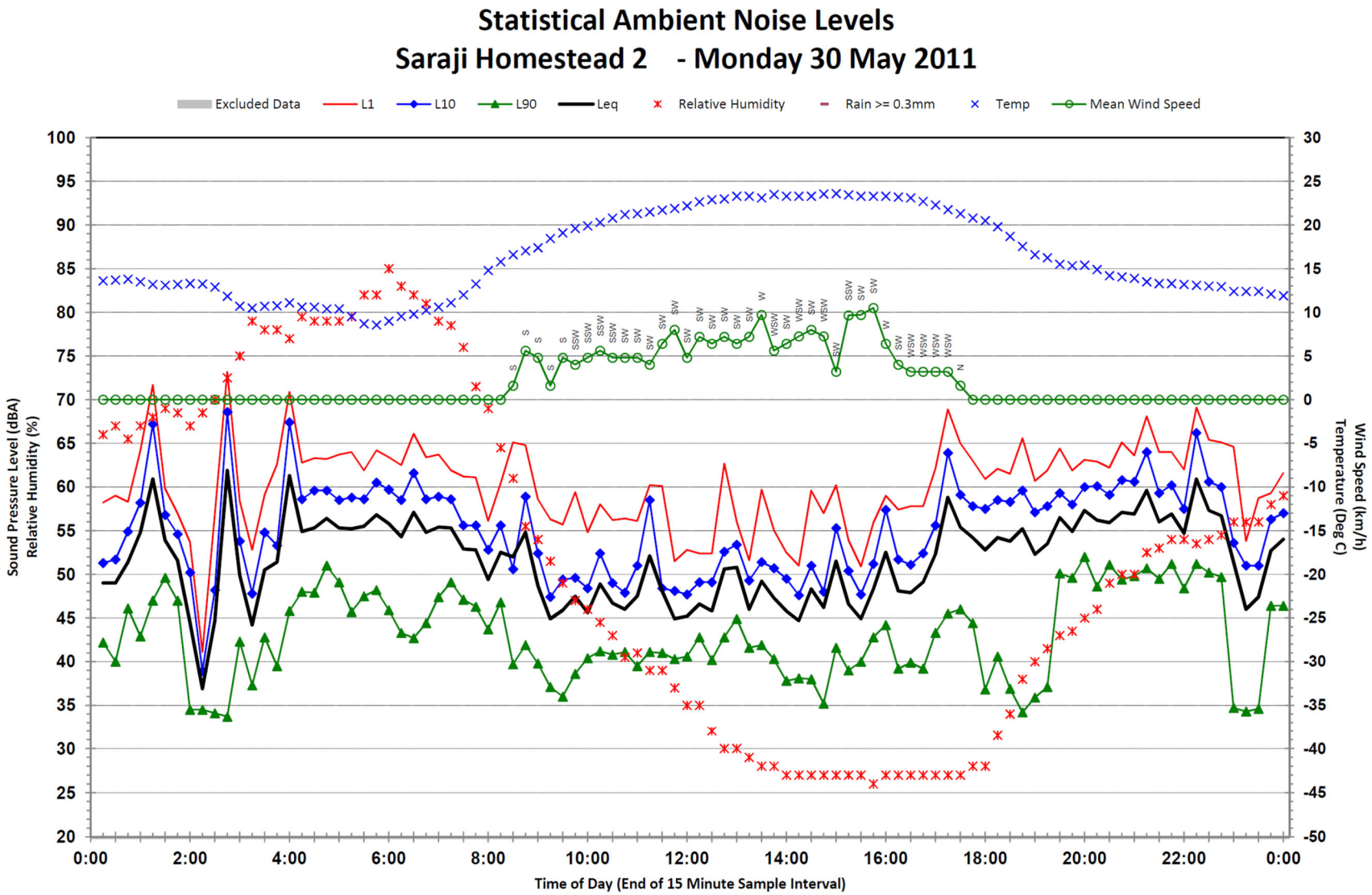

Statistical Ambient Noise Levels
Saraji Homestead 1 - Friday 17 June 2011
Excluded Data
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

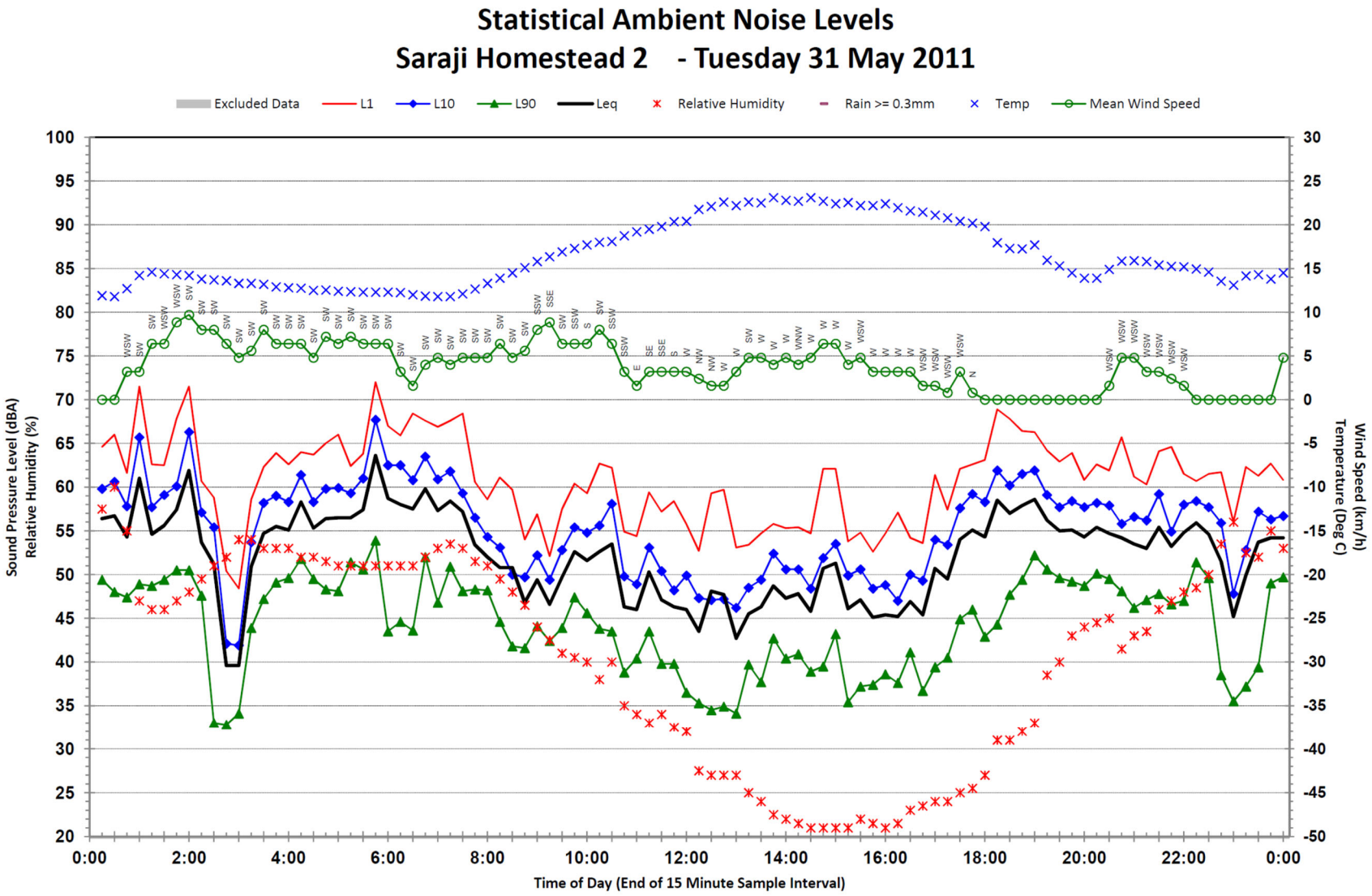

Statistical Ambient Noise Levels
Saraji Homestead 2 - Thursday 26 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

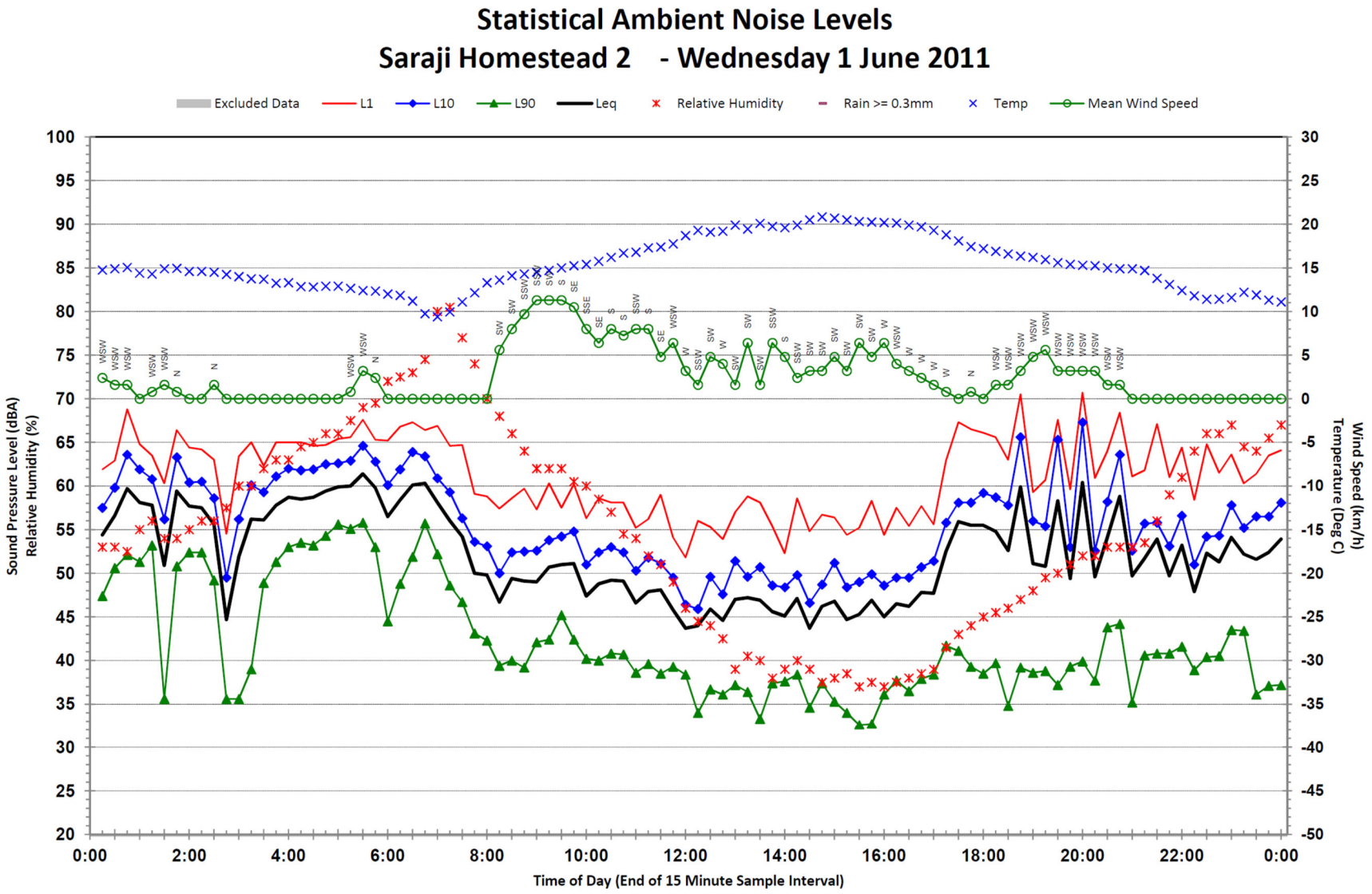

Statistical Ambient Noise Levels
Saraji Homestead 2 - Friday 27 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

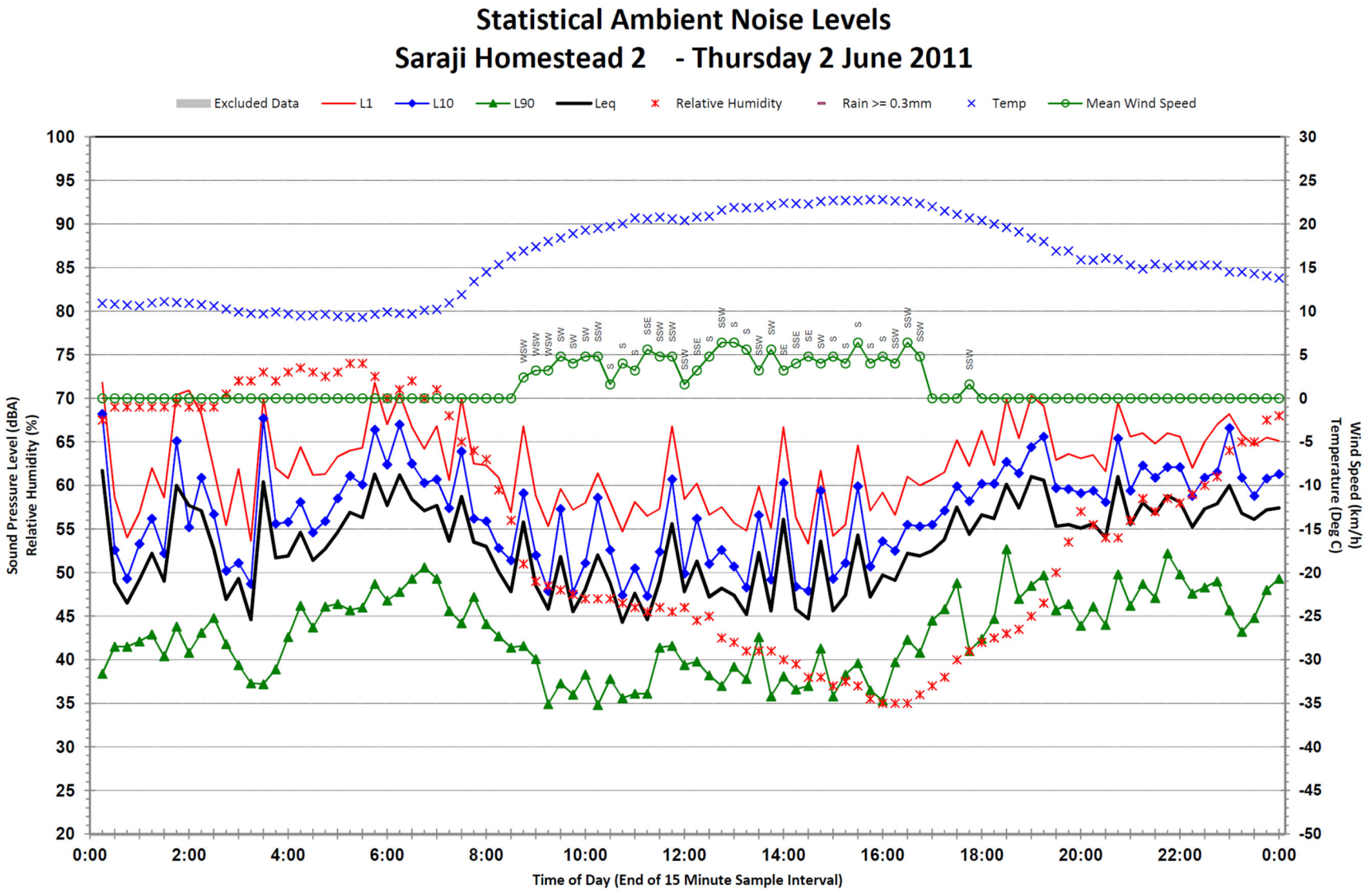

Statistical Ambient Noise Levels
Saraji Homestead 2 - Saturday 28 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

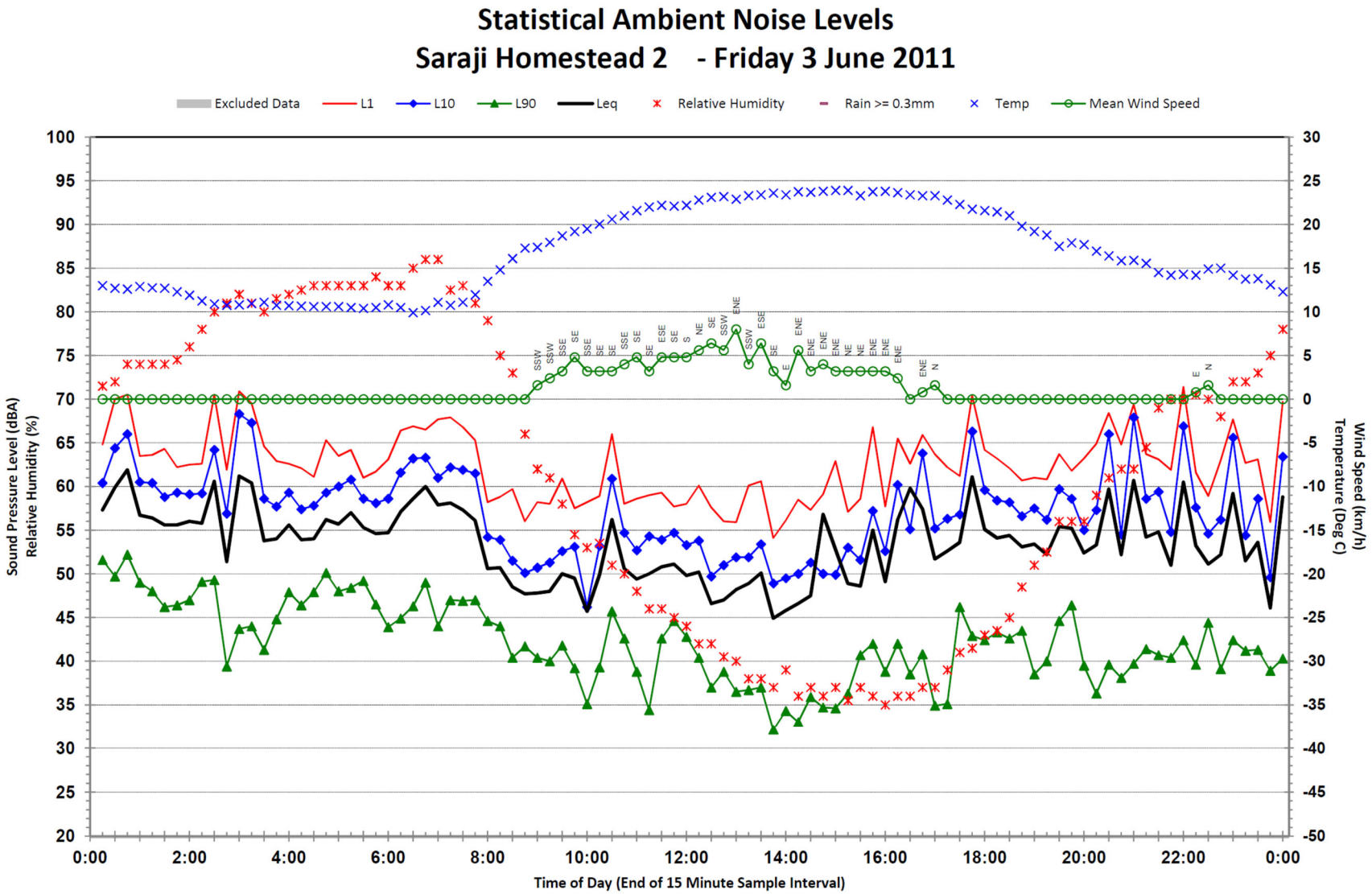

Statistical Ambient Noise Levels
Saraji Homestead 2 - Sunday 29 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

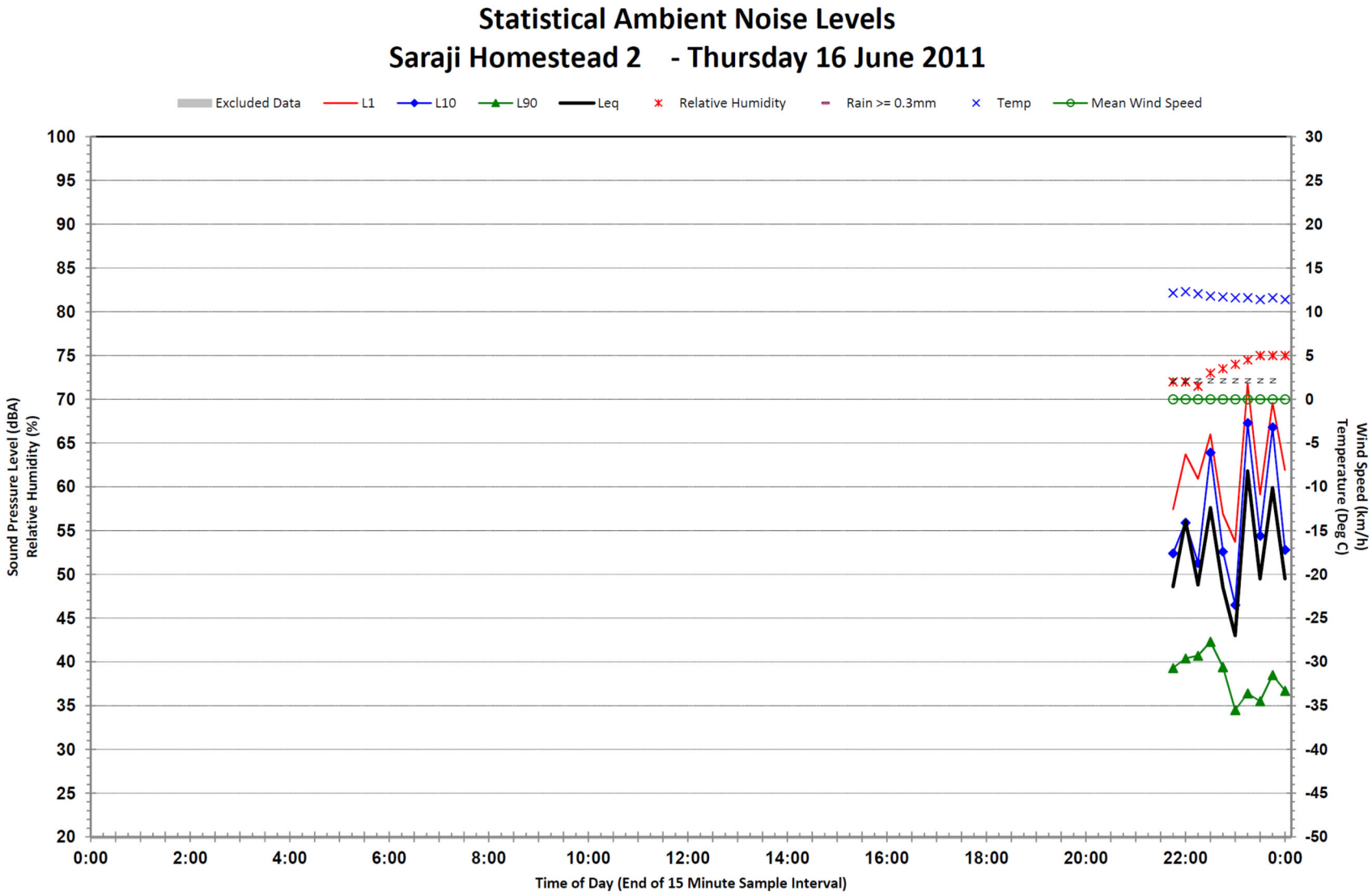

Statistical Ambient Noise Levels
Saraji Homestead 2 - Monday 30 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Saraji Homestead 2 - Tuesday 31 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

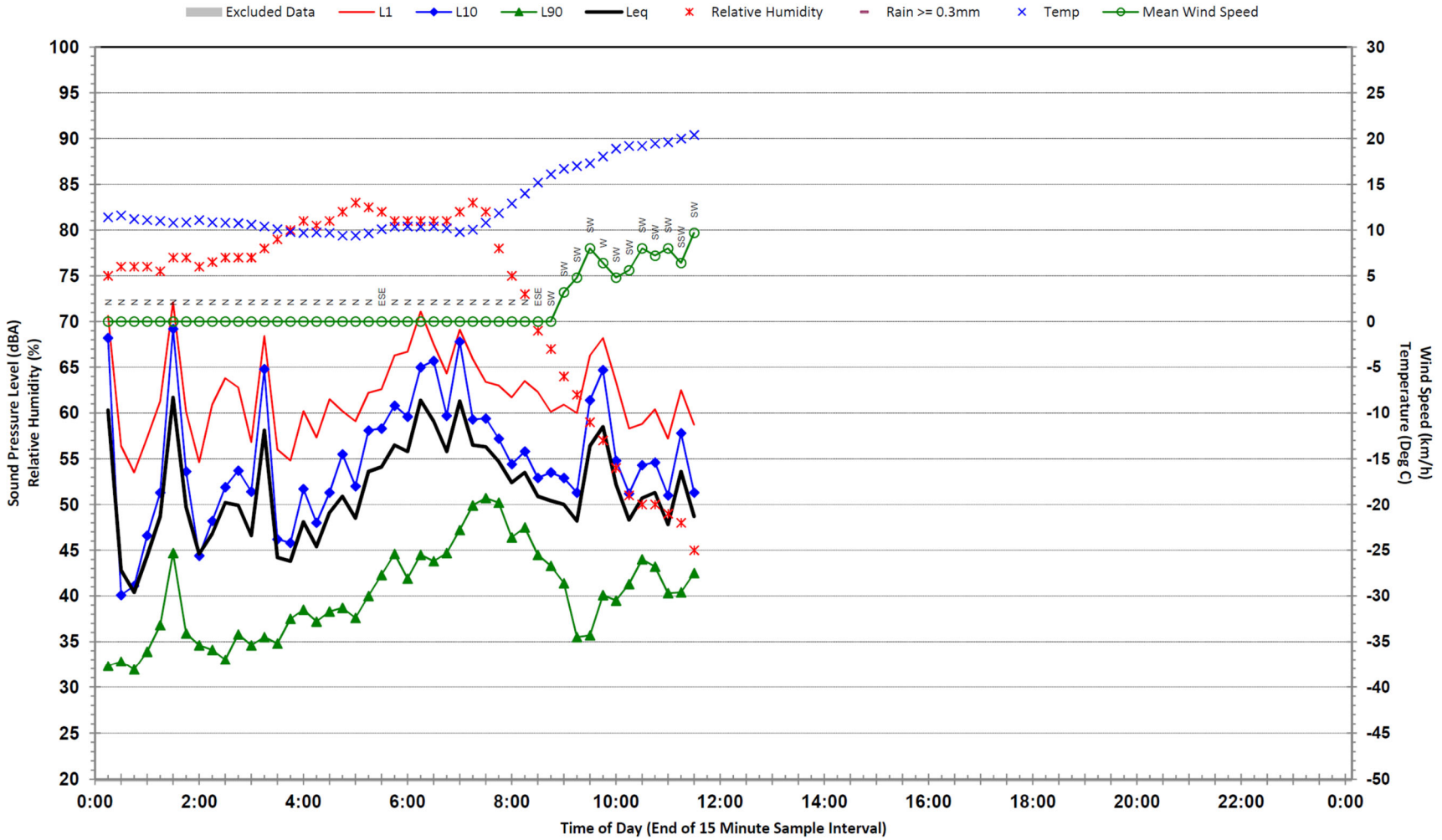

Statistical Ambient Noise Levels
Saraji Homestead 2 - Wednesday 1 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

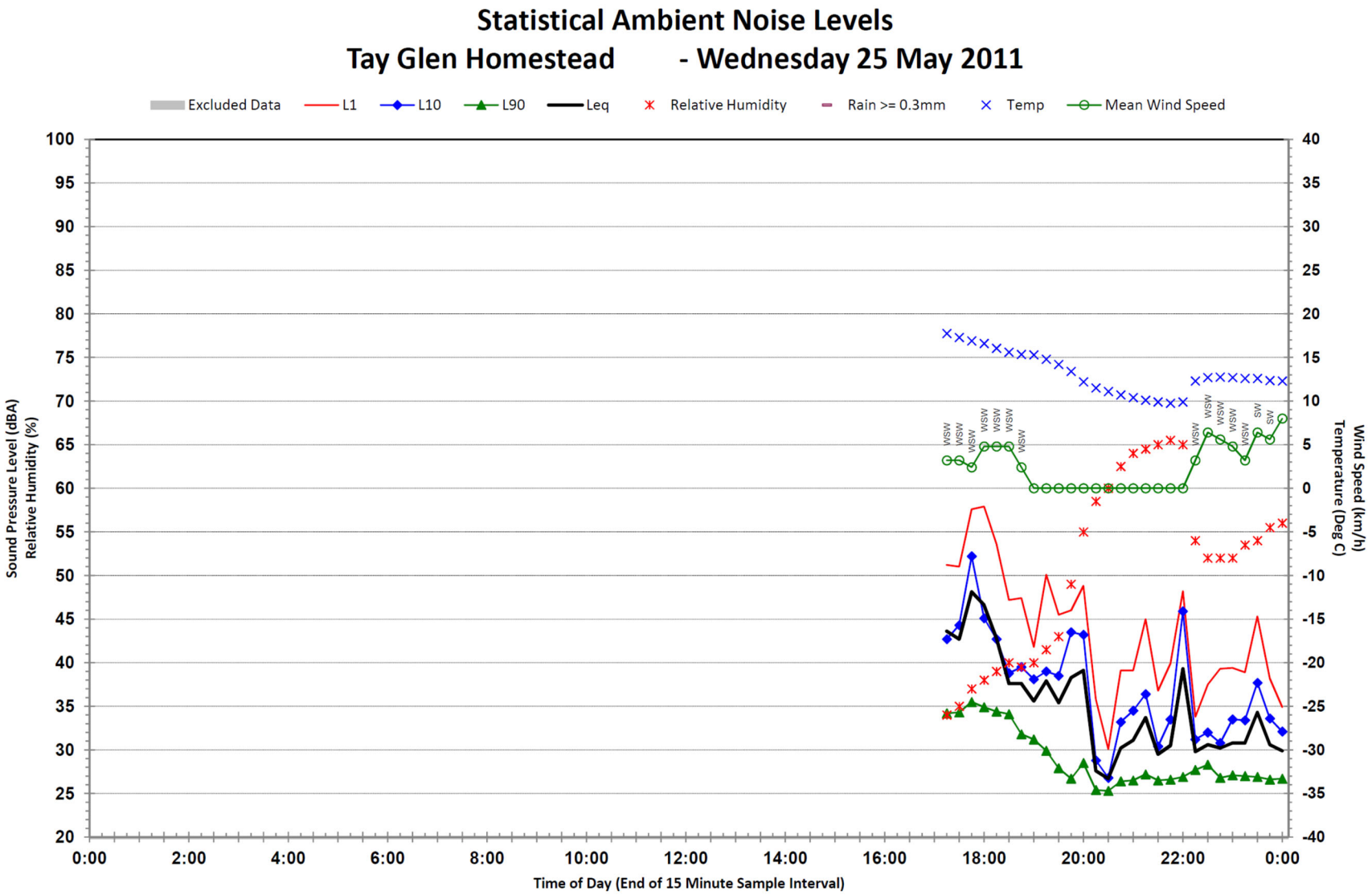

Statistical Ambient Noise Levels
Saraji Homestead 2 - Thursday 2 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

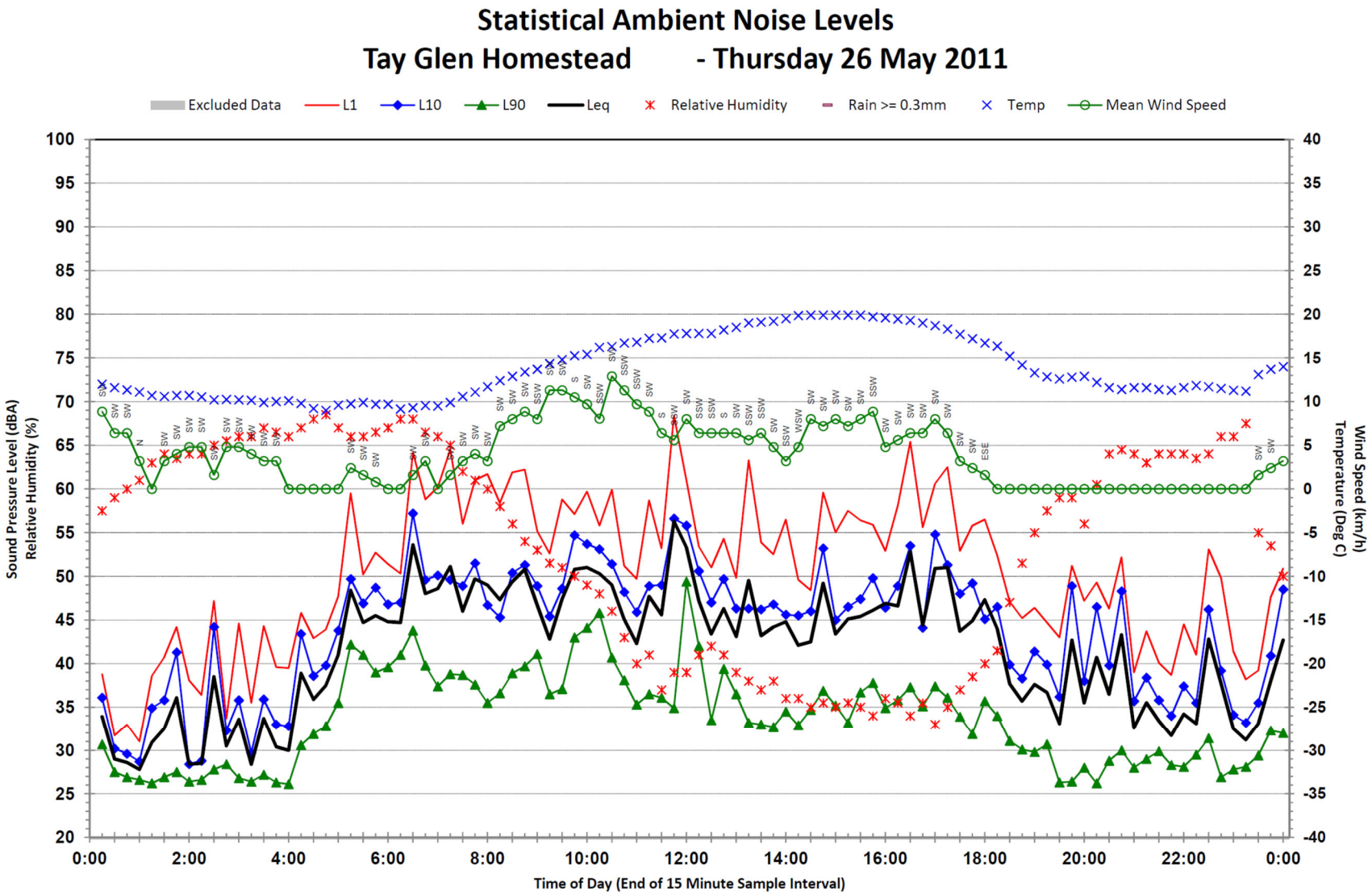

Statistical Ambient Noise Levels
Saraji Homestead 2 - Friday 3 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

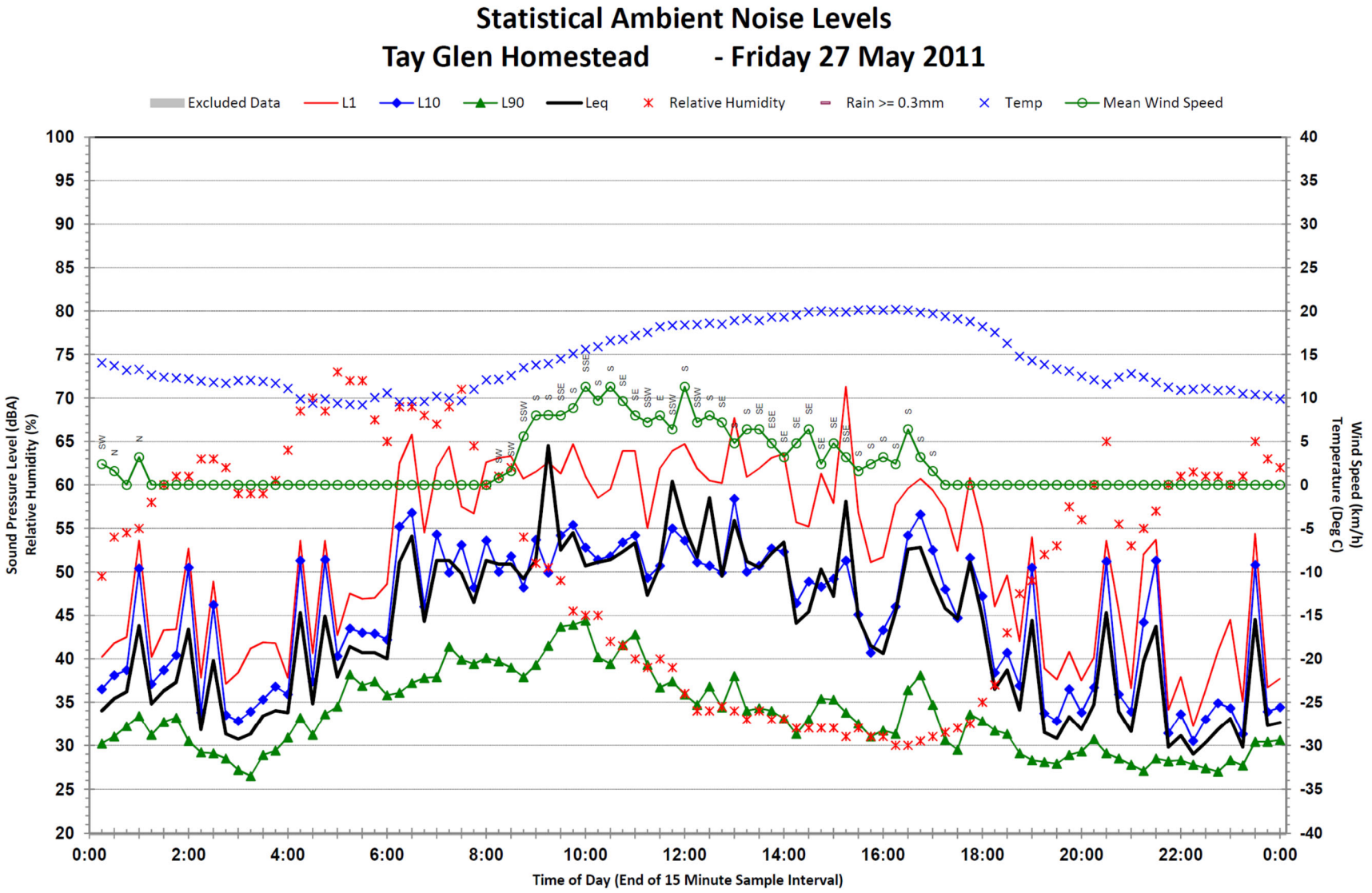

Statistical Ambient Noise Levels
Saraji Homestead 2 - Thursday 16 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

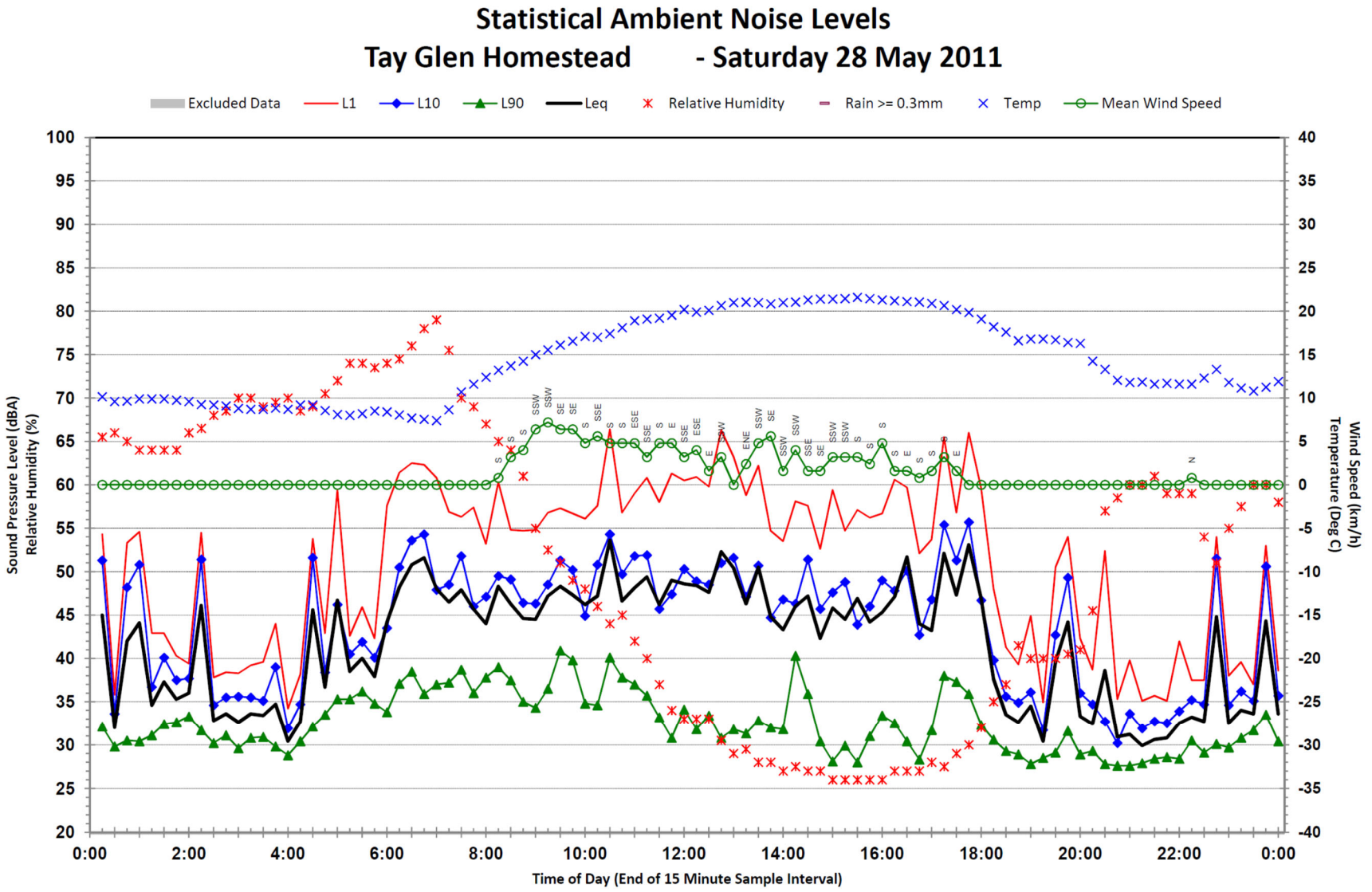
Statistical Ambient Noise Levels
Saraji Homestead 2 - Friday 17 June 2011

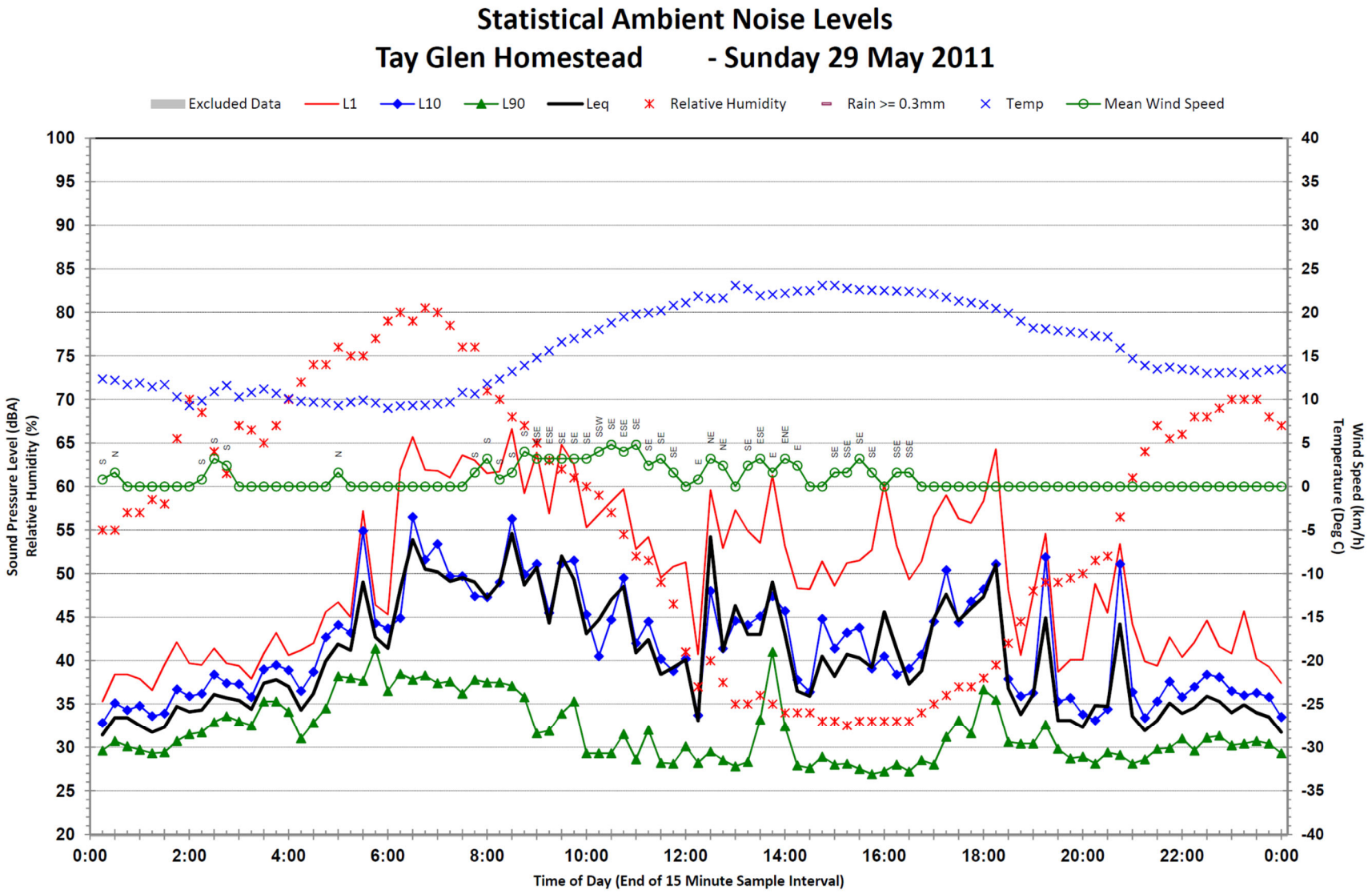


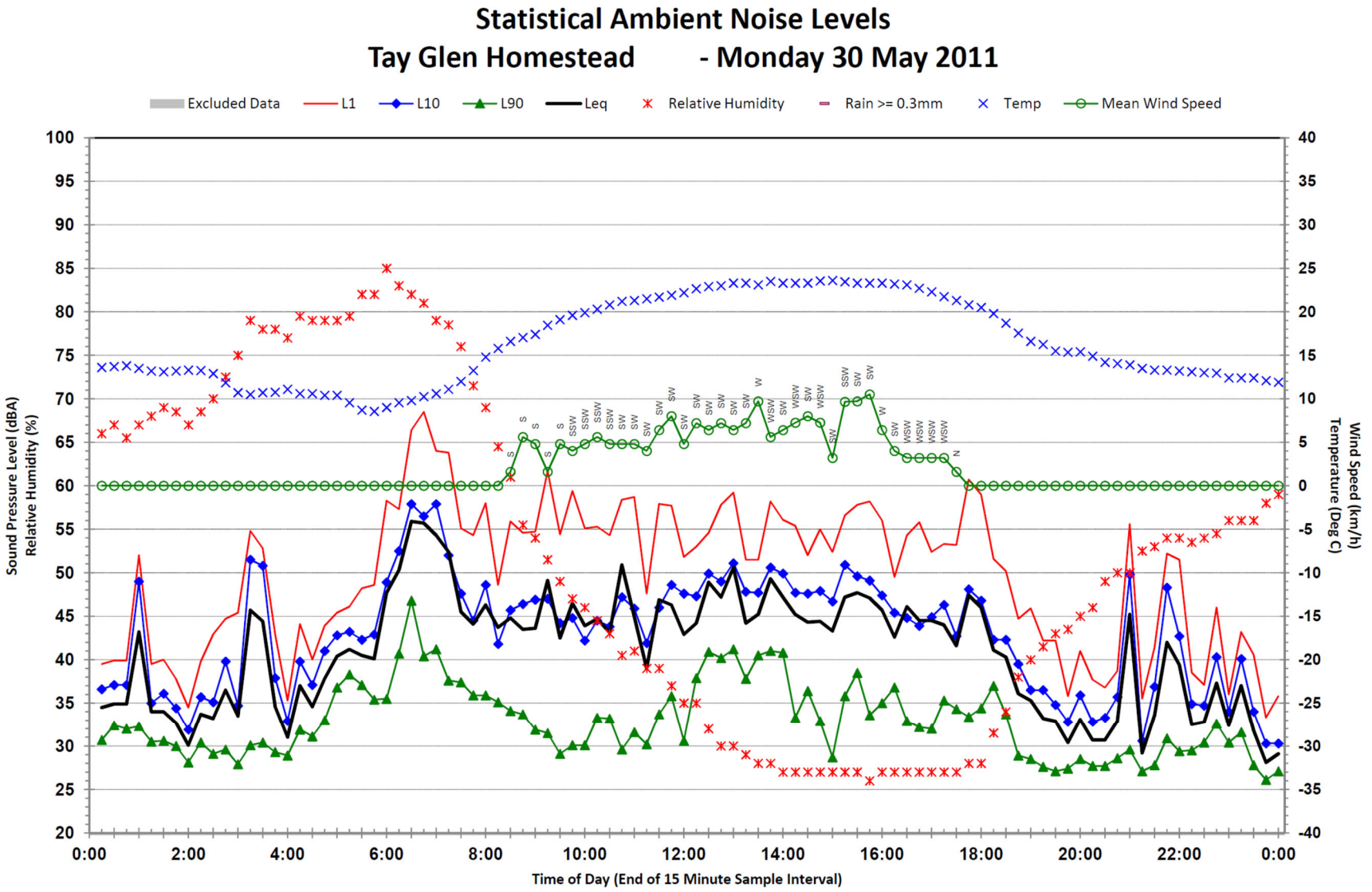

Statistical Ambient Noise Levels
Tay Glen Homestead - Wednesday 25 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

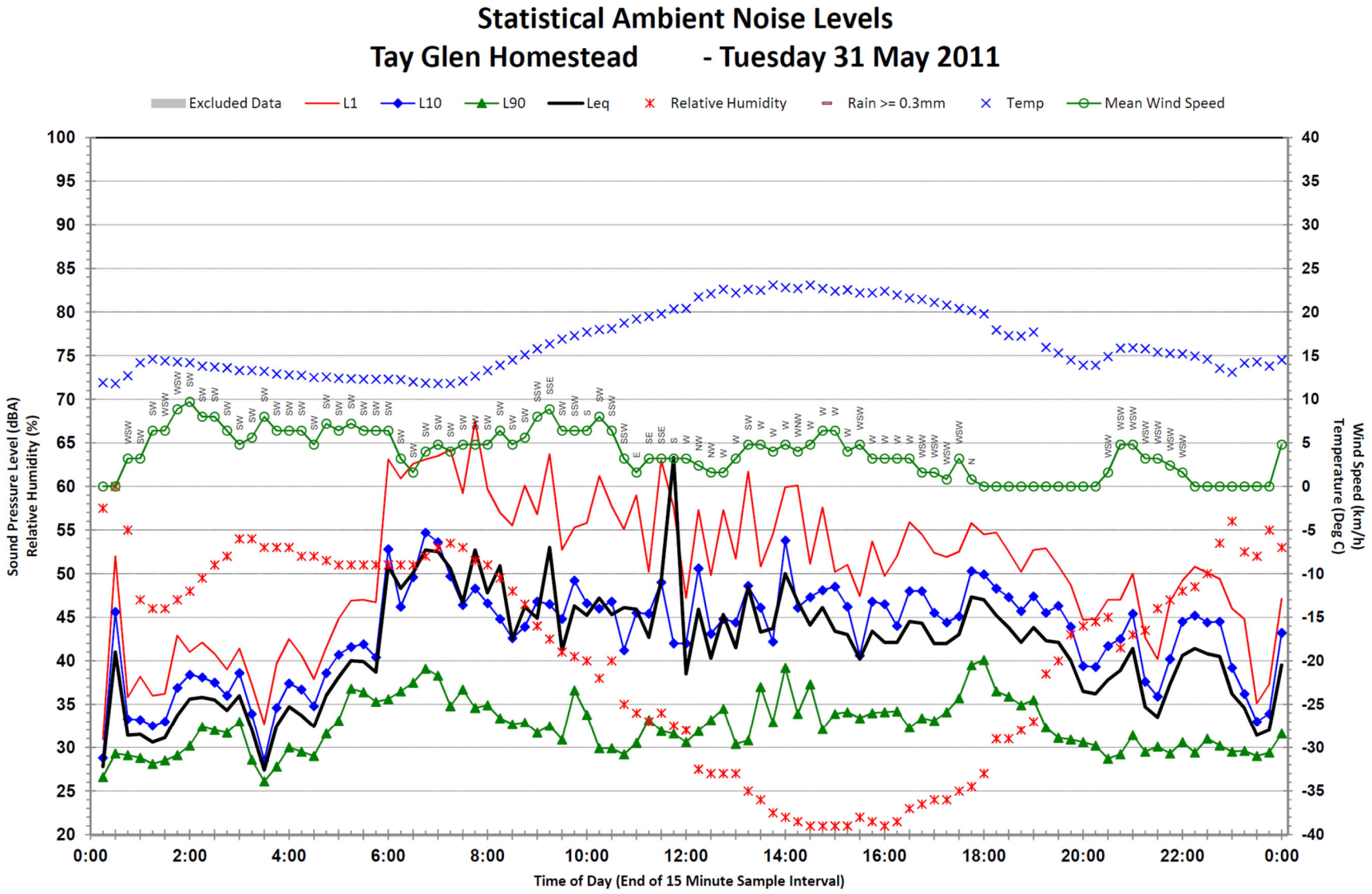

Statistical Ambient Noise Levels
Tay Glen Homestead - Thursday 26 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

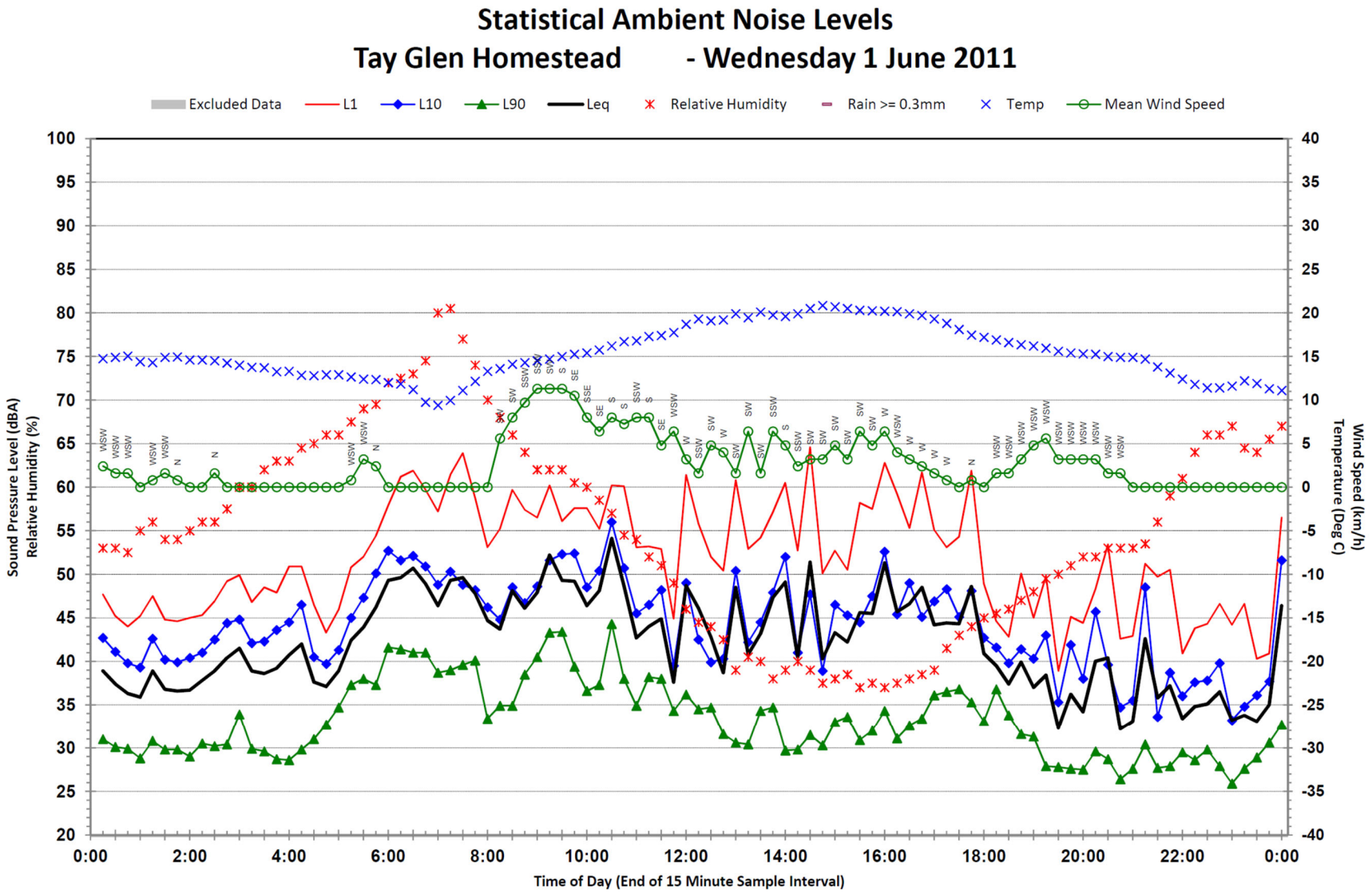

Statistical Ambient Noise Levels
Tay Glen Homestead - Friday 27 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

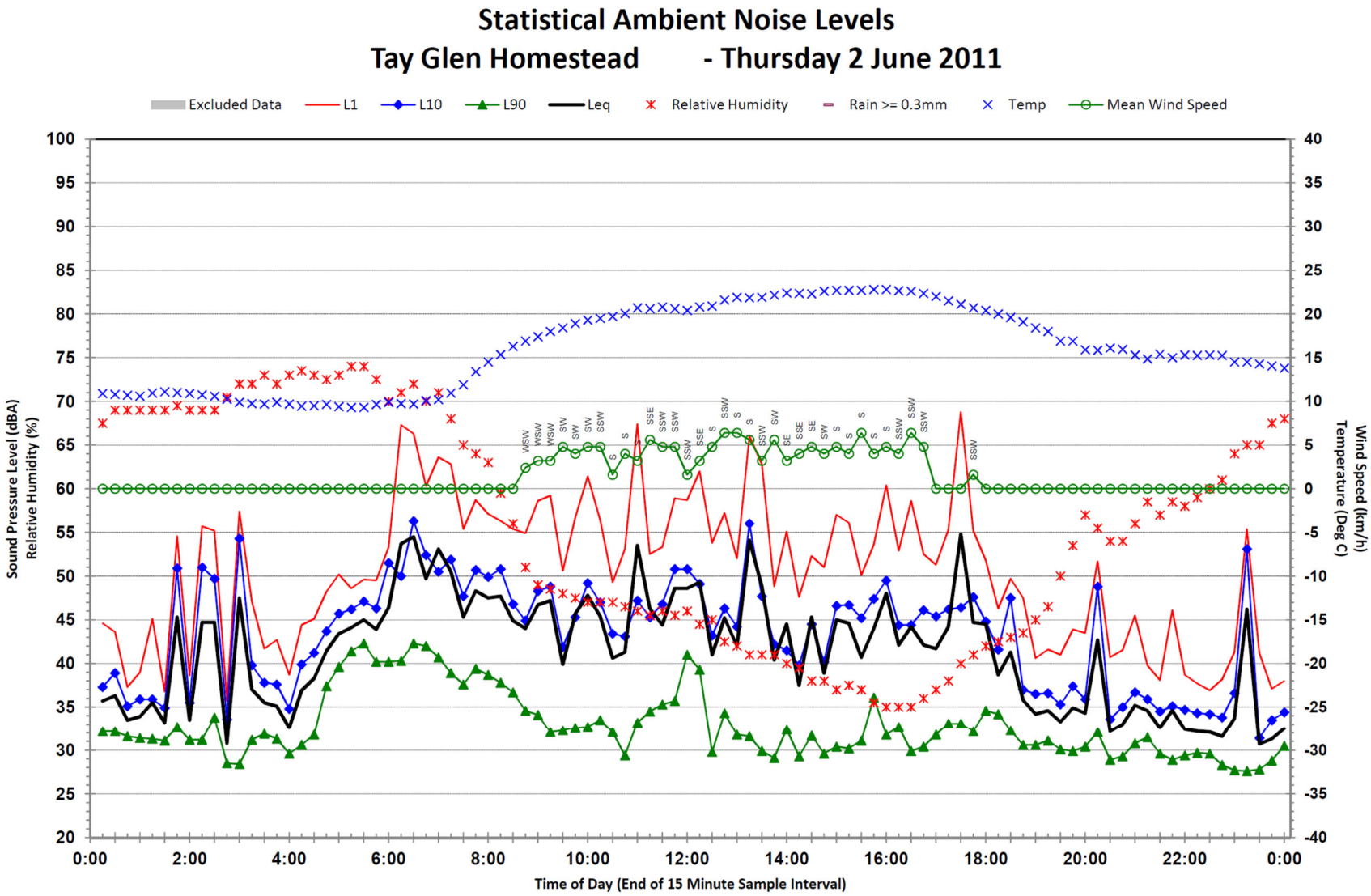

Statistical Ambient Noise Levels
Tay Glen Homestead - Saturday 28 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

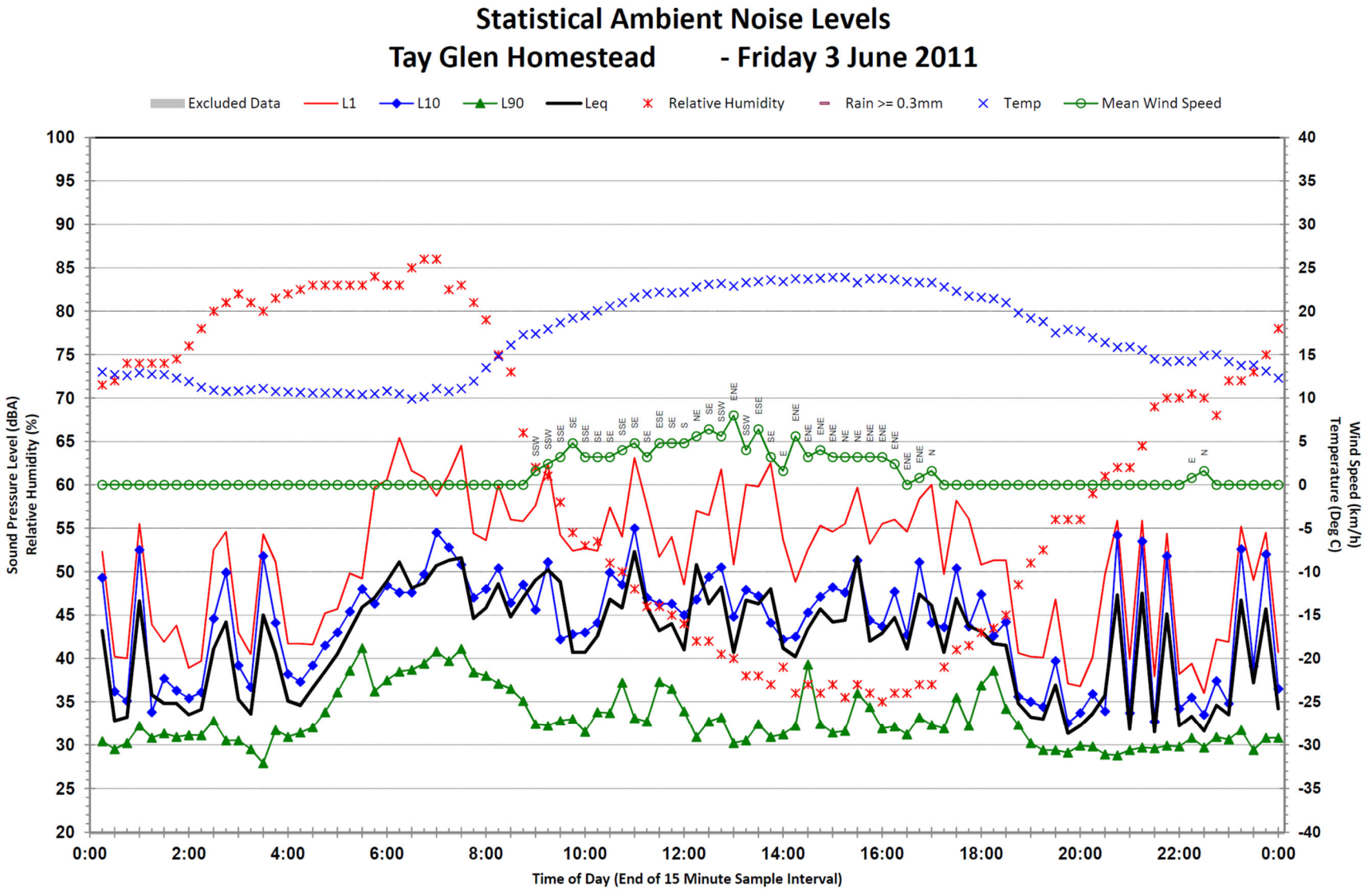

Statistical Ambient Noise Levels
Tay Glen Homestead - Sunday 29 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

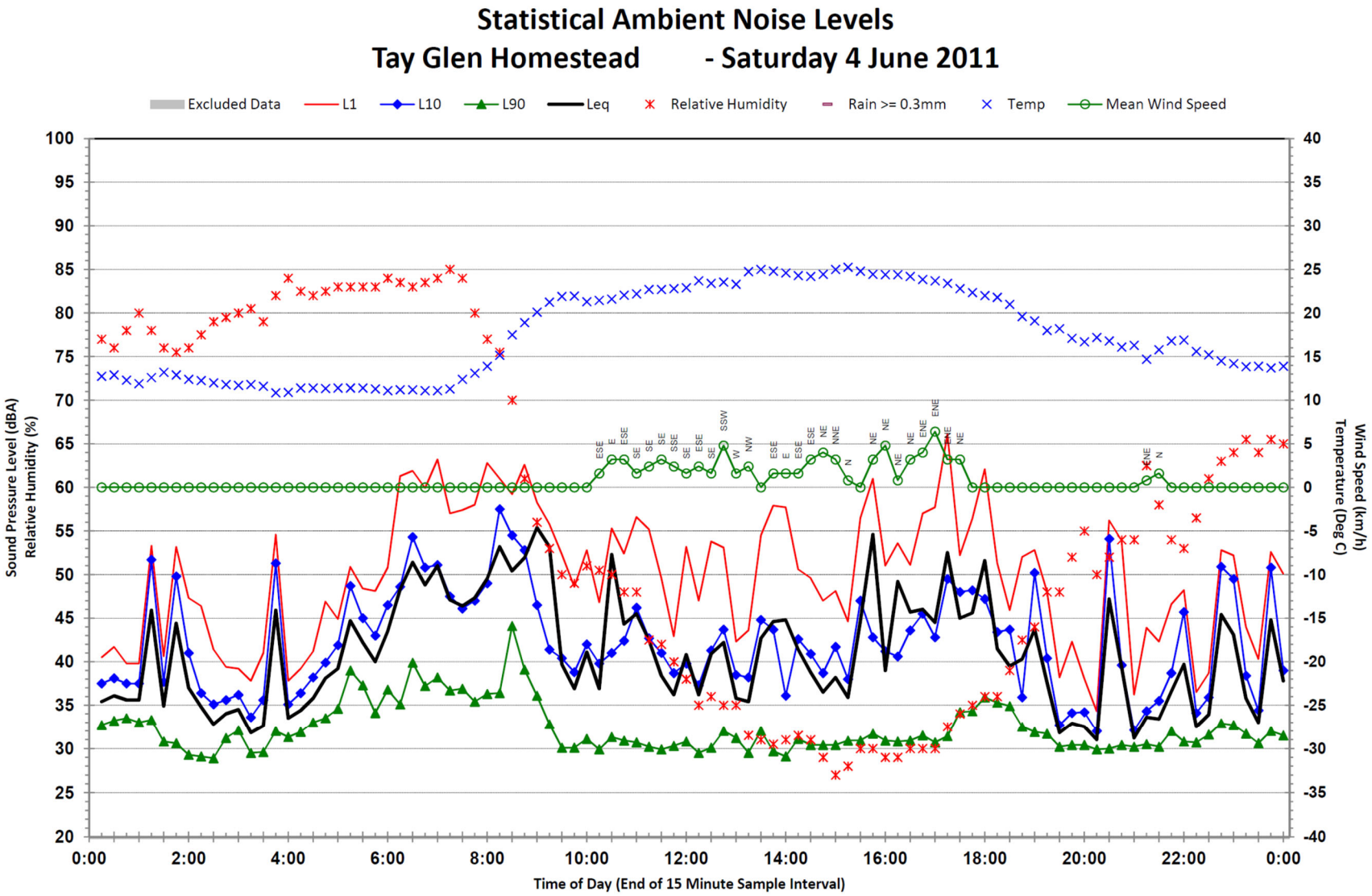

Statistical Ambient Noise Levels
Tay Glen Homestead - Monday 30 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

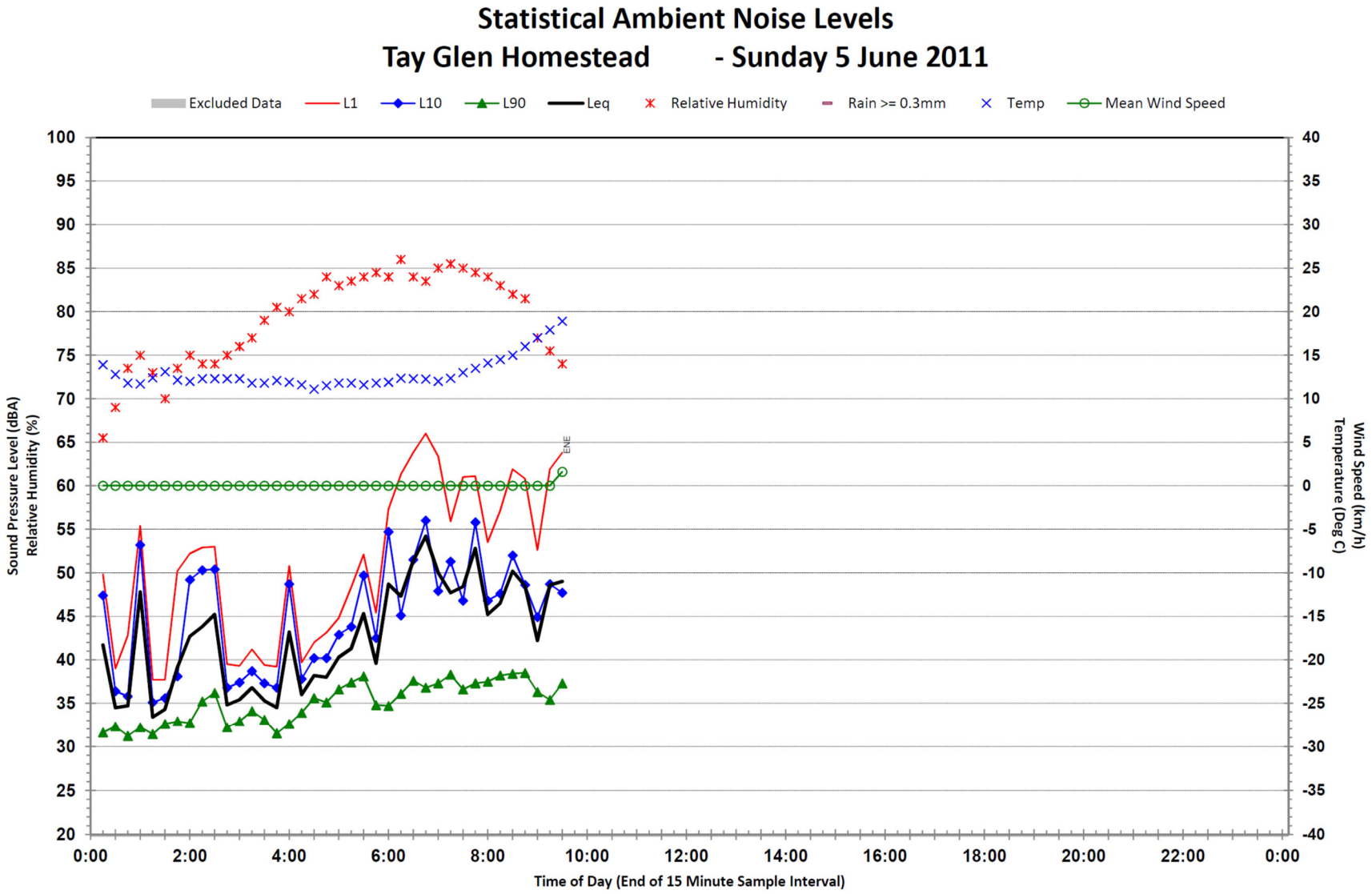

Statistical Ambient Noise Levels
Tay Glen Homestead - Tuesday 31 May 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

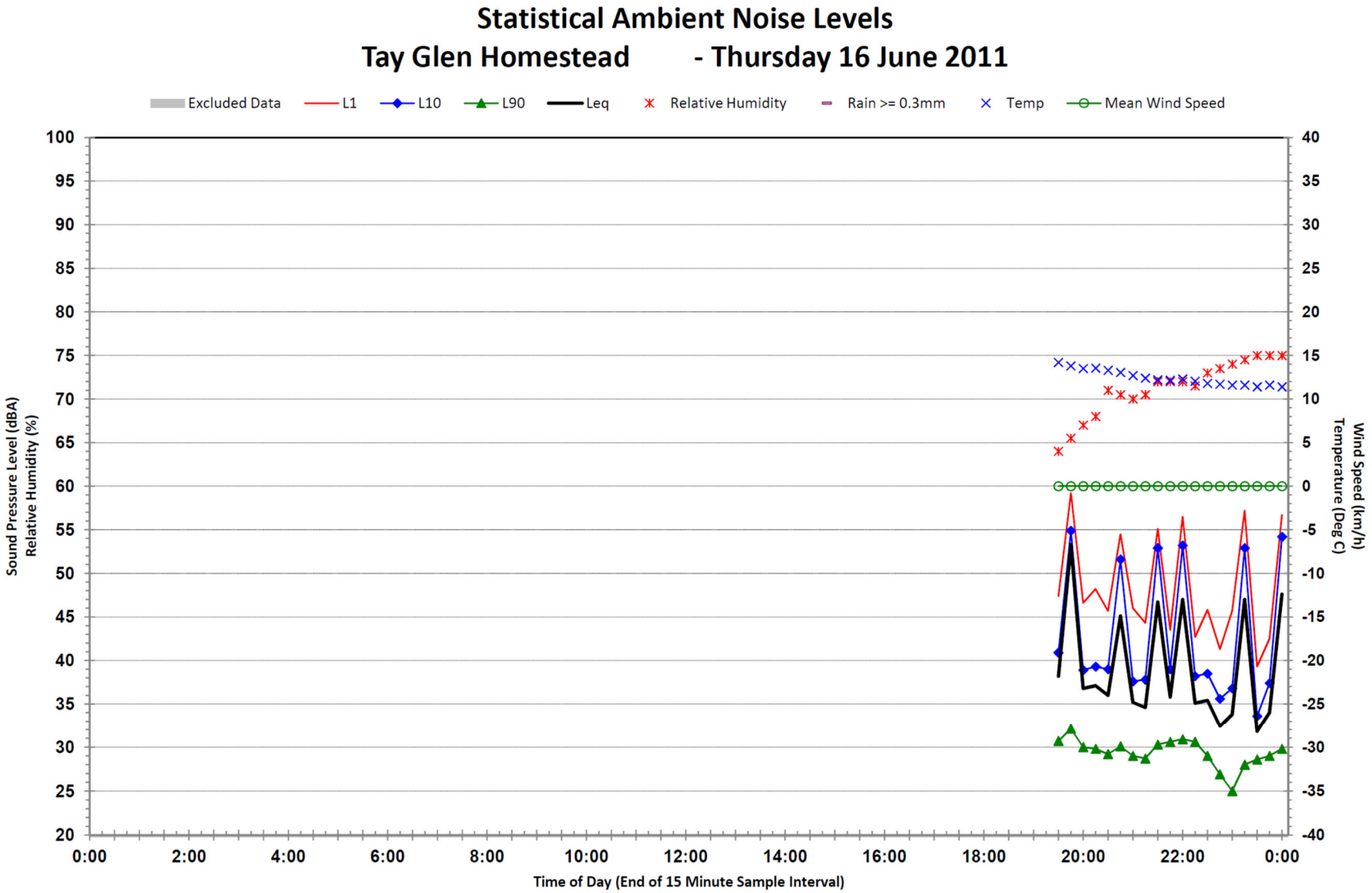

Statistical Ambient Noise Levels
Tay Glen Homestead - Wednesday 1 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

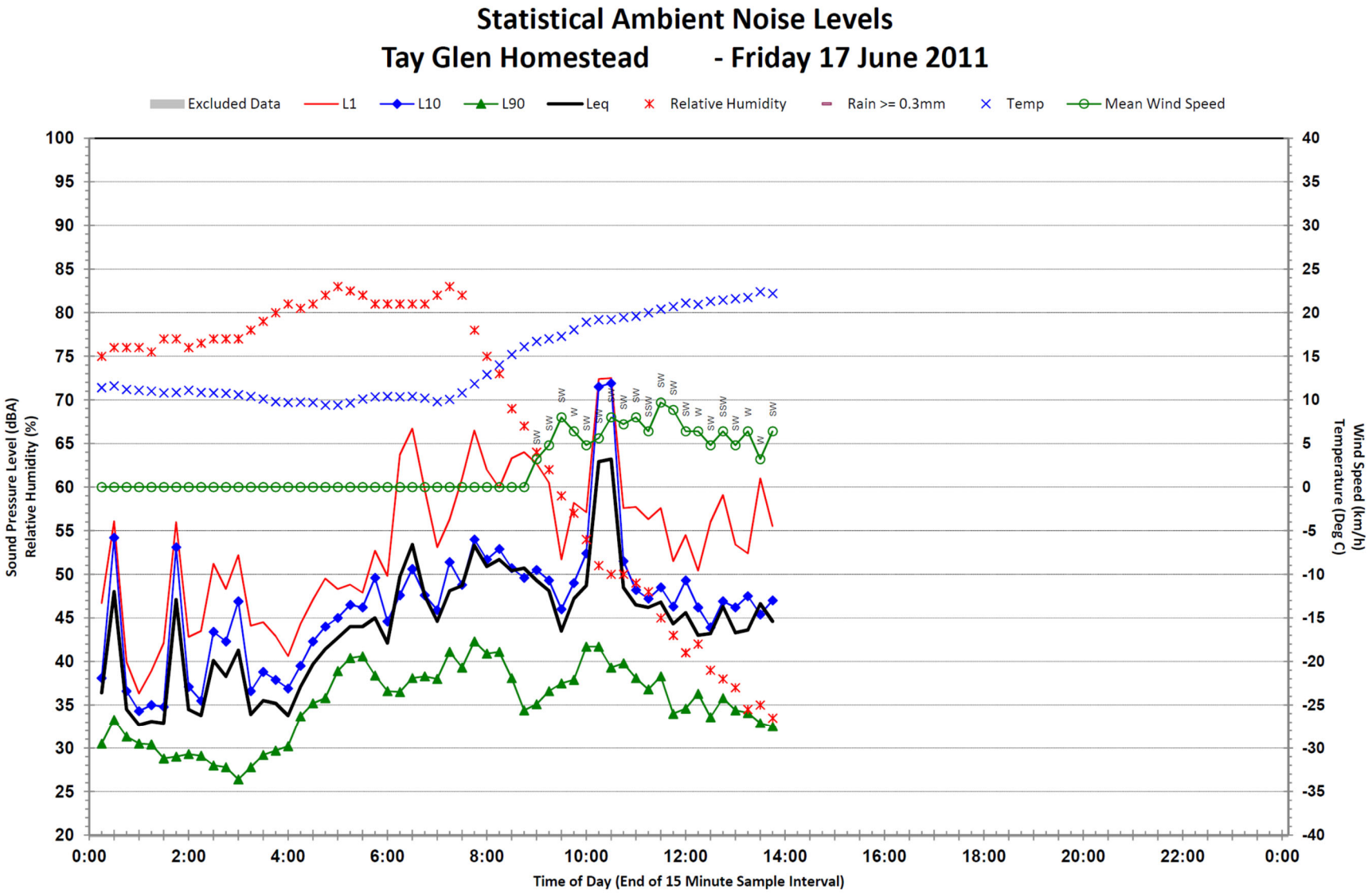

Statistical Ambient Noise Levels
Tay Glen Homestead - Thursday 2 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

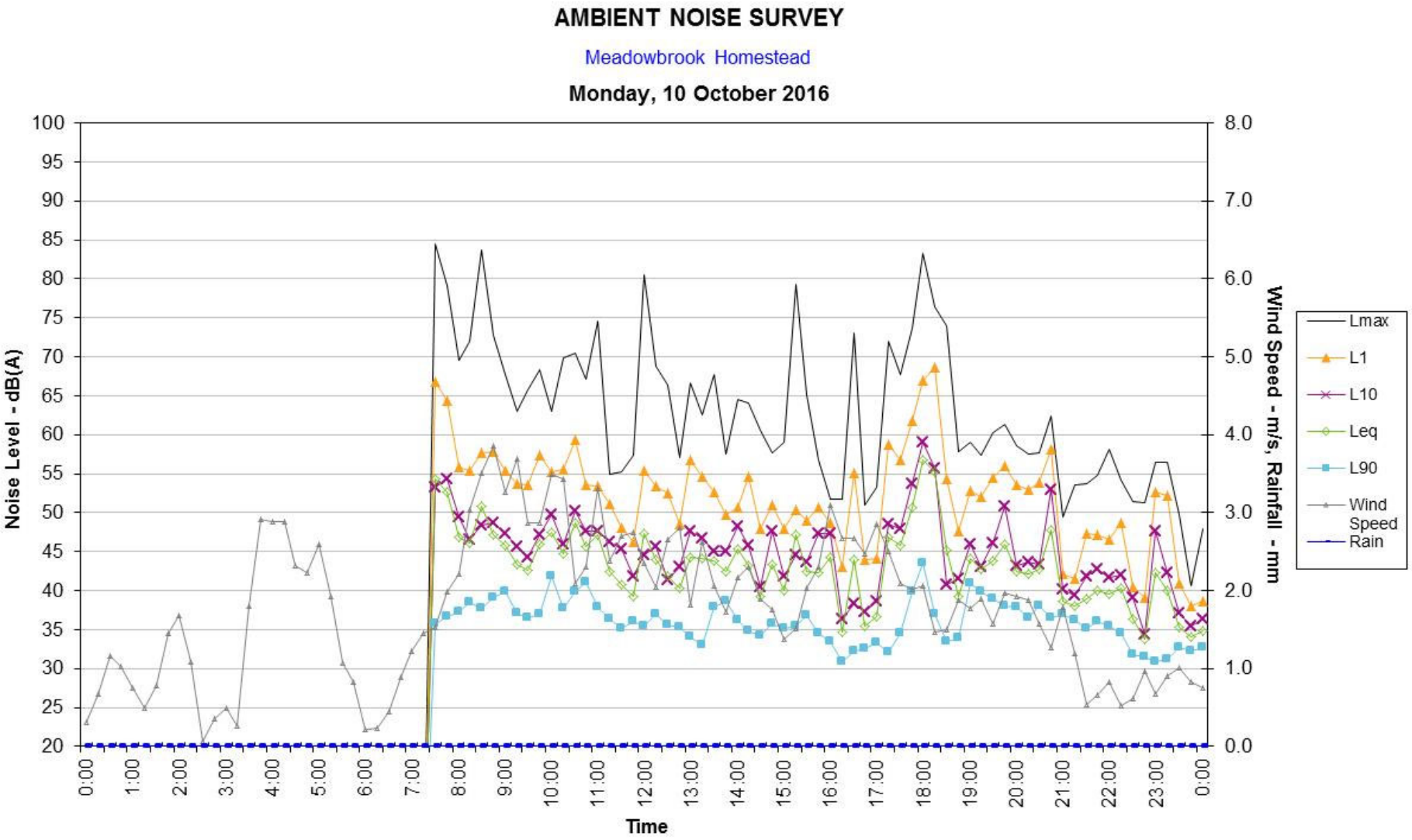

Statistical Ambient Noise Levels
Tay Glen Homestead - Friday 3 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Tay Glen Homestead - Saturday 4 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Tay Glen Homestead - Sunday 5 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
ENE
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Statistical Ambient Noise Levels
Tay Glen Homestead - Thursday 16 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day (End of 15 Minute Sample Interval)

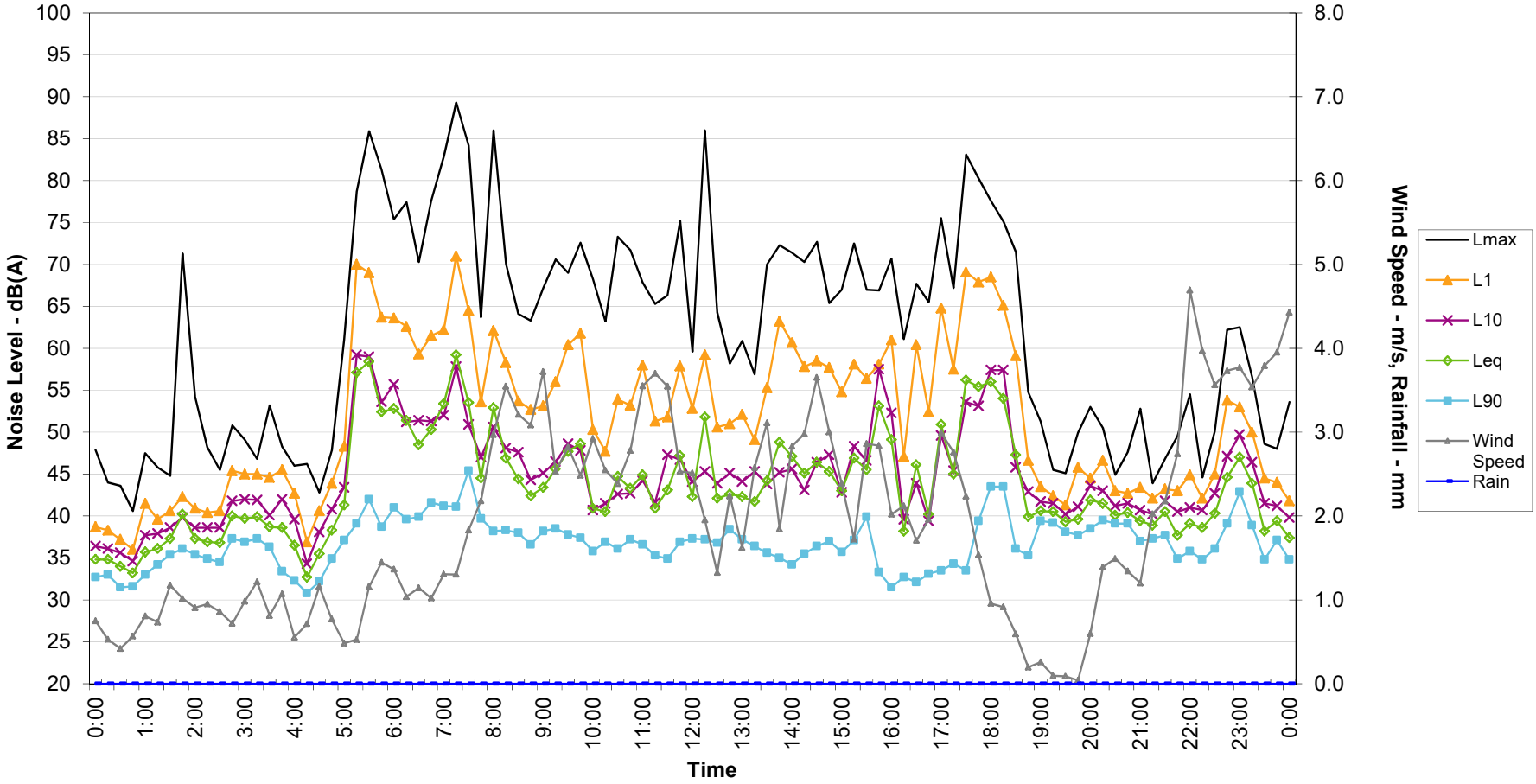

Statistical Ambient Noise Levels
Tay Glen Homestead - Friday 17 June 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

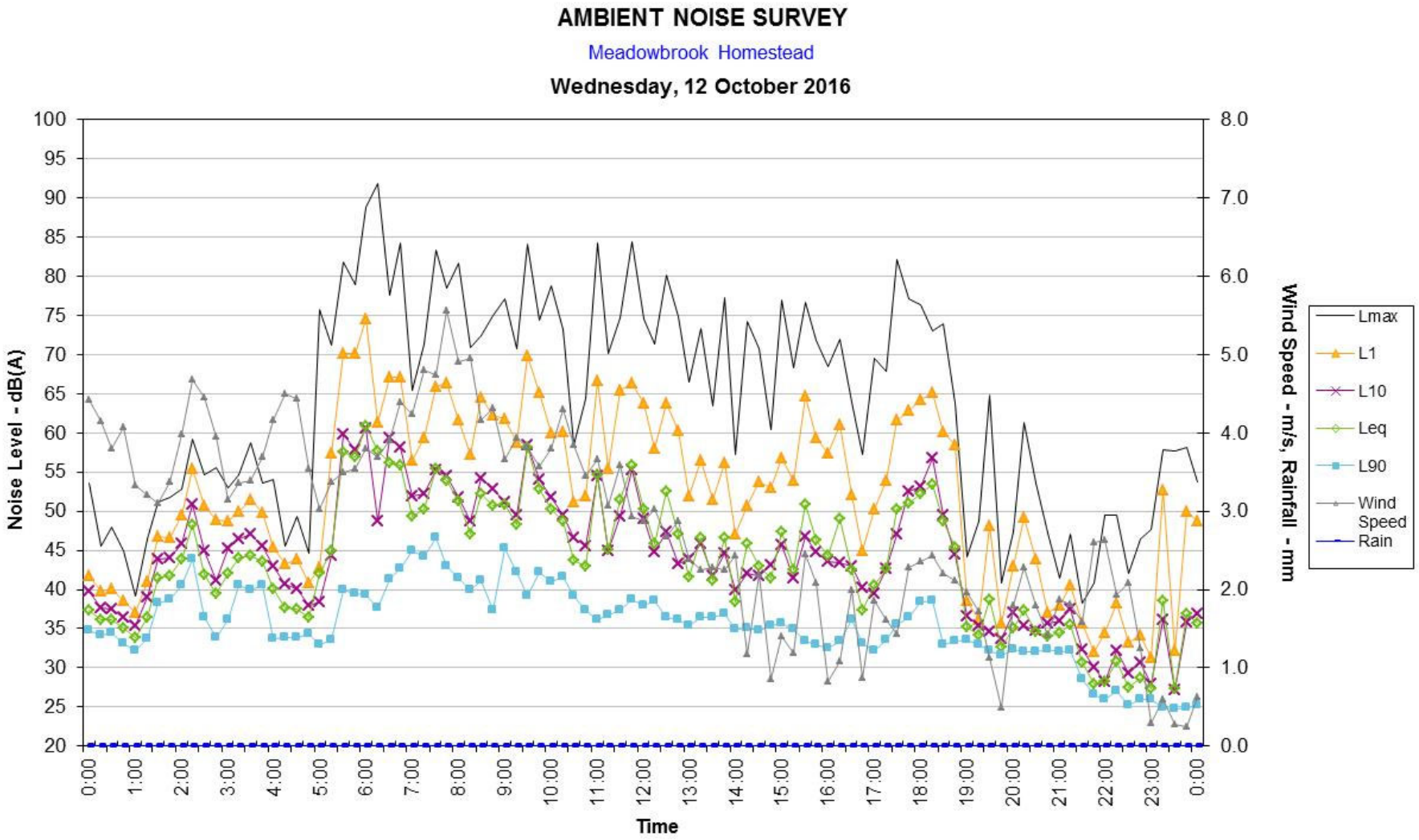

AMBIENT NOISE SURVEY
Meadowbrook Homestead
Monday, 10 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
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15:00
16:00
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18:00
19:00
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21:00
22:00
23:00
0:00

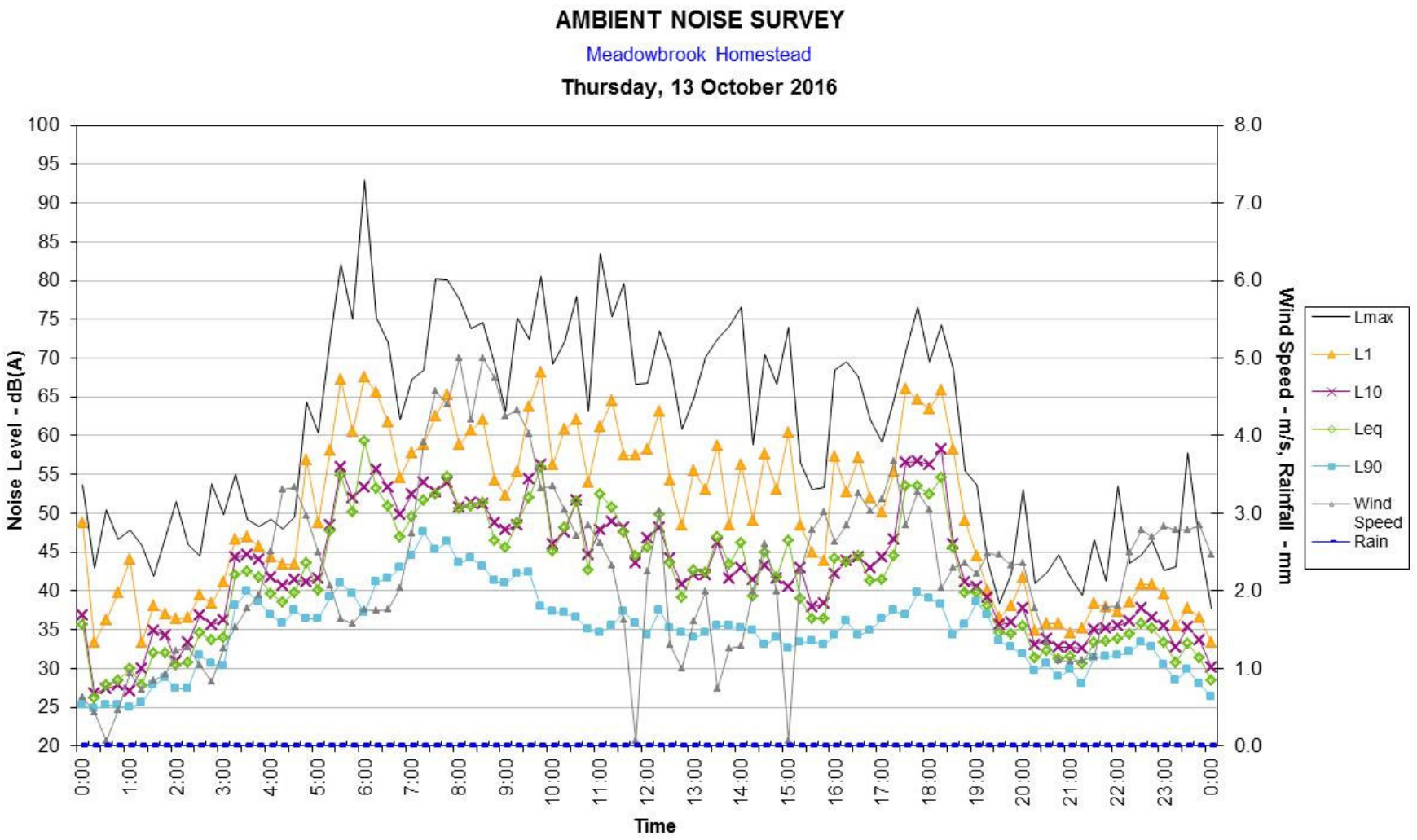
AMBIENT NOISE SURVEY

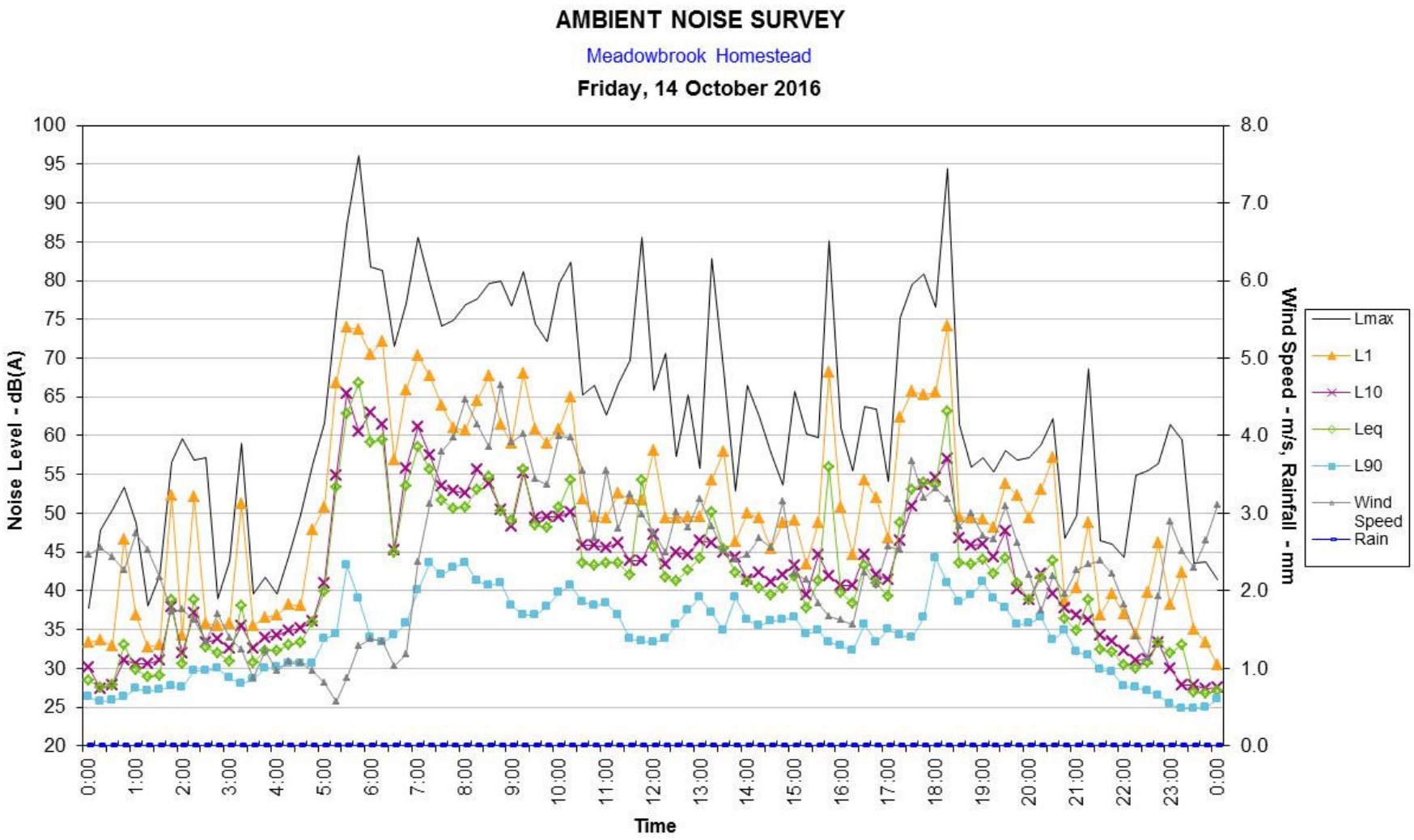
Meadowbrook Homestead

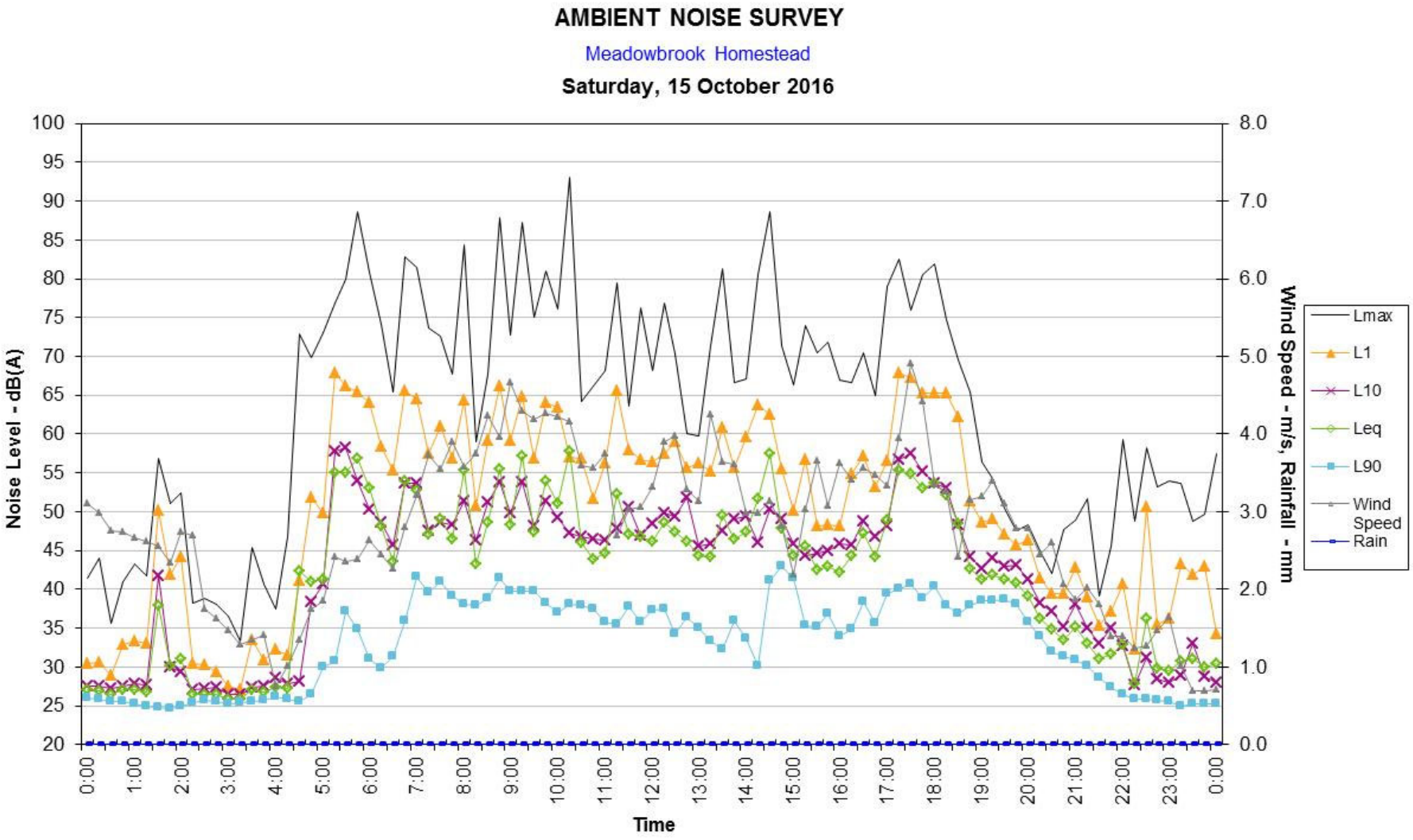
Tuesday, 11 October 2016

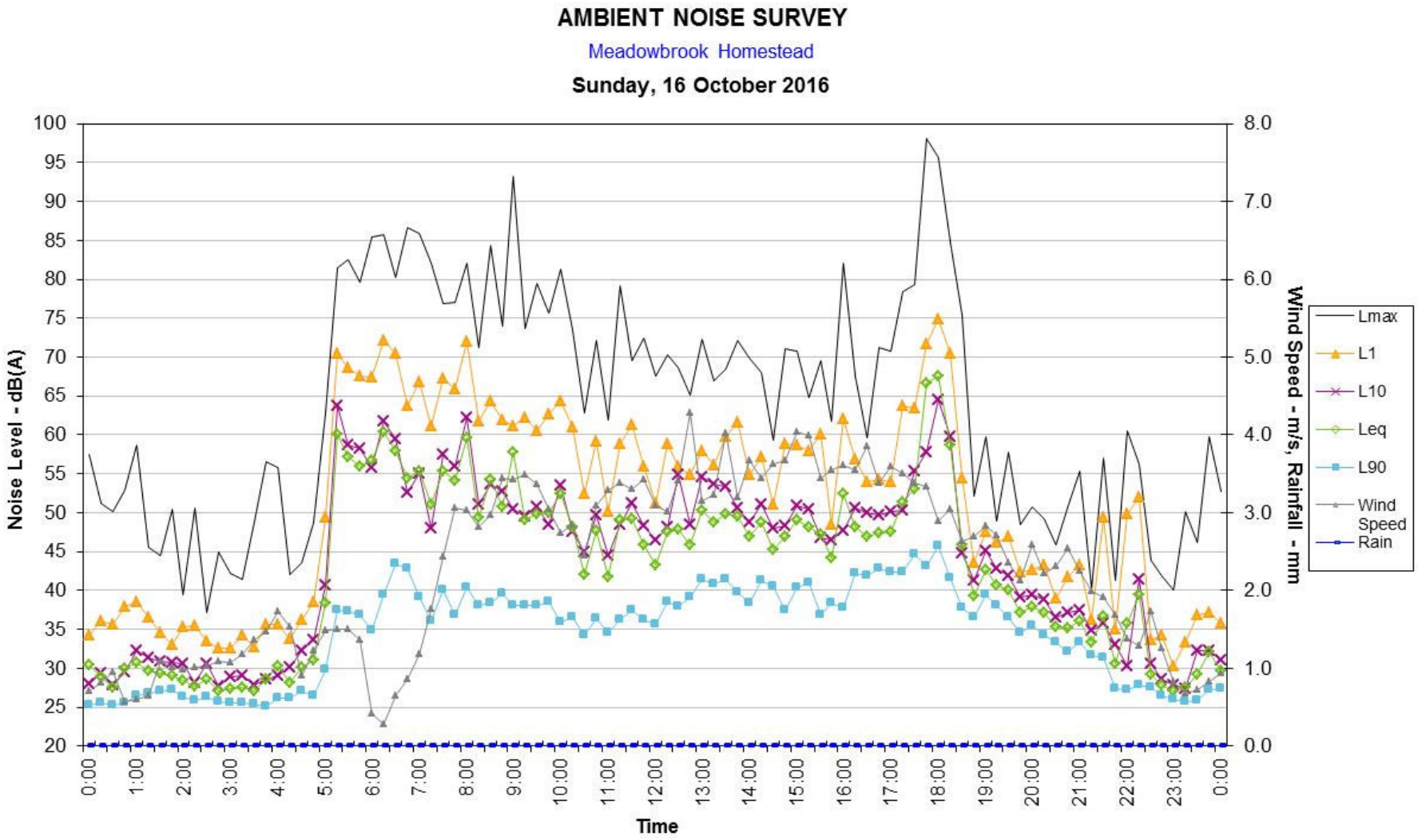


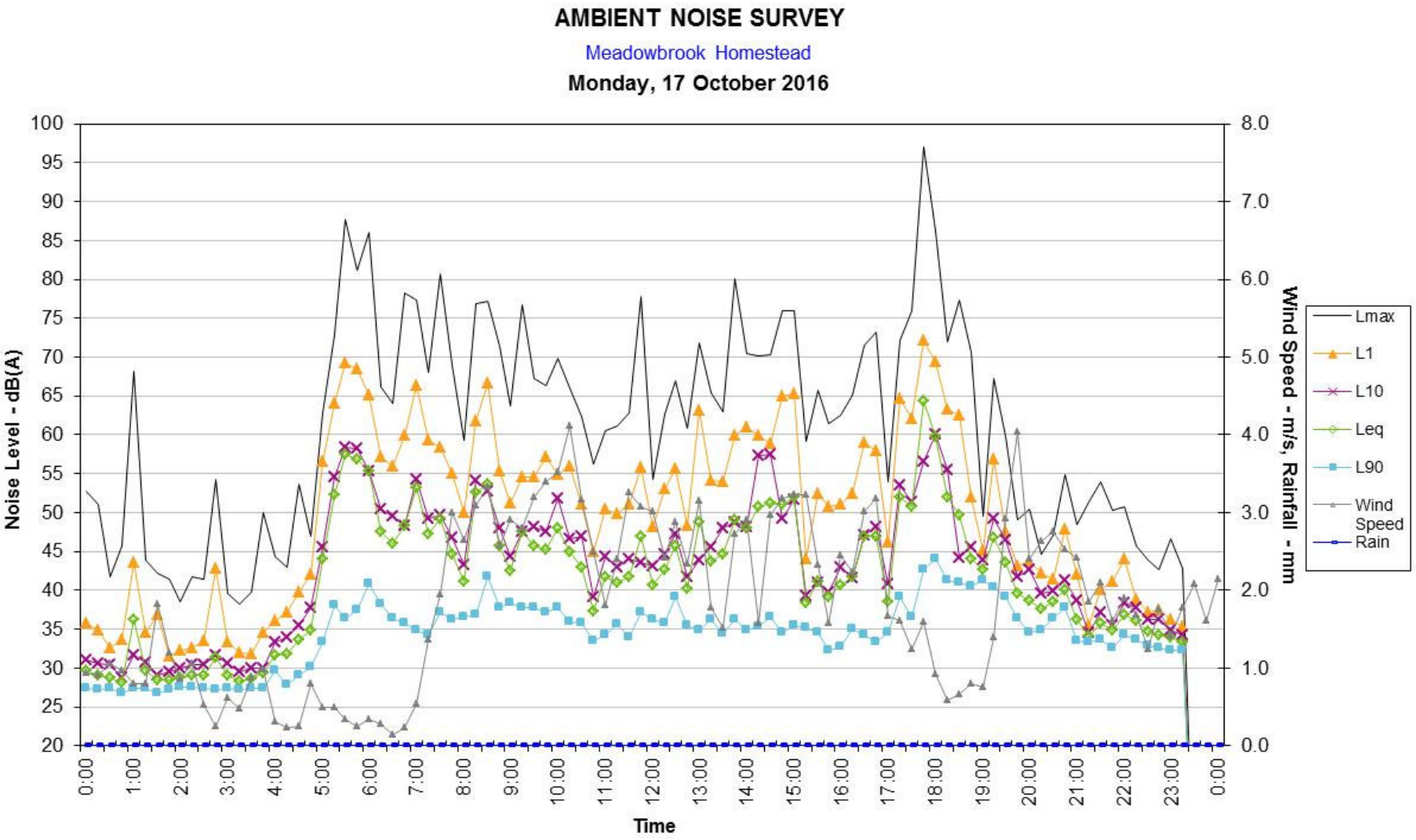

AMBIENT NOISE SURVEY
Meadowbrook Homestead
Wednesday, 12 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00

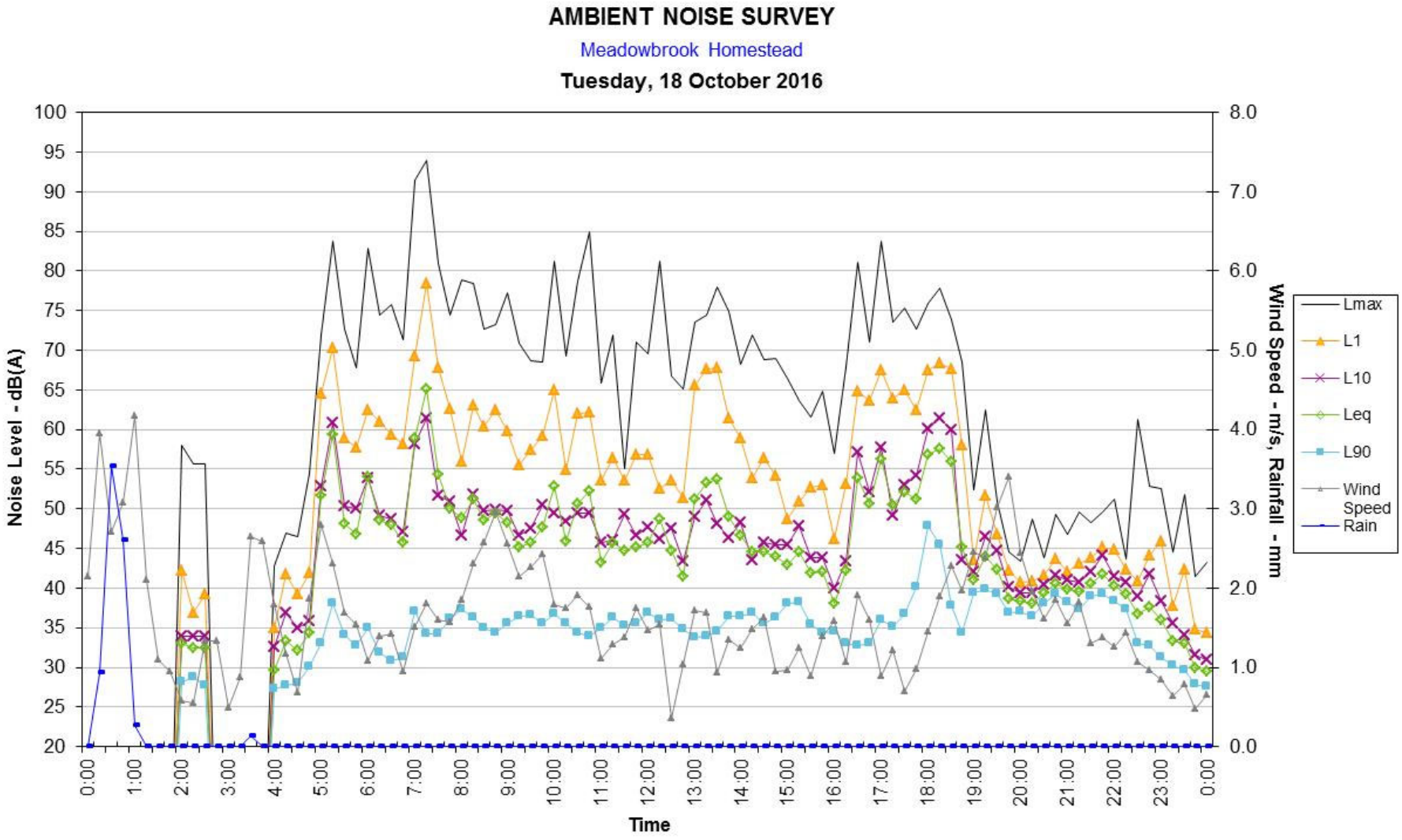

AMBIENT NOISE SURVEY
Meadowbrook Homestead
Thursday, 13 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
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16:00
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22:00
23:00
0:00

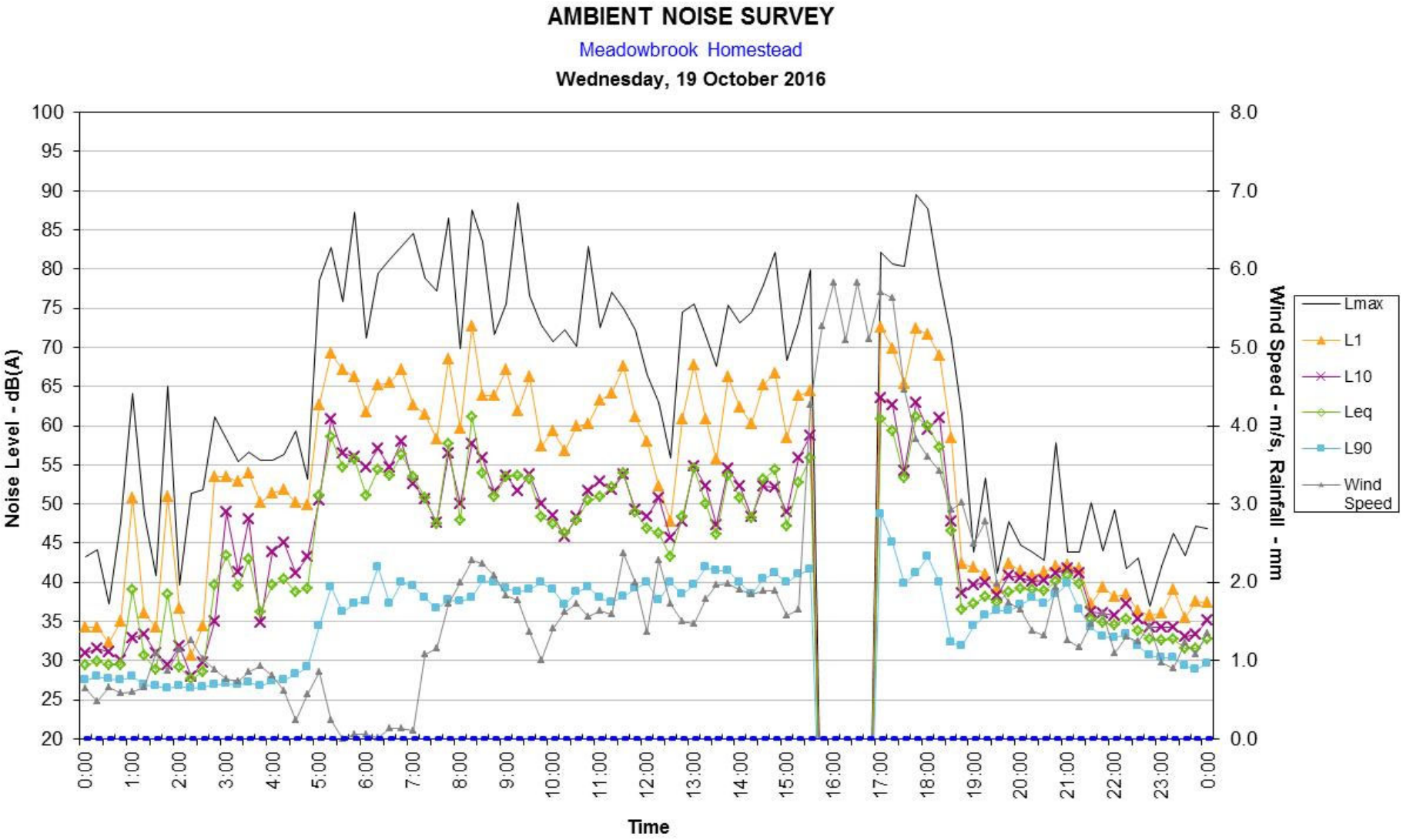

AMBIENT NOISE SURVEY
Meadowbrook Homestead
Friday, 14 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain

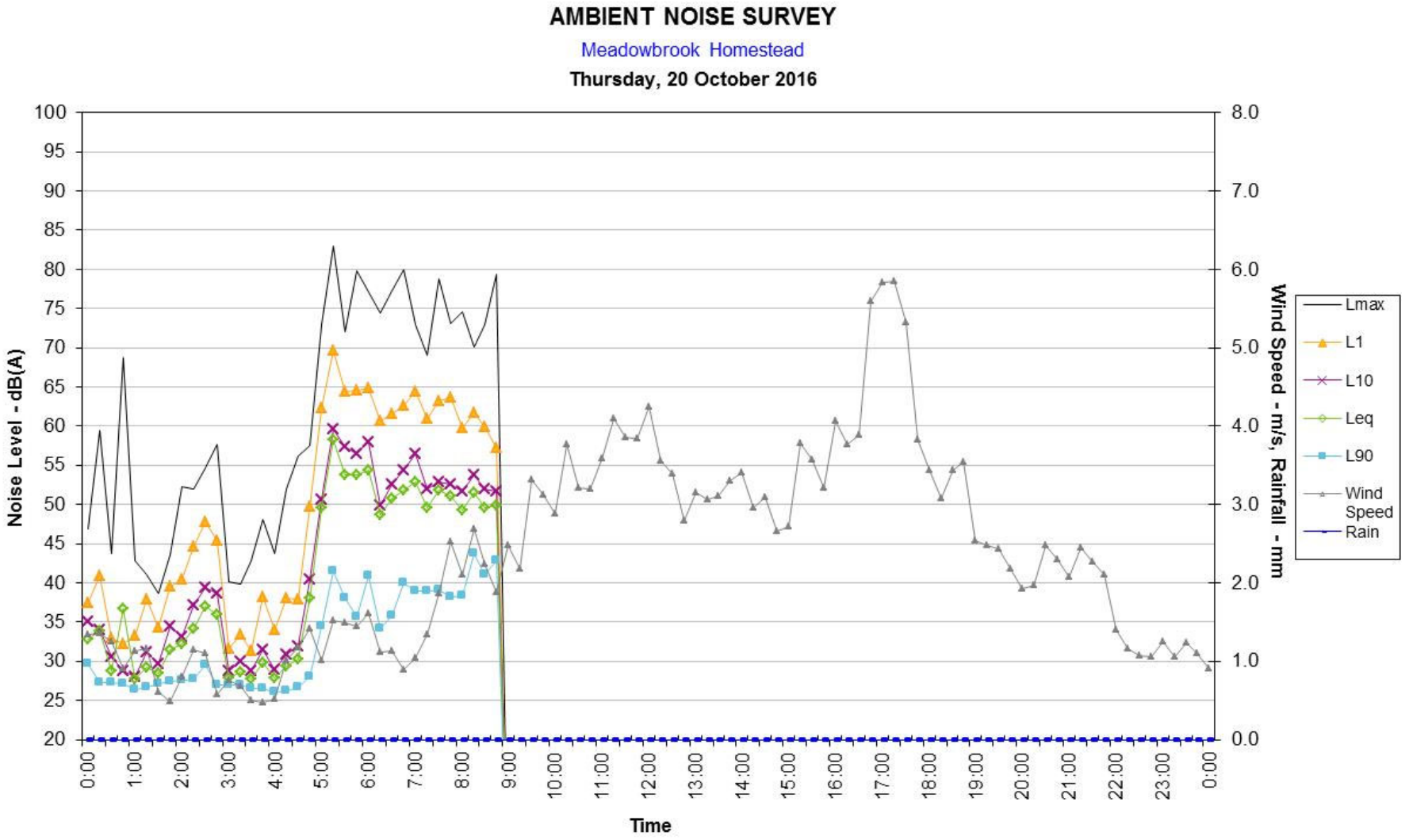

AMBIENT NOISE SURVEY
Meadowbrook Homestead
Saturday, 15 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
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0:00
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7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00


AMBIENT NOISE SURVEY
Meadowbrook Homestead
Sunday, 16 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
1:00
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11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00


AMBIENT NOISE SURVEY
Meadowbrook Homestead
Monday, 17 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
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5.0
4.0
3.0
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7:00
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11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00


AMBIENT NOISE SURVEY
Meadowbrook Homestead
Tuesday, 18 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
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0:00
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13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00


AMBIENT NOISE SURVEY
Meadowbrook Homestead
Wednesday, 19 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
1:00
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8:00
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10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00


AMBIENT NOISE SURVEY
Meadowbrook Homestead
Thursday, 20 October 2016
Noise Level - dB(A)
Wind Speed - m/s, Rainfall - mm
Time
Lmax
L1
L10
Leq
L90
Wind Speed
Rain
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
1:00
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20:00
21:00
22:00
23:00
0:00

Appendix C

Noise Criteria

Appendix C Noise Criteria

C.1 Environmental Protection Act 1994

The key piece of legislation in Queensland for assessing potential environmental impacts associated with development is the EP Act.

Under the Act, a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm (the general environmental duty). Failure to do this is an offence under the Act

C.2 Terms of Reference

The ToR state the objective and performance outcomes as follows:

> *The environmental objective to be met under the EP Act is that the activity will be operated in a way that protects the environmental values of the acoustic environment.*
>
> *The performance outcomes corresponding to these objectives are in Schedule 5, Table 1 of the EP Regulation. The Proponent should supply sufficient evidence (including through studies and proposed management measures) that show these outcomes can be achieved.*

EP Regulation was updated in September 2019 with the performance outcomes now provided in Schedule 8, Part 3, Division 1. There is no change in wording for the Environmental Objective or Performance Outcomes for Noise between the previous 2008 and current 2019 version. The relevant sections of the EP Regulation are discussed below.

C.3 Environmental Protection Regulation 2019

Schedule 8 of the EP Regulation states the following:

> *Part 3 Environmental Objectives and Performance Outcomes*
>
> *Division 1 Operational Assessment*
>
> *Noise*
>
> *Environmental Objective*
>
> *The activity will be operated in a way that protects the environmental values of the acoustic environment.*
>
> *Performance Outcomes*
>
> *1 Sound from the activity is not audible at a sensitive receptor*
>
> *2 The release of sound to the environment from the activity is managed so that adverse effects on environmental values including health and wellbeing and sensitive ecosystems are prevented or minimised.*

Schedule 8 Part 2 of the EP Regulation clarifies the following in relation to the above performance outcomes

> *Part 2 General matters to be addressed by environmental objective assessment*
>
> *General information*
>
> *1 the assessor must decide the extent to which the application achieves each environmental objective relevant to the application*
>
> *2 In assessing whether the application achieves the relevant environmental objective, the assessor must decide whether the activity the subject of the application achieves item 1 of the performance outcome stated for the environmental objective.*

3 *If the assessor is not satisfied the activity the subject of the application achieves item 1 of the performance outcome for the relevant environmental objective, the assessor must decide whether the activity achieves the relevant item 2 performance outcomes stated for the environmental objective.*

4 *the application achieves the relevant environmental objective if the assessor is satisfied the activity the subject of the application achieves –*

(a) item 1 of the performance outcome for the relevant environmental objective: or

(b) item 2 of the performance outcomes for the relevant environmental objective

5 *If the assessor is not satisfied the application achieves a performance outcome for the relevant environmental objective, the assessor may still decide the application achieves the relevant environment objective if the application includes alternative measures for the activity the subject of the application to achieve the environmental objective.*

As discussed in Clause 4 above, either Item 1 or Item 2 of the performance outcomes is to be achieved. Due to the relative proximity of some Project related activities to sensitive receptors, the Project is unlikely to achieve Item 1 of the performance outcomes during some activities and some meteorological conditions. In this instance, the assessment has focused on satisfying Item 2 of the performance outcome. The environmental values discussed in this performance outcome are detailed in EPP (Noise).

C.4 Environmental Protection (Noise) Policy 2019

The purpose of the EPP (Noise) is to achieve the objective of the EP Act in relation to the acoustic environment. It achieves this through identifying environmental values to be enhanced or protected to avoid environmental harm, stating acoustic quality objectives for enhancing or protecting these environmental values, and providing a framework for making decisions in relation to the acoustic environment.

Environmental values to be protected under the policy include the health and biodiversity of ecosystems; human health and wellbeing, and the amenity of the community. Most of the sensitive receptors surrounding the project site are residential, where human health and wellbeing is the key environmental value to be protected, including protecting the ability to sleep, study or learn and to be involved in recreation and conversation.

Schedule 1 of the EPP (Noise) then details acoustic quality objectives for protecting these environmental values. The schedule includes objectives for dwellings as summarised Table 23. These limits are designed to be long term noise limits and are not applied to any individual project or enterprise. They can however inform the decision making process around the limits and can assist in identifying whether the environmental values are protected.

Table 23 EPP (Noise) acoustic quality objectives

Sensitive receptor	Time of day	Acoustic quality objectives, dB(A)			Environmental value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Dwelling (for outdoors)	Daytime and evening	50	55	65	Health and wellbeing
Dwelling (for indoors)	Daytime and Evening	35	40	45	Health and wellbeing
	Night-time	30	35	40	Health and wellbeing, in relation to the ability to sleep

In addition to the Acoustic Quality objectives, the EPP (Noise) provides a hierarchy for the management of activities involving noise; reproduced below:

> *8 Management hierarchy for noise*
>
> *1 This section states the management hierarchy for an activity involving noise that affects, or may affect, an environmental value to be enhanced or protected under this policy.*
>
> *2 To the extent that it is reasonable to do so , noise must be dealt with in the following order of preference:*
>
> *a. Firstly – avoid:*
>
> *Example for paragraph (a)*
>
> *Locating an industrial activity in an area that is not near a sensitive receptors*
>
> *b. Secondly – minimise the noise, in the following–*
>
> *(i) Firstly-orientate an activity to minimise noise*
>
> *Example for subparagraph (i)-*
>
> *Facing a part of an activity that makes noise away from a sensitive receptors*
>
> *(ii) Secondly – use best available technology to minimise the nose*
>
> *c. Thirdly – manage the noise*
>
> *Example for paragraph (c) –*
>
> *using heavy machinery only during business hours*

Additionally, the EPP (Noise) discusses the control of background creep as an additional management intent; reproduced below:

> *9 Management intent for noise*
>
> *2) to the extent it is reasonable to do so, noise must be dealt with in a way that ensures –*
>
> *(a) the noise does not have an any adverse effect, or potential adverse effect, on an environmental value under this policy, and*
>
> *(b) background creep in an area or place is prevented or minimised*
>
> *(4) In this section –*
>
> ***Background creep**, for noise in an area or place, means a gradual increase in the total amount of background noise in the area or place as measured under the document call the "noise measurement manual" publicised on the departments' website.*

The EPP (Noise) 2008 version provided noise limits for controlling background creep; these limits are no longer present in the current version of EPP (Noise). In this instance, guidance has been taken from the Noise Measurement Manual, which provides the following subjective effects of changes in noise levels as shown in Table 11.

Table 24 Subjective effect of increases in noise levels

Change in level of dB	Subjective effect
3	Just perceptible
5	Clearly perceptible
10	Twice as loud

Accordingly, a 3 dB(A) increase in background noise level is considered to be "just perceptible". Additionally, a "just perceptible" increase in background noise level over the life of the Project (approximately 20 years) is considered a "gradual increase" therefore consistent with EPP (Noise) requirements. As such, the following background creep noise goal has been adopted for the current assessment:

$L_{Aeq(1h)} \leq$ RBL + 3 dB(A)

Based on the measured RBLs, the relevant noise criteria under these conditions are summarised in Table 25.

Table 25 Derived EPP (Noise) Background Creep Noise Goal

Receptor	RBL dB(A)			Background Creep $L_{Aeq,adj,T}$ dB(A)		
	Day	Evening	Night	Day	Evening	Night
Kyewong Homestead	26	25	25	29	28	28
Lake Vermont Homestead	26	25	26	29	28	29
Saraji Homestead 1	32	36	36	35	39	39
Saraji Homestead 2	35	38	37	38	41	40
Saraji Homestead 3	35	38	37	38	41	40
Tay Glen Homestead	31	28	28	34	31	31
Meadowbrook Homestead	34	32	25	37	35	28

C.5 Model Mining Conditions

The model conditions contained in MMC17 provide a basis for "proposing environmental protection commitments in the application documents". Noise limits recommended in this document are summarised below:

Table 26 MMC 07 Noise Limits

Noise level dB(A) measured as:	Monday to Saturday			Sundays and Public Holidays		
	7am to 6pm	6pm to 10pm	10pm to 7am	9am to 6pm	6pm to 10pm	10pm to 9am
$L_{Aeq,adj,15\ min}$	CV = 50 AV = 5	CV = 45 AV = 5	CV = 40 AV = 0	CV = 45 AV = 5	CV = 40 AV = 5	CV = 35 AV = 0
$L_{A1,adj,15\ min}$	CV = 55 AV = 10	CV = 50 AV = 10	CV = 45 AV = 5	CV = 50 AV = 10	CV = 45 AV = 10	CV = 40 AV = 5

The following is noted concerning the above table:

- CV = Critical Value
- AV = Adjustment Value
- bg = background noise level (LA90,adj,15 mins) measured over 3-5 days at the nearest sensitive receptor
- To calculate noise limits in table:

  If bg ≤ (CV-AV): Noise limit = bg + AV

  If (CV-AV) < bg ≤ CV: Noise limit = CV

  If bg > CV: Noise limit = bg + 0
- In the event that measured bg is less than 30 dB(A), then 30 dB(A) can be substituted for the measured background level.

As the Project will be operational 24 hours a day, 365 days a year, the "Monday to Saturday" MMC 17 criteria is recommended as applying to all days of the week including public holidays.

Based on the measured RBLs, the relevant noise criteria under these conditions are summarised in Table 27.

Table 27 Derived MMC 17 Criteria

Receptor	$L_{Aeq, adj, T}$ dB(A)			$L_{A1, adj, T}$ dB(A)		
	Day	Evening	Night	Day	Evening	Night
Kyewong Homestead	35	35	30	40	40	35
Lake Vermont Homestead	35	35	30	40	40	35
Saraji Homestead 1	37	41	36	42	46	41
Saraji Homestead 2	40	43	37	45	48	42
Saraji Homestead 3	40	43	37	45	48	42
Tay Glen Homestead	36	35	30	41	40	35
Meadowbrook Homestead	39	37	30	44	42	35

MMC 17 also states the following:

> *A mining camp (i.e. accommodation and ancillary facilities for mine employees or contractors or both, associated with the mine the subject of the environmental authority) is not a sensitive place for that mine or mining project, whether or not the mining camp is located within a mining tenement that is part of the mining project the subject of the environmental authority. For example, the mining camp might be located on neighbouring land owned or leased by the same company as one of the holders of the environmental authority for the mining project, or a related company. However, accommodation for mine employees or contractors is a sensitive place, even if the land is held by a mining company or related company, if occupation is not restricted to the employees, contactors and the families for the particular mine or mines which are held by the same company or a related company.*

As the construction and operation mining camps are restricted to use by employees or contractors associated with the Project, these are not considered sensitive receptors.

C.6 World Health Organization Guidelines for Community Noise 1999

The WHO guidelines provide information and recommendations for community noise in specific environments. The document includes recommended noise levels for community noise, and also provides background information on the health related impacts attributed to various types of noise exposure.

The WHO also presents guideline values for the protection of communication, night time annoyance and sleep disturbance in its document "Guidelines for Community Noise".

The following sections are applicable to the current assessment:

Section 4.2.1 Interference with Communication

a. Speech in relaxed conversation is 100% intelligible in background noise levels of about 35 dB(A), and can be understood fairly well in background levels of 45 dB(A)

Section 4.2.3 Sleep Disturbance Effects

…Where noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided.

A summary of the WHO Guidelines is provided in Table 28.

Table 28 Summary of WHO Criteria

Descriptor	Expected Effects	Indoor criterion dB(A)	Outdoor Criterion dB(A)
Daytime and Evening	Moderate Annoyance and Speech intelligibility	$L_{Aeq(16h)}$ 35	$L_{Aeq(16h)}$ 50
	Serious Annoyance	-	$L_{Aeq(16h)}$ 55
Night time	Sleep disturbance – Continuous noise	$L_{Aeq(8h)}$ 30	$L_{Aeq(8h)}$ 35-40*
	Sleep disturbance – single events	$L_{Amax(8h)}$ 45	$L_{Amax(8h)}$ 50-55*

* Assuming a 5-10 dB reduction through an open window.

C7. enHealth: The health effects of environmental noise – other than hearing loss, May 2004

The Environmental Health Committee (enHealth) is a subcommittee of the Australian Health Protection Committee (AHPC). enHealth is responsible for providing health policy advice and implementation of the National Environmental Health Strategy 2007 – 2012.

The enHealth Council produced a report that presented a review of the current status of national and international research into the health effects of environmental noise, other than hearing loss. The primary aims of the report were to present:

- a review of the health effects associated with environmental noise
- a review of the measures (national and international) used to manage environmental noise.

The report examined a range of environmental noise sources, with a focus on the primary sources of road, rail, air traffic and industry noise, and reviewed key literature discussing impacts of noise exposure on quality of life, sleep disturbance, learning, cardio vascular disease, mental health and stress. Key recommendations of the report are to:

1. recognise environmental noise as a potential health concern
2. promote measures to reduce environmental noise and its impacts
3. address environmental noise in planning and development activities
4. foster research on the non-auditory health impacts of noise.

The report recommends that the WHO Guidelines for Community Noise be adopted as the primary reference for environmental noise levels, below which no health effects are expected.

In addition, by considering these guidelines in the planning for the Project, and incorporating measures to reduce environmental noise and its impacts into the mine plan, it is considered that the noise impact assessment is also consistent with broader recommendations of the enHealth report.

C.8 Ecoaccess Low Frequency Noise Guideline

The assessment of low frequency noise is discussed in the EcoAccess "Guideline for the Assessment of Low Frequency Noise" dated 2004. The guideline separates low frequency noise into infrasound (1 – 20 Hz) and low frequency noise (20 – 200 Hz). For low frequency noise the guideline has a multi-step process which is summarised below:

1. An initial assessment should be conducted to determine
    - if the indoor linear noise level exceeds 50 dB(Linear)
    - to determine if the dB(Linear) measurement exceeds the dB(A) measurement by more than 15 dB.
2. Where the noise fails the initial screening test, an audibility assessment should be conducted to determine if noise between 8 – 200 Hz is audible by comparing the forecast/measured noise between 8 – 200Hz with the median threshold hearing curve defined in the document
3. If this comparison shows that the noise is audible, determine if the low frequency content of the noise is annoying by comparing overall A-weighted low frequency noise levels against set criteria.

For Step 3 above, the guideline sets a criterion of $L_{pA,LF}$ 25 dB for dwellings during the day and $L_{pA,LF}$ 20 dB for dwellings during the evening and night-time period, where $L_{pA,LF}$ is defined as the overall A-weighted noise level between 10 and 160 Hz.

The guideline also clarifies the following concerning the initial assessment:

> *The initial assessment is intended for use in cases where an individual complains about low frequency noise and a decision needs to be made as to whether the particular noise is audible. This assessment does not verify whether the noise is annoying or not. A sound that is audible is not necessarily unacceptable.*

The aforementioned initial assessment has therefore been adopted for the current assessment, further assuming a 5 dB reduction through open windows to obtain the equivalent external noise criterion.

C.9 DES Approvals for Similar Operations

C.9.1 May 2002

In May 2002 DES issued draft environmental authority criteria for a truck/shovel coal mining operation in a quiet area. This coal mining operation was in the Ipswich basin and was the subject of an application to the Land and Resources Tribunal. The tribunal delivered its judgement in March 2003 where it recommended in Section 146 that:

> *'… the environmental authority be granted on the basis of the draft environmental authority issued 17 May 2002."*

The environmental authority criteria are listed on Table 29.

Table 29 Environmental authority criteria

Noise Level dB(A)	Noise Measured at a 'Noise Sensitive Place'					
	Average Hourly A-Weighted Sound Pressure Levels, $L_{Ar\ ,\ 1hour}$ in dB(A)					
	Monday to Saturday			Sundays and Public Holidays		
	7am – 6pm	6pm–10pm	10pm-7am	7am – 6pm	6pm–10pm	10pm-7am
$L_{Ar,\ 1hour}$*	50	45	40	50	45	40

Note * $L_{Aeq(1h)}$ level adjusted for tonality and impulsiveness.

C.9.2 March 2004

In March 2004 DES issued an Environmental Authority for a new coal mine located in a rural area in South-East Queensland. The noise limits for sensitive places near the operations are reproduced in Table 30.

Table 30 Noise limits for sensitive places

Noise Level dB(A)	Noise Measured at a 'Noise Sensitive Place'					
	Average Hourly A-Weighted Sound Pressure Levels, $L_{Ar\ ,\ 1hour}$ in dB(A)					
	Monday to Saturday			Sundays and Public Holidays		
	7am – 6pm	6pm–10pm	10pm-7am	9am – 6pm	6pm–10pm	10pm-9am
$L_{Ar,\ 1hour}$*	50	45	40	50	45	40

C.9.3 March 2012

In March 2012 DES issued draft environmental authority criteria for the open-cut mining thermal coal operation within the Surat basin. The operational noise criteria presented within the draft environmental authority application was the subject of a hearing conducted by the Land Court of Queensland.

The court delivered its judgement on 27 March 2012 where it recommended in Section 424 that:

> *'… it is sufficient that the draft EA limits have been set consistently with the acoustic quality objectives in the EPP (Noise).'*

The controlling noise limit for sensitive places near the operations was a night time criteria of $L_{Aeq(1h)}$ 35 dB(A). This limit is in accordance with the recommended acoustic quality objectives outlined in EPP (Noise)

C.9.4 November 2018

In November 2018, DES issued an Environmental Authority for a coal mine located within the Bowen Basin. The noise limits for sensitive places near the operations are reproduced in Table 30.

Table 31 Noise limits

Noise Level dB(A)	Monday to Sunday (including Public Holidays)		
	7am – 6pm	6pm – 10pm	10pm – 7am
$L_{Aeq(1hr)}$ dB(A)	45	40	35

Appendix D

CONCAWE

Appendix D CONCAWE

The CONCAWE noise prediction method was originally developed to predict noise levels at long distances (typically up to 2 km) from petrochemical plants. The validity of the method was tested using an extensive measurement programme at two oil refineries and a natural gas station.

The model takes account of the following attenuation mechanisms:

- Geometrical spreading (the attenuation of a source with distance).
- Atmospheric absorption (the attenuation due to the atmosphere, varying with temperature and humidity and affecting mainly the higher frequencies).
- Ground attenuation (the additional attenuation that occurs due to complex interference effects over acoustically absorptive (soft) ground).
- Meteorological correction (the correction that accounts for refraction of sound by wind and temperature gradients).
- Source/receptor height correction (the decrease in attenuation due to ground effects where the source/receptor is higher than approximately 2 m, based on grazing angle of the sound ray).
- Barrier attenuation (the attenuation due to screens and barriers - based on the Maekawa semi-empirical method).

With the exception of the geometrical spreading, the method is primarily empirically based. The 95% confidence limits for the model were derived from independent measured data and varied with meteorological category. The results are less accurate in upwind conditions, when measured noise levels would have been lower and the signal (i.e. the plant noise) to noise (i.e. overall noise from all sources) level would have been lower as well. In dB(A) terms, the 95% confidence limits were found to be:

- meteorological category 2: 6.8 (e.g. upwind, moderate wind speed vector and zero temperature gradient, or upwind, light wind vector with temperature lapse)
- meteorological category 3: 6.9 (e.g. upwind, light wind speed vector, zero temperature gradient, or calm with temperature lapse)
- meteorological category 4: 5.7 (calm and zero temperature gradient conditions)
- meteorological category 5: 4.7 (e.g. light downwind with zero temperature gradient, or calm with temperature inversion)
- meteorological category 6: 4.5 (e.g. moderate downwind with zero temperature gradient, or light downwind with temperature inversion).

The 95% confidence limit is interpreted to mean that the "true" sound level at any location will be, with 95% certainty, the predicted level +/- the confidence limit (4.5 - 6.8). It is further noted that these confidence limits are based on distance up to 2 km from the source. At greater distances, such as those between the receptors and the Project, the confidence limit would be much wider.

When used for environmental noise predictions it should also be noted that the tolerance in the sound power output of the units modelled is usually around 2 dB(A).

Appendix E

Equipment Sound Power Levels

Appendix E Equipment Sound Power Levels

Table 32 Spectral noise data for mine noise sources – operational sources used in Operational FY 2023-FY2042 Scenario

Area	Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound power level (dB) per octave band (Hz)								
					31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
MIA	Breaker Station	1	10	113	111	112	111	111	110	108	106	98	89
MIA (CHPP)	Coal Preparation Plant	1	23	119	118	118	117	116	117	114	113	106	96
MIA	Crusher - Primary	1	19	124	122	123	122	122	121	119	117	109	100
MIA	Crusher - Secondary	1	9	117	115	116	115	115	114	112	110	102	93
MIA	Crusher - Tertiary	1	9	111	109	110	109	109	108	106	104	96	87
MIA	Product Stacker Reclaimer	1	3	104	115	111	109	106	101	96	94	90	80
MIA	Rail loadout	1	15	111	104	104	101	103	104	104	106	103	94
MIA	Rejects hopper	1	30	100	99	99	98	97	98	95	94	87	77
MIA	ROM Hopper	1	29	105	104	104	103	102	103	100	99	92	82
MIA	Surge Bin	1	20	101	89	94	92	93	94	96	95	93	87
MIA	Transfer station	1	10	111	107	109	114	111	108	105	103	100	92
MIA	Cat 994 wheel dozer	1	4	123	117	117	118	112	115	119	118	109	96
MIA (CHPP)	Cat 789 haul truck	1	4	120	126	126	124	120	117	114	112	105	105
MIA (CHPP)	Cat 854 Wheel Dozer	4	4	123	117	117	118	112	115	119	118	109	96
MIA (CHPP)	Cat 16 Grader	1	4	113	103	114	117	116	110	106	105	101	96

Area	Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound power level (dB) per octave band (Hz)								
					31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
MIA (CHPP)	Cat 777 water truck	1	4	116	120	122	125	118	111	109	109	103	96
MIA (general)	FEL	1	4	113	115	115	121	117	109	105	99	89	89
Portal	Grader	1	4	113	103	114	117	116	110	106	105	101	96
Portal	Portal fan	1	3	130	122	122	120	126	125	125	123	121	117
Mine Ventilation	Upcast vent Shaft	9	5.5	122	121	121	114	130	111	106	104	93	93
As required	Conveyors	1	varies	88/metre	99	99	93	85	84	80	79	81	81
Gas Drainage Infrastructure	Gas wells	90	1.5	100	101	109	106	101	94	95	93	88	81
Gas Drainage Infrastructure	Gas Flares	2	10	127	137	133	128	122	120	122	118	113	106
Gas Drainage Infrastructure	Central process hubs	2	4	105	120	112	115	110	97	94	93	94	94

Table 33 Spectral noise data for mine noise sources – construction sources used in all scenarios

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Mine Infrastructure	Site establishment	Ripping	D7 Bulldozer	2	4	119	113	113	114	108	111	115	114	105	92
		Ground removal	Cat 631 scrapper	2	4	108	106	112	112	107	105	103	101	94	87
			30t excavator	2	4	106	104	105	108	104	105	100	97	89	77
		Placement	Cat 631 scraper	2	4	108	106	112	112	107	105	103	101	94	87
			Cat 773 dump truck	2	4	120	126	126	124	120	117	114	112	105	105
		Add water	Cat 777 water truck	2	4	116	120	122	125	118	111	109	109	103	96
		Grade	Cat 16 Grader	2	4	113	103	114	117	116	110	106	105	101	96
		Roll	825 Roller compactor	2	4	106	94	99	104	107	102	100	99	93	85
	Install slabs	Deliver materials	B double	3	4	110	106	112	113	108	107	105	102	99	96
		Add water	Cat 777 water truck	2	4	116	120	122	125	118	111	109	109	103	96
		Load on/off truck	Cat 966 Loader	1	4	113	115	115	121	117	109	105	99	89	89
		Deliver to site	10t body truck	2	4	110	106	112	113	108	107	105	102	99	96
		Deliver to site	40t articulate dump truck	2	4	110	106	112	113	108	107	105	102	99	96
		Grade	Cat 16 Grader	2	4	113	103	114	117	116	110	106	105	101	96

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Roll	825 Roller compactor	2	4	106	94	99	104	107	102	100	99	93	85
		Lay concrete	Concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
		Lay concrete	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
		Lay bitumen	Bitumen sprayer	1	4	106	106	104	111	105	104	100	98	92	83
	Assembly	Lifting	100t outrigger	1	4	107	105	109	108	105	107	100	98	96	90
		Lifting	Rough terrain crane	1	4	105	121	108	107	103	103	100	96	87	79
		Lifting	Franna crane	2	4	105	121	108	107	103	103	100	96	87	79
		Access	Elevated work platform	2	4	96	112	99	98	94	94	91	87	78	70
		Access	Scissor lift	2	4	96	112	99	98	94	94	91	87	78	70
		Concrete delivery	Concrete truck	4	4	109	105	111	112	107	106	104	101	98	95
		Concrete delivery	Concrete pump	2	4	110	106	112	113	108	107	105	102	99	96
		Construction equipment	Air compressor	2	4	103	97	92	92	91	94	97	97	95	92
		Construction equipment	Generators	2	4	102	106	114	111	105	96	95	94	88	76
		Construction equipment	Welders	2	4	101	99	99	94	91	96	93	98	89	82
		Construction equipment	Winch	2	4	102	106	114	111	105	96	95	94	88	76

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Rail Loops	Earthworks	Ripping	D7 bulldozer with ripper	1	4	119	113	113	114	108	111	115	114	105	92
		Ground removal	Backhoe	1	4	100	101	109	107	101	96	95	92	87	81
		Ground removal	30t excavator	1	4	106	104	105	108	104	105	100	97	89	77
		Placement	40t articulate dump truck	2	4	110	106	112	113	108	107	105	102	99	96
		Add water	Water truck	1	4	116	120	122	125	118	111	109	109	103	96
		Grade	Cat 16 Grader	1	4	113	103	114	117	116	110	106	105	101	96
		Roll	825 Roller compactor	1	4	106	94	99	104	107	102	100	99	93	85
	OHWS and footings	Prepare footings	30t excavator	1	4	106	104	105	108	104	105	100	97	89	77
		Remove spoil	40t articulate dump truck	2	4	110	106	112	113	108	107	105	102	99	96
		Form footings	Concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
		Form footings	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
		Hoist materials	Franna crane	1	4	105	121	108	107	103	103	100	96	87	79
		Access	Elevated work platform	2	4	96	112	99	98	94	94	91	87	78	70
		Access	Scissor lift	2	4	96	112	99	98	94	94	91	87	78	70
		Construction	Air compressor	2	4	103	97	92	92	91	94	97	97	95	92

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		equipment													
		Construction equipment	Generators	2	4	102	106	114	111	105	96	95	94	88	76
		Construction equipment	Welders	2	4	101	99	99	94	91	96	93	98	89	82
		Construction equipment	Winch	2	4	102	106	114	111	105	96	95	94	88	76
	Trackwork	Deliver material	B double	1	4	110	106	112	113	108	107	105	102	99	96
		Deliver material	40t articulate dump truck	1	4	110	106	112	113	108	107	105	102	99	96
		Unload/move material	Front end loader	1	4	107	107	105	111	109	102	100	99	93	89
		Lay/form track	Ballast train	1	4	111	103	103	114	110	109	107	102	96	96
		Lay/form track	Tamping machine	1	4	111	103	103	114	110	109	107	102	96	96
		Lay/form track	Grinding machine	1	4	108	106	112	112	107	105	103	101	94	87
Portal	Creating portal	Drill	Rock bolting machine	1	4	115	105	114	114	113	112	107	109	107	105
		Drill	Road header	1	4	115	105	114	114	113	112	107	109	107	105
	Stabilisation of highwall and formation of portal	Shotcreting	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
		Shotcreting	Concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
		Concreting	Concrete agitator	1	4	110	106	112	113	108	107	105	102	99	96

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Concreting	Slurry pump	1	4										
	Removing spoil	Load onto truck	Loader	1	4	107	107	105	111	109	102	100	99	93	89
		Remove spoil to storage area	40t articulate dump truck	2	4	110	106	112	113	108	107	105	102	99	96
	Plant assembly	Deliver material	B double	2	4	110	106	112	113	108	107	105	102	99	96
		Lifting	Franna crane	1	4	105	121	108	107	103	103	100	96	87	79
		Access	Elevated work platform	2	4	96	112	99	98	94	94	91	87	78	70
		Access	Scissor lift	2	4	96	112	99	98	94	94	91	87	78	70
		Construction equipment	Generators	2	4	102	106	114	111	104	96	95	94	88	76
		Construction equipment	Welders	2	4	101	99	99	94	91	96	93	98	89	82
Vent Shaft	Site preparation	Earthworks	Backhoe	1	4	100	101	109	107	101	96	95	92	87	81
		Earthworks	Articulated truck	2	4	110	106	112	113	108	107	105	102	99	96
	Drill shaft	Drill	Drill rig	1	4	118	121	121	122	116	108	110	111	112	110
	Removing spoil	Load onto truck	loader	1	4	107	107	105	111	109	102	100	99	93	89
		spoil removal	articulated truck	2	4	110	106	112	113	108	107	105	102	99	96
	Form shaft	Shotcreting	concrete pump	1	4	110	106	112	113	108	107	105	102	99	96

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
	lining	Shotcreting	concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
	Plant assembly	Deliver material	B double	1	4	110	106	112	113	108	107	105	102	99	96
		Lifting	Franna crane	1	4	105	121	108	107	103	103	100	96	87	79
		Construction equipment	Air compressor	1	4	103	97	92	92	91	94	97	97	95	92
		Construction equipment	Generators	1	4	102	106	114	111	105	96	95	94	88	76
		Construction equipment	Welders	2	4	101	99	99	94	91	96	93	98	89	82
		Construction equipment	Scissor lift	1	4	96	112	99	98	94	94	91	87	78	70
		Construction equipment	Elevated work platform	2	4	96	112	99	98	94	94	91	87	78	70
		Construction equipment	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
		Construction equipment	Concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
Gas Pipeline / Water Pipeline / Powerline	Clearing	Slashing	Slasher	1	4	106	104	105	108	104	105	100	97	89	77
		Slashing	Tub grinder	1	4	122	106	114	115	120	119	118	114	99	101
		Ground removal	Cat 631 scraper	1	4	108	106	112	112	107	105	103	101	94	87
		Ground removal	Backhoe	1	4	100	101	109	107	101	96	95	92	87	81
		Ground removal	D7 Bulldozer	1	4	119	113	113	114	108	111	115	114	105	92

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Add water	Water truck	1	4	116	120	122	125	118	111	109	109	103	96
	Trenching	Trenching	Vermeer trencher	1	4	115	105	114	114	113	112	107	109	107	105
		Trenching	30t excavator	1	4	106	104	105	108	104	105	100	97	89	77
		Lowering	D7 Bulldozer	1	4	119	113	113	114	108	111	115	114	105	92
		Welding	Generators	2	4	102	106	114	111	105	96	95	94	88	76
		Welding	Welders	2	4	101	99	99	94	91	96	93	98	89	82
	Backfill of pipe and testing	Padding	Ozzie Padder	1	4	110	127	122	119	112	105	104	102	96	91
		Placement	12t excavator	2	4	106	104	105	108	104	105	100	97	89	77
		Placement	Cat 854 Wheel Dozer	1	4	119	113	113	114	108	111	115	114	105	92
		Deliver material	B double	2	4	110	106	112	113	108	107	105	102	99	96
		Trench compacting	Trench roller	1	4	106	94	99	104	107	102	100	99	93	85
		Dust suppression	water truck	1	4	116	120	122	125	118	111	109	109	103	96
		Pipe testing	Air compressor	1	4	103	97	92	92	91	94	97	97	95	92
	Access track construction	Deliver material	Truck and dog	2	4	110	106	112	113	108	107	105	102	99	96
		Roll	825 Roller compactor	1	4	106	94	99	104	107	102	100	99	93	85

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Level ground	Cat 16 Grader	1	4	113	103	114	117	116	110	106	105	101	96
		Dust suppression	Cat 777 water truck	1	4	116	120	122	125	118	111	109	109	103	96
Gas wells and flares	Access track construction	Deliver material	b double	1	4	110	106	112	113	108	107	105	101	99	96
		Roll	825 Roller compactor	1	4	106	94	99	104	107	102	100	99	93	85
		Grade	Cat 16 Grader	1	4	113	103	114	117	116	110	106	105	101	96
		Add water	Water truck	2	4	116	120	122	125	118	111	109	109	103	96
	Create lease pad	Ground removal	D7 Bulldozer	1	4	119	113	113	114	108	111	115	114	105	92
		Ground removal	30t excavator	1	4	106	104	105	108	104	105	100	97	89	77
		Grade	Cat 16 Grader	1	4	113	103	114	117	116	110	106	105	101	96
		Roll	825 Roller compactor	1	4	106	94	99	104	107	102	100	99	93	85
		Lay concrete	Concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
		Lay concrete	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
	Drilling well	Drilling	50t drill rig	1	4	118	121	121	122	116	108	110	111	112	110
		Drilling	Cat 966 Loader	1	4	113	115	115	121	117	109	105	99	89	89
	Assembly	Deliver material	B double	2	4	110	106	112	113	108	107	105	102	99	96
		Lifting	Franna crane	1	4	105	121	108	107	103	103	100	96	87	79

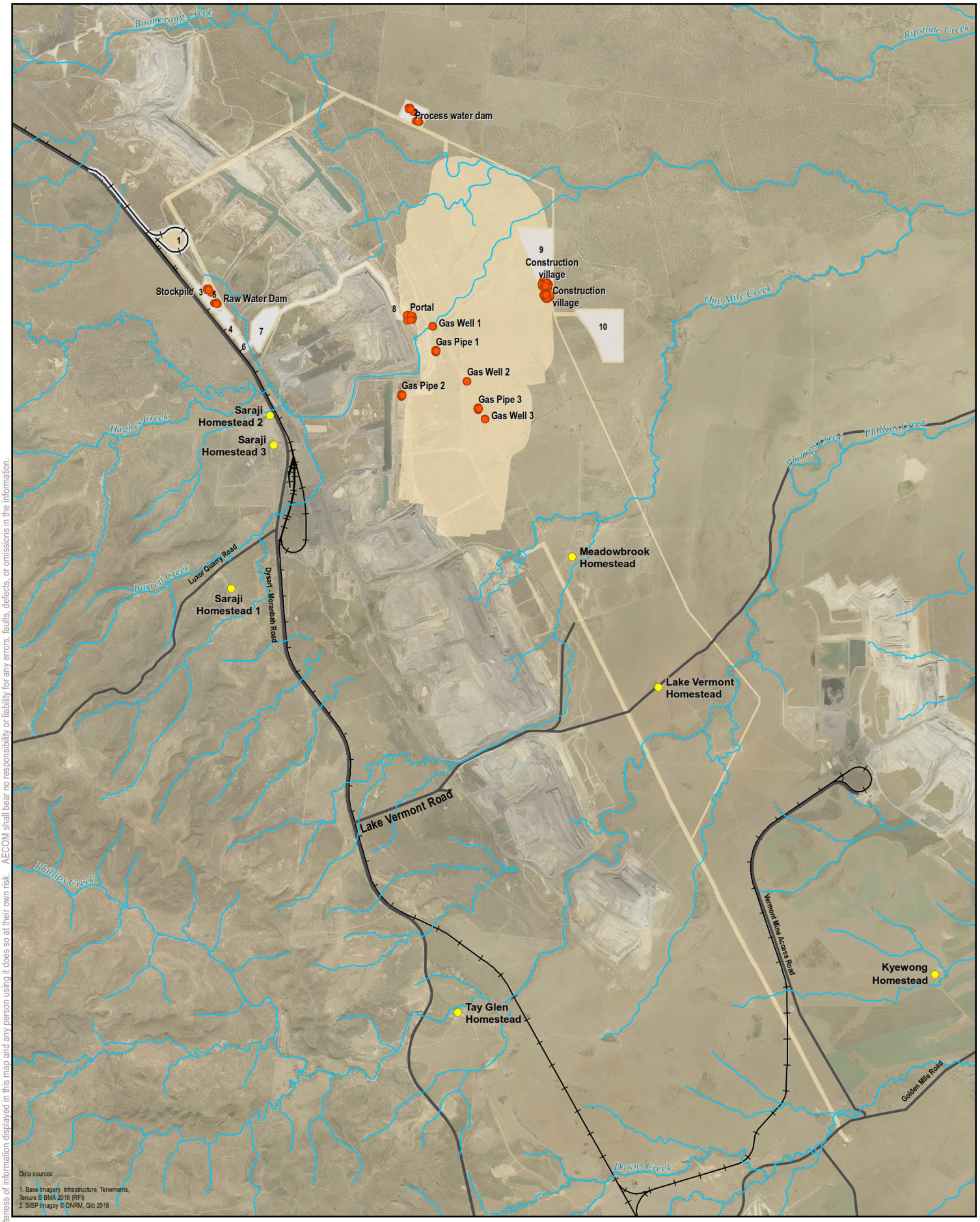
Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Construction equipment	Air compressor	1	4	103	97	92	92	91	94	97	97	95	92
		Construction equipment	Generators	1	4	102	106	114	111	105	96	95	94	88	76
		Construction equipment	Welders	1	4	101	99	99	94	91	96	93	98	89	82
Dams	Earthworks	Ripping	D7 bulldozer	2	4	119	113	113	114	108	111	115	114	105	92
		Ground removal	Cat 631 scraper	2	4	108	106	112	112	107	105	103	101	94	87
		Ground removal	30t excavator	2	4	106	104	105	108	104	105	100	97	89	77
		Remove spoil	Articulated truck	2	4	110	106	112	113	108	107	105	102	99	96
		Dust suppression	Water truck	2	4	116	120	122	125	118	111	109	109	103	96
Accommodation camps	Site Establishment	Ripping	D7 Bulldozer	2	4	119	113	113	114	108	111	115	114	105	92
		Ground removal	Backhoe	2	4	100	101	109	107	101	96	95	92	87	81
		Ground removal	30t excavator	2	4	106	104	105	108	104	105	100	97	89	77
		Placement	Backhoe	2	4	100	101	109	107	101	96	95	92	87	81
		Placement	Articulated truck	2	4	110	106	112	113	108	107	105	102	99	96
		Add water	Cat 777 water truck	2	4	116	120	122	125	118	111	109	109	103	96
		Grade	Cat 16 Grader	2	4	113	103	114	117	116	110	106	105	101	96

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Roll	Compactor	2	4	106	94	99	104	107	102	100	99	93	85
	Install slabs and pavement	Deliver material from quarry	B double	2	4	110	106	112	113	108	107	105	102	99	96
		Add water	Cat 777 water truck	2	4	116	120	122	125	118	111	109	109	103	96
		Lay concrete	Concrete truck	1	4	109	105	111	112	107	106	104	101	98	95
		Lay concrete	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
		Bitumen	Bitumen sprayer	2	4	106	106	104	111	105	104	100	98	92	83
	Village assembly	Deliver material	B double	2	4	110	106	112	113	108	107	105	102	99	96
		Lifting	Franna crane	1	4	105	121	108	107	103	103	100	96	87	79
		Lifting	100t outrigger	2	4	107	105	109	108	105	107	100	98	96	90
		Lifting	Roughie 4WD 50t	2	4	110	106	112	113	108	107	105	102	99	96
		Access	Elevated work platform	2	4	96	112	99	98	94	94	91	87	78	70
		Access	Scissor lift	2	4	96	112	99	98	94	94	91	87	78	70
		Form concrete	Concrete truck	2	4	109	105	111	112	107	106	104	101	98	95
		Form concrete	Concrete pump	1	4	110	106	112	113	108	107	105	102	99	96
		Construction equipment	Air compressor	2	4	103	97	92	92	91	94	97	97	95	92

Area	Phase	Activity	Indicative Equipment	Quantity	Source Height m	Sound Power Level dB(A)	Sound Power Level (dB) per octave band (Hz)								
							31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
		Construction equipment	Generators	2	4	102	106	114	111	105	96	95	94	88	76
		Construction equipment	Welders	2	4	101	99	99	94	91	96	93	98	89	82
		Construction equipment	Winches	2	4	102	106	114	111	105	96	95	9	88	76

Appendix F

Predicted Mine Noise Contours



LEGEND

Project Footprint
Surface Infrastructure

Sensitive Receptors
Homestead

Noise Sources

Watercourse
Public Road
Rail Loop
Existing Railway

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Operations Village

N

Figure 2
Construction Phase 1 (2021)
Typical Equipment Locations

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

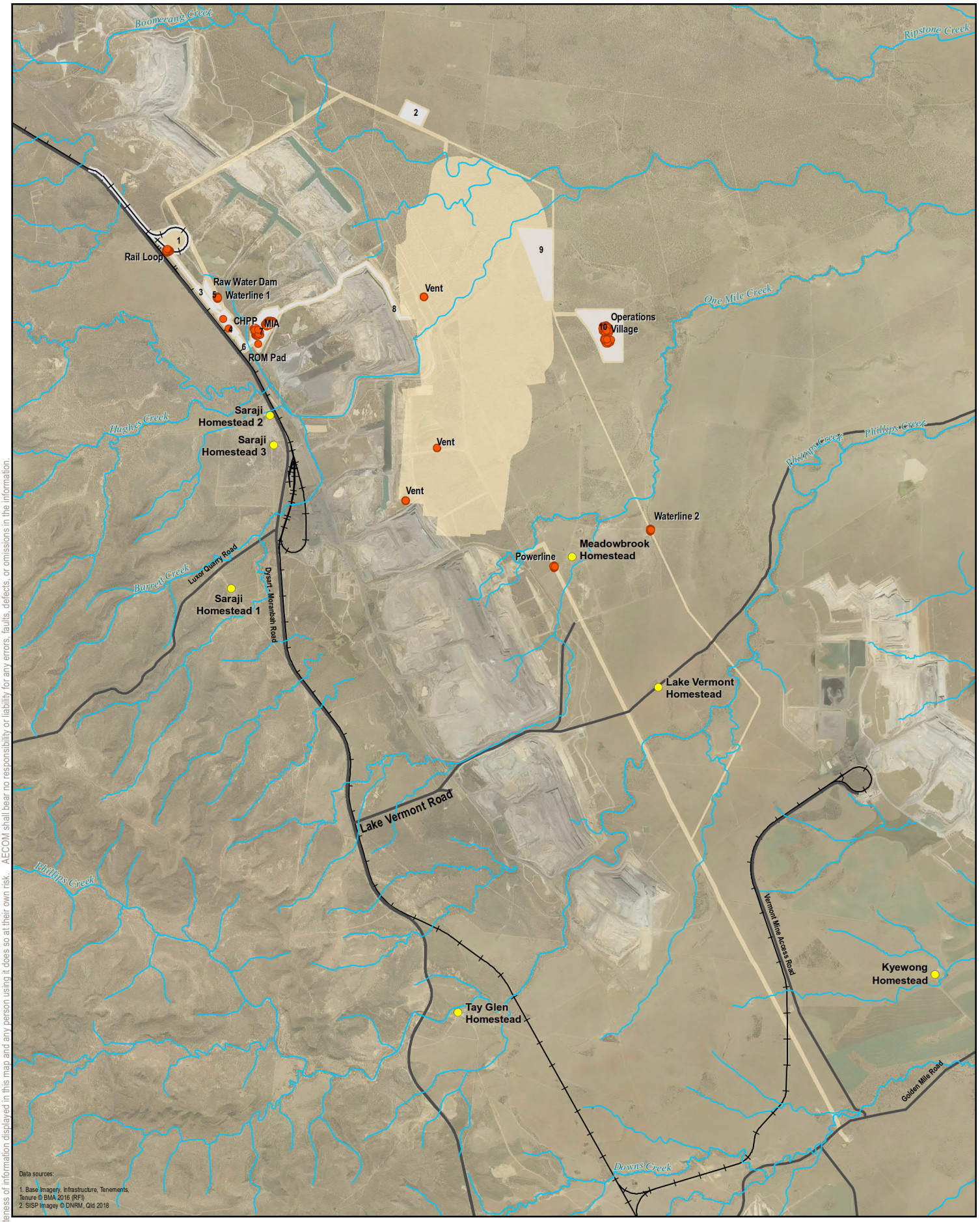
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LEGEND

- Project Footprint
- Surface Infrastructure

Sensitive Receptors

- Homestead

- Noise Sources
- Watercourse
- Public Road
- Rail Loop
- Existing Railway

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Operations Village

N

Figure 3

Construction Phase 2.1 (2022-2023) and Operational Phase (2023) – Powerline and Waterline Construction near Meadowbrook Homestead Typical Equipment Locations

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

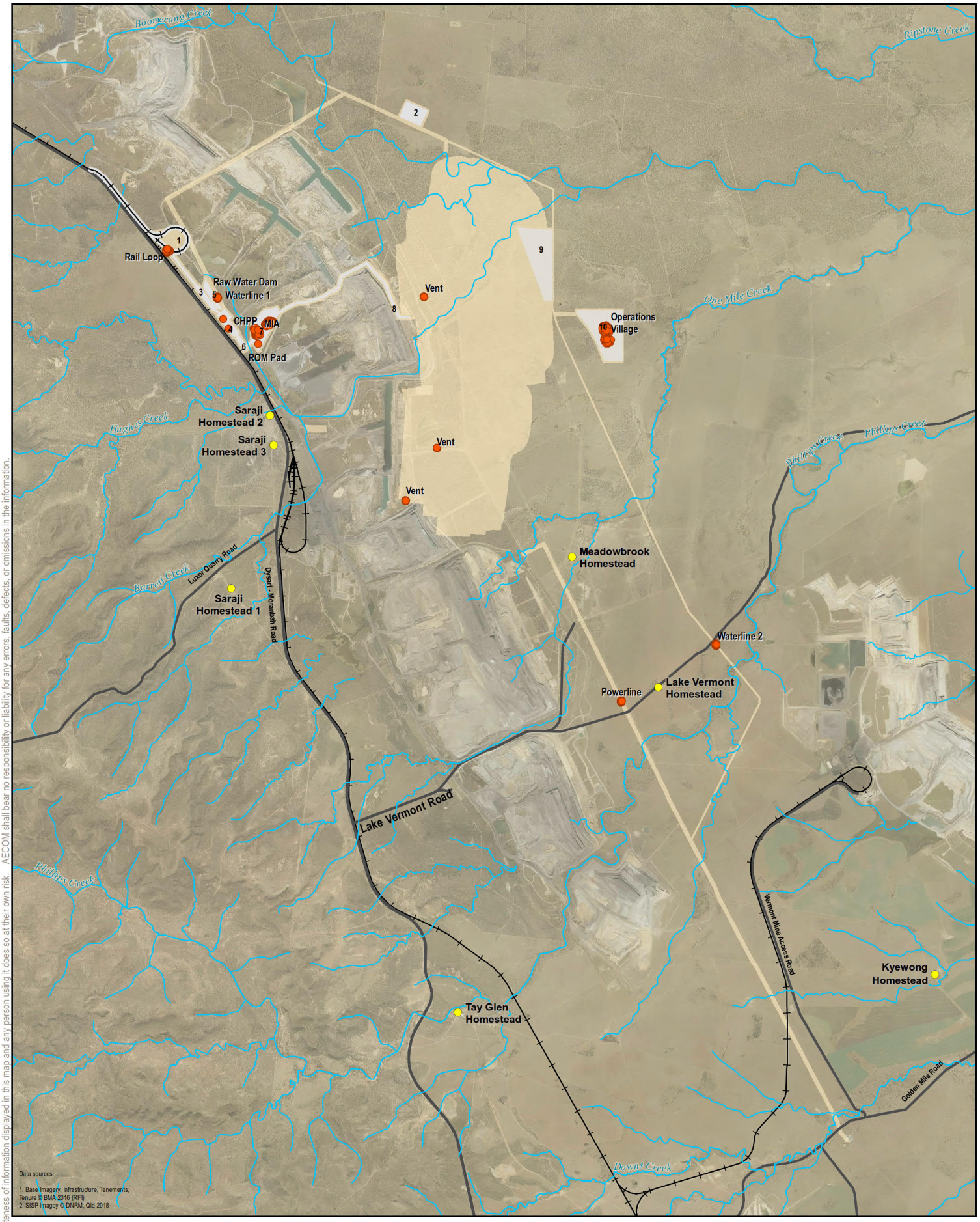
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LEGEND

- Project Footprint
- Surface Infrastructure

Sensitive Receptors

- Homestead

Noise Sources

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Operations Village

N

Figure 4
Construction Phase 2.2 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Lake Vermont Homestead Typical equipment locations

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

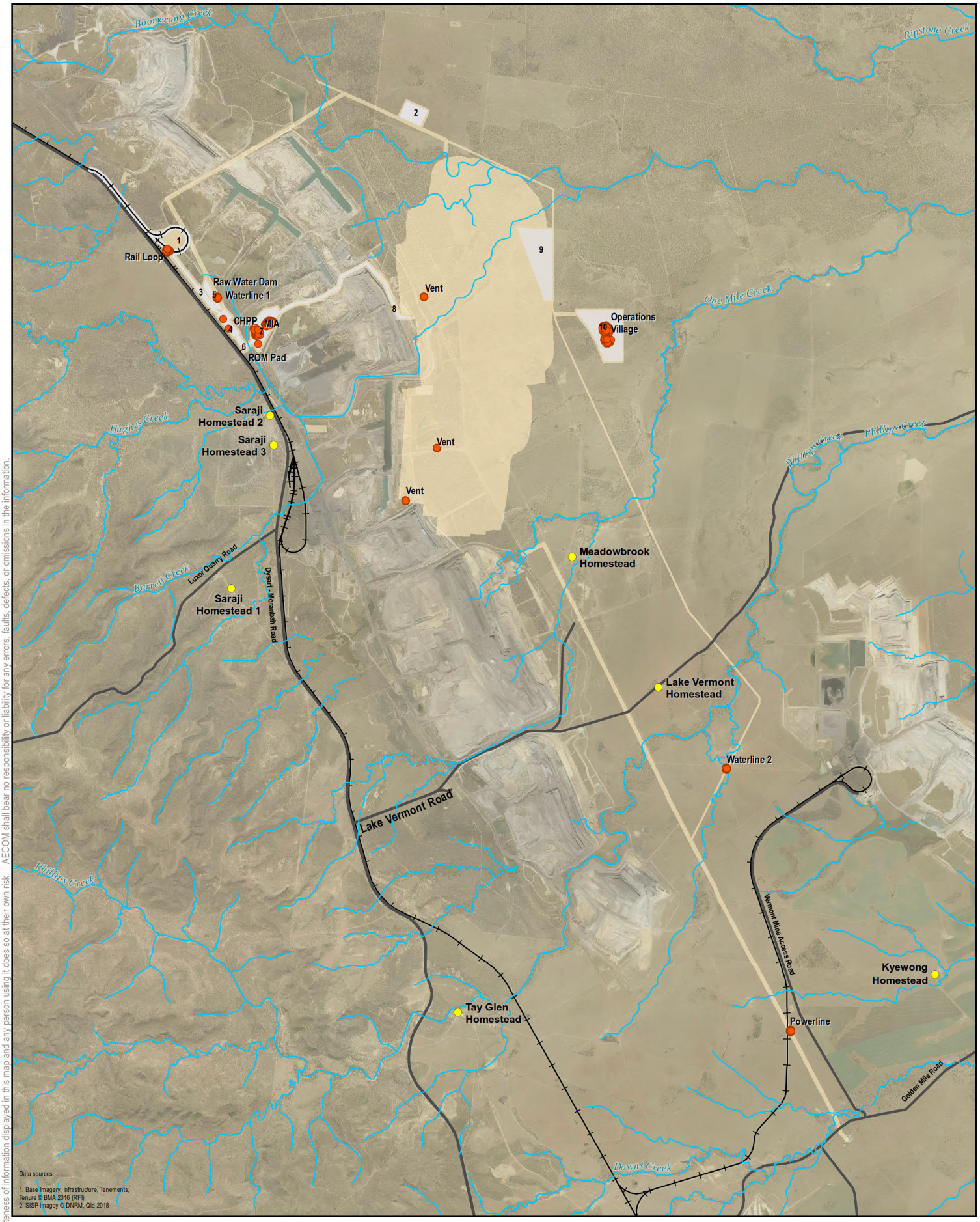
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LEGEND

Project Footprint
Surface Infrastructure

Sensitive Receptors
Homestead

Noise Sources

Watercourse
Public Road
Rail Loop
Existing Railway

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Operations Village

N

Figure 5

Construction Phase 2.3 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Kyewong and Tay Glen Homestead Typical equipment locations

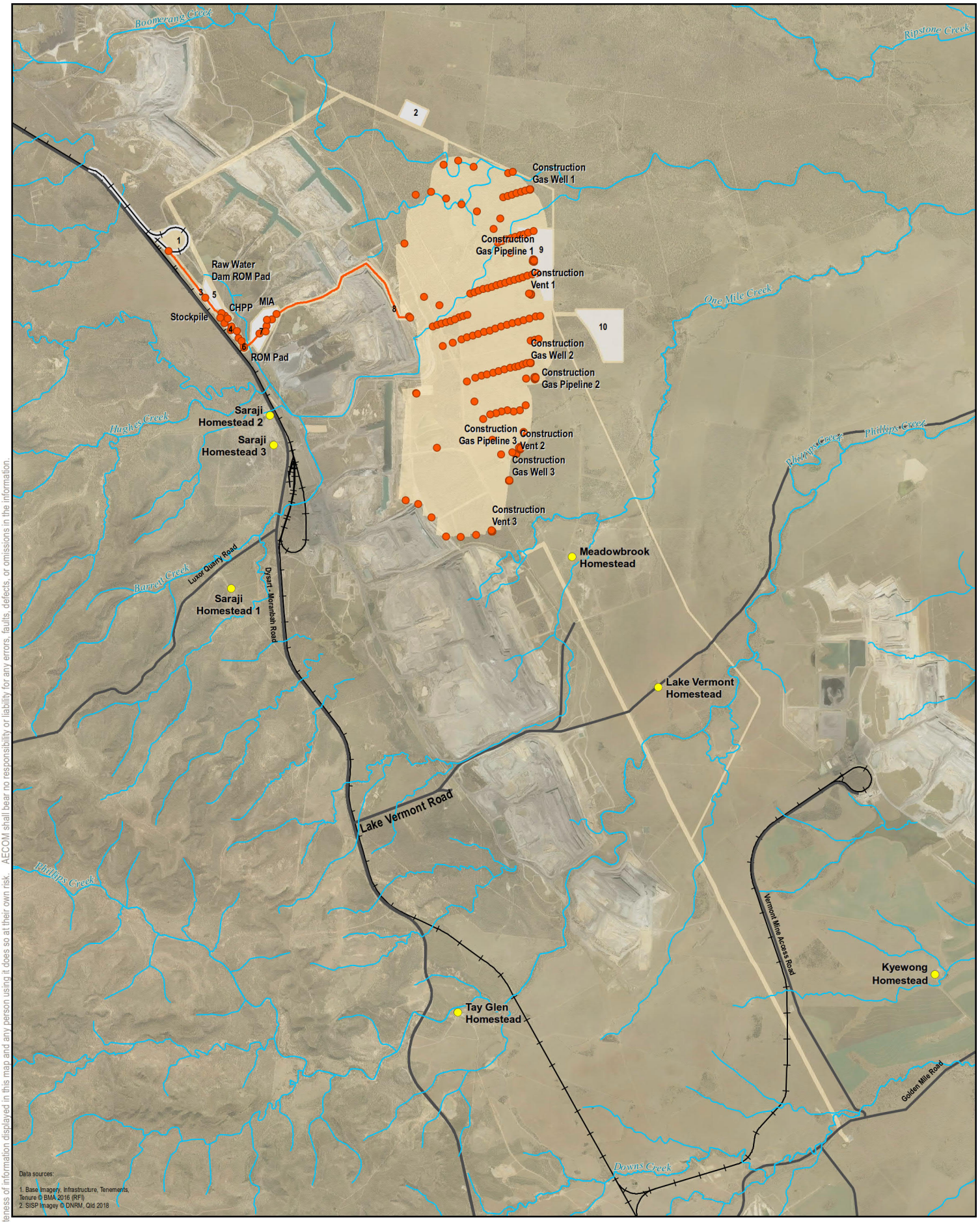
Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres
Scale: 1:120,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Project Footprint
- Surface Infrastructure

Sensitive Receptors

- Homestead

- Noise Sources
- Conveyor Belt

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Operations Village

Figure 6
Operational Phase (2024-2043)
Typical equipment locations

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

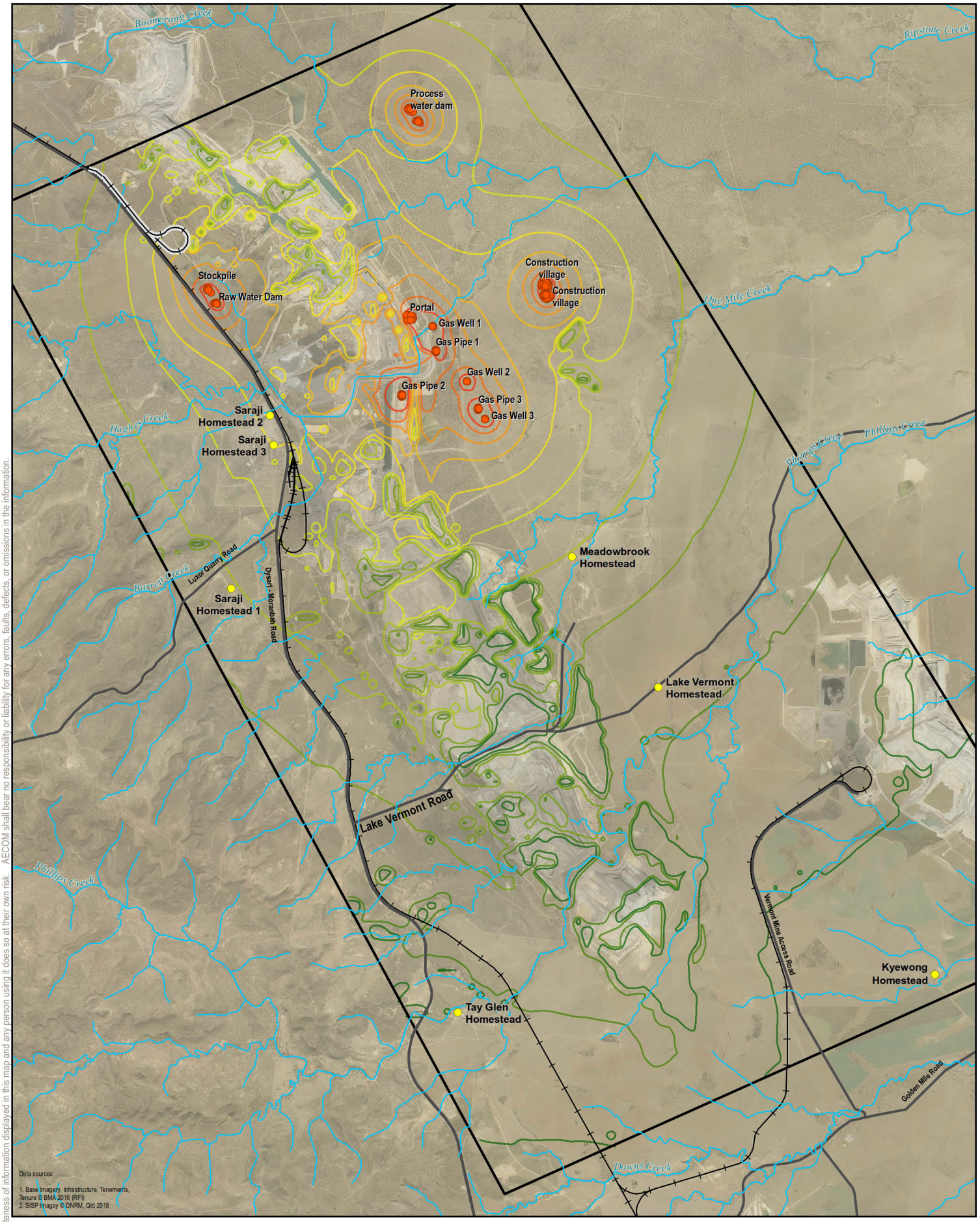
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 7

Construction Phase 1 (2021)
Worst-case meteorological conditions
$L_{Aeq(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

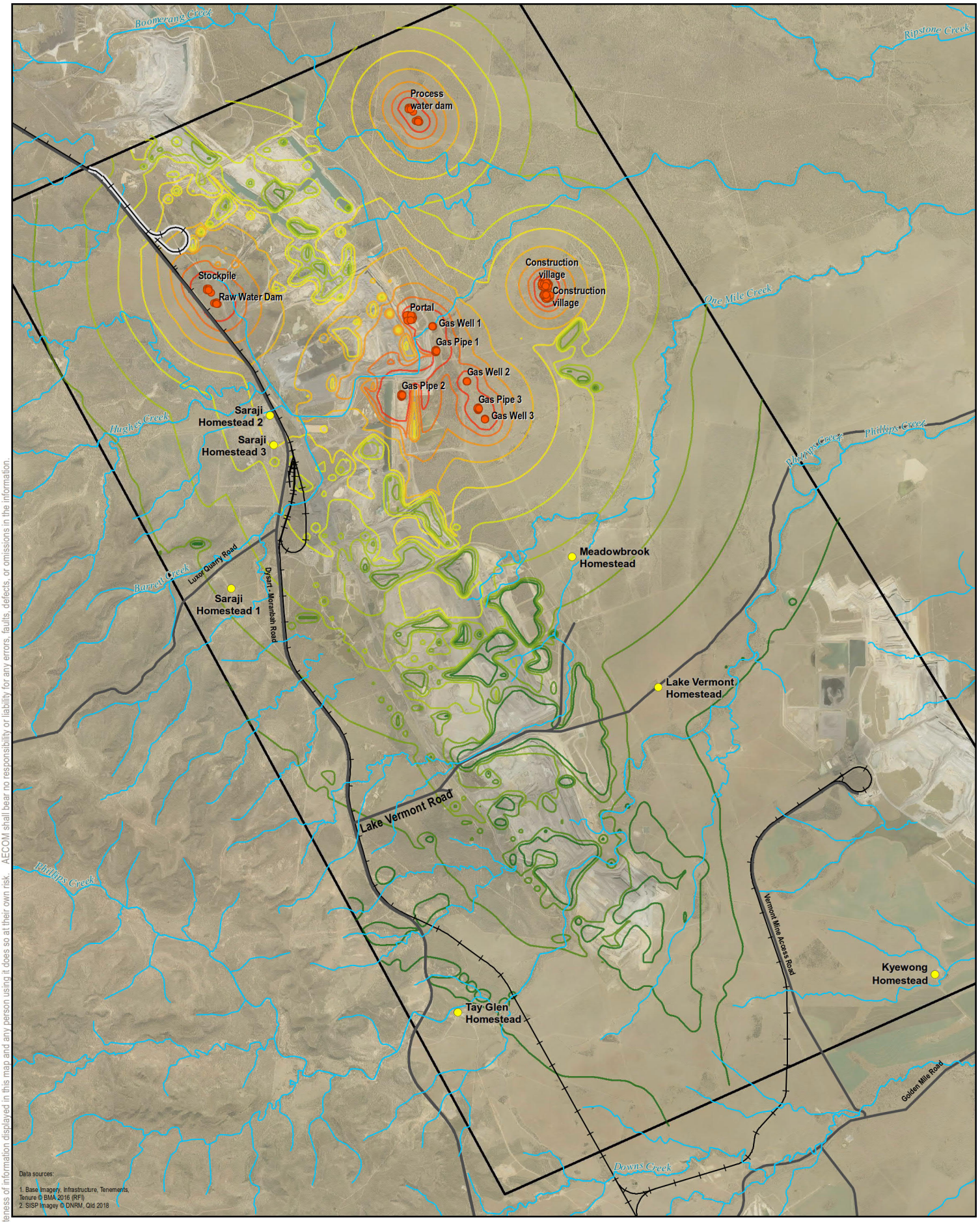
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LEGEND

- Assessment Boundary
- Noise Sources

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{A1(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 8

Construction Phase 1 (2021)
Worst-case meteorological conditions
$L_{A1(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

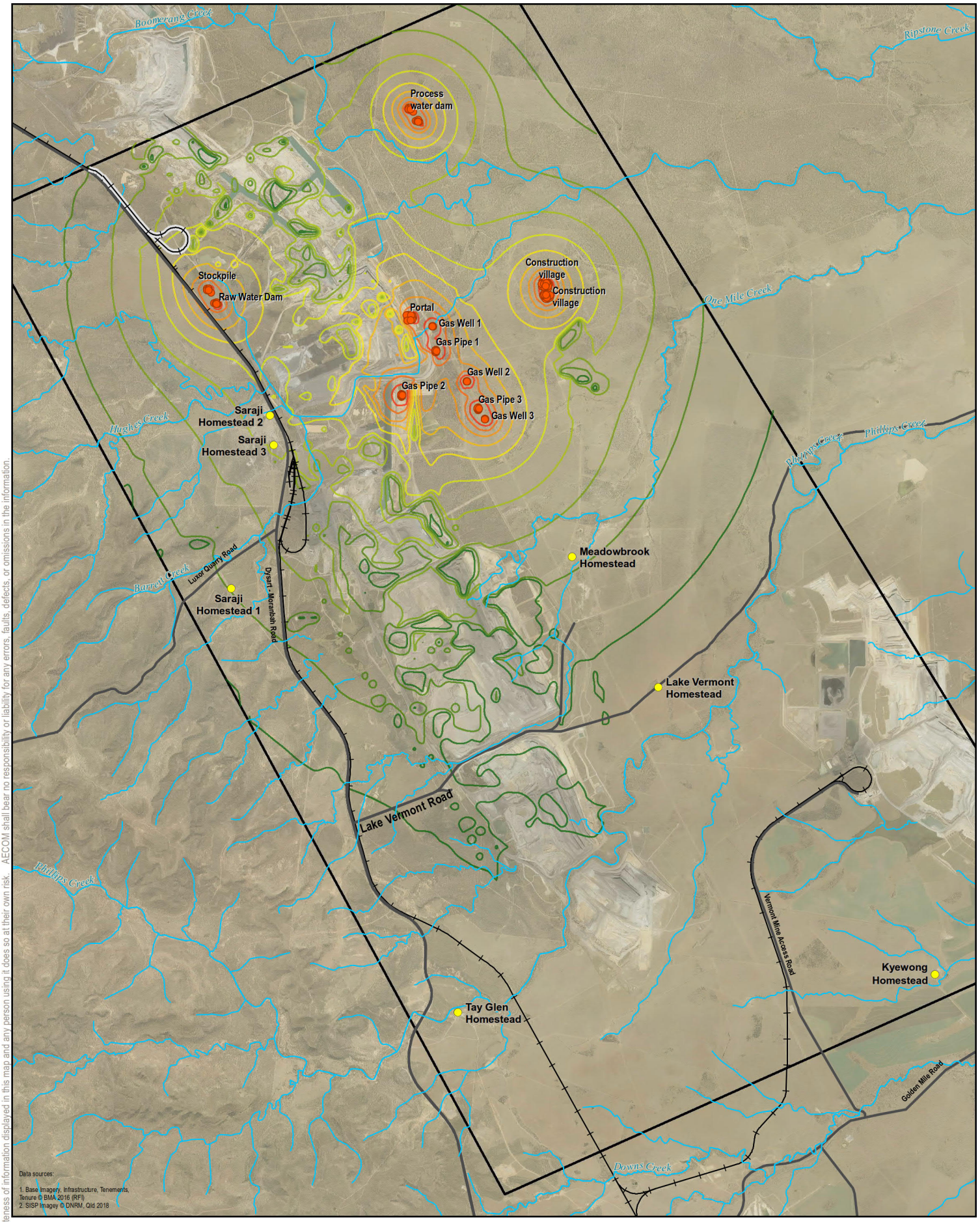
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 9
Construction Phase 1 (2021)
Neutral meteorological conditions
$L_{Aeq(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

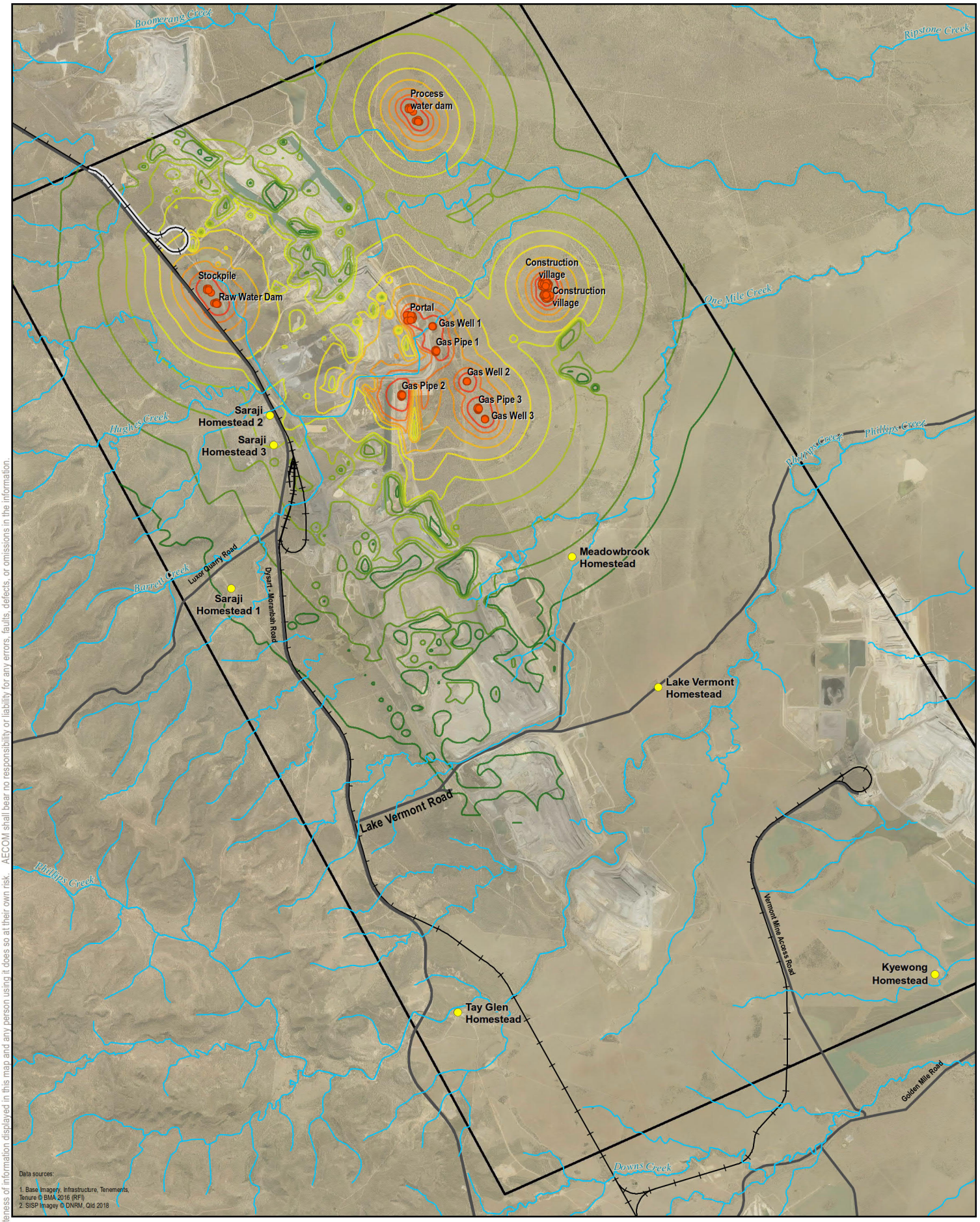
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{A1(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

Figure 10
Construction Phase 1 (2021)
Neutral meteorological conditions
$L_{A1(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

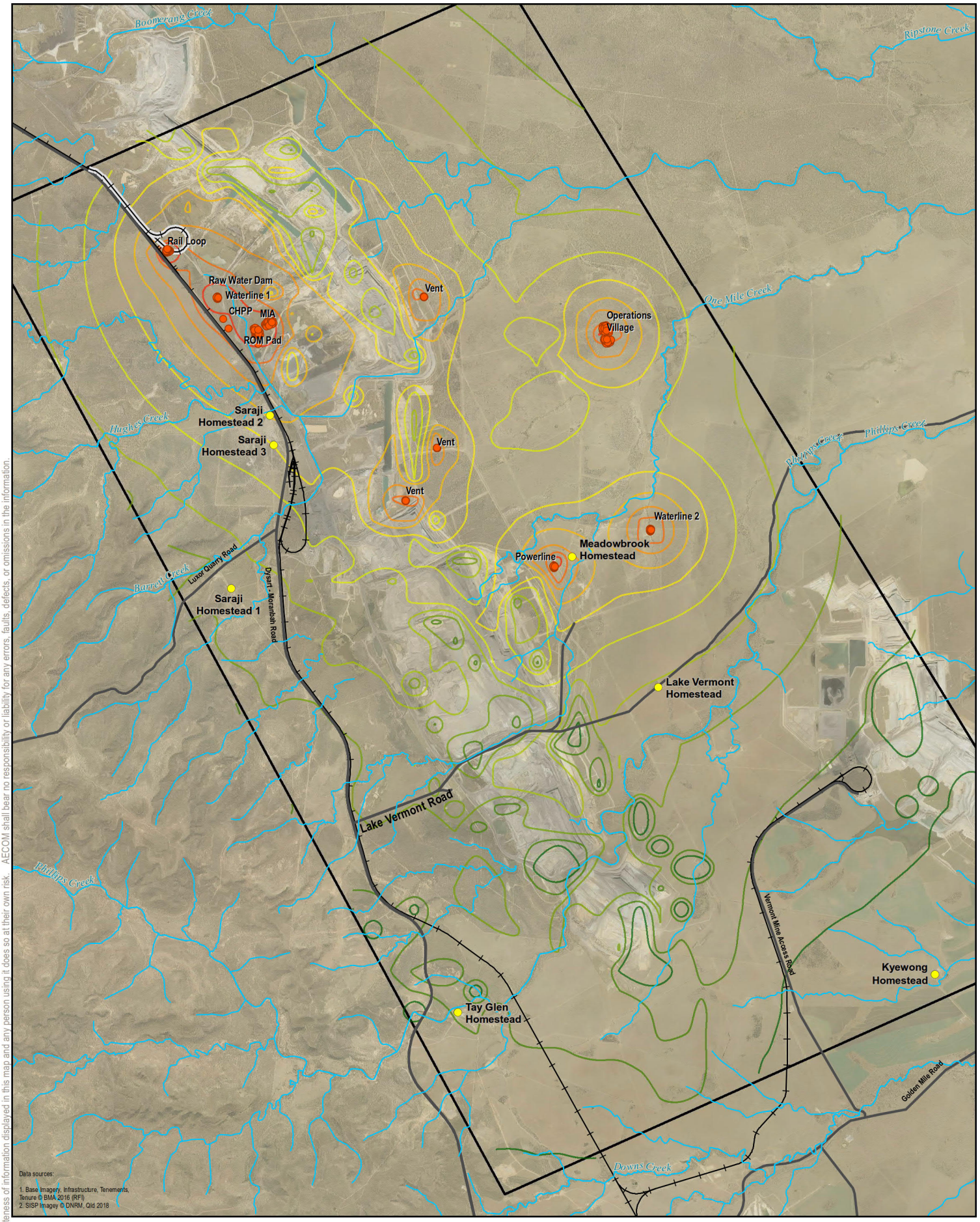
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Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

Figure 11
Construction Phase 2.1 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Meadowbrook Homestead
Worst-case meteorological conditions $L_{Aeq(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

N

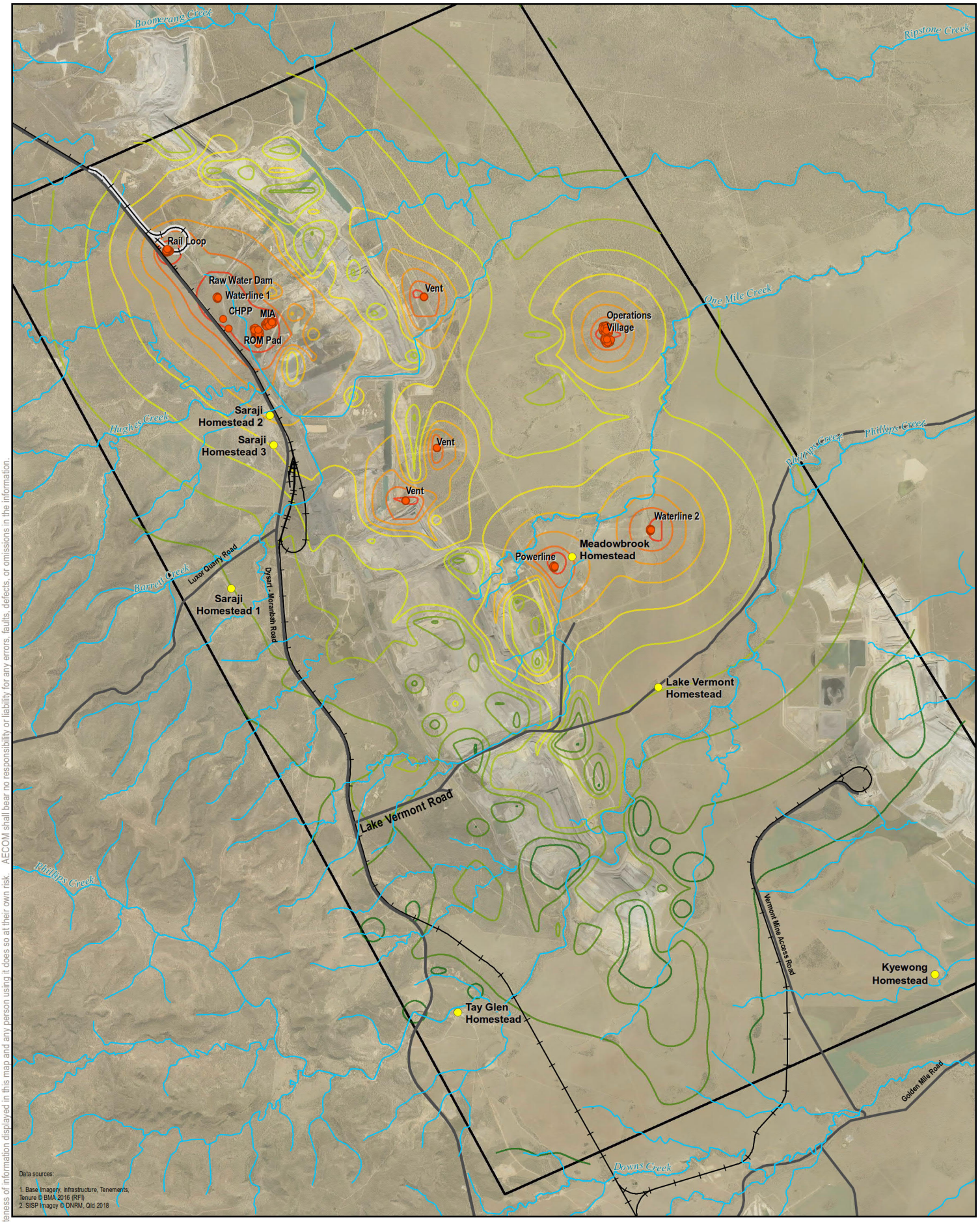
0 0.5 1 2
Kilometres
Scale: 1:120,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{A1(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

Figure 12
Construction Phase 2.1 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Meadowbrook Homestead
Worst-case meteorological conditions
$L_{A1(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

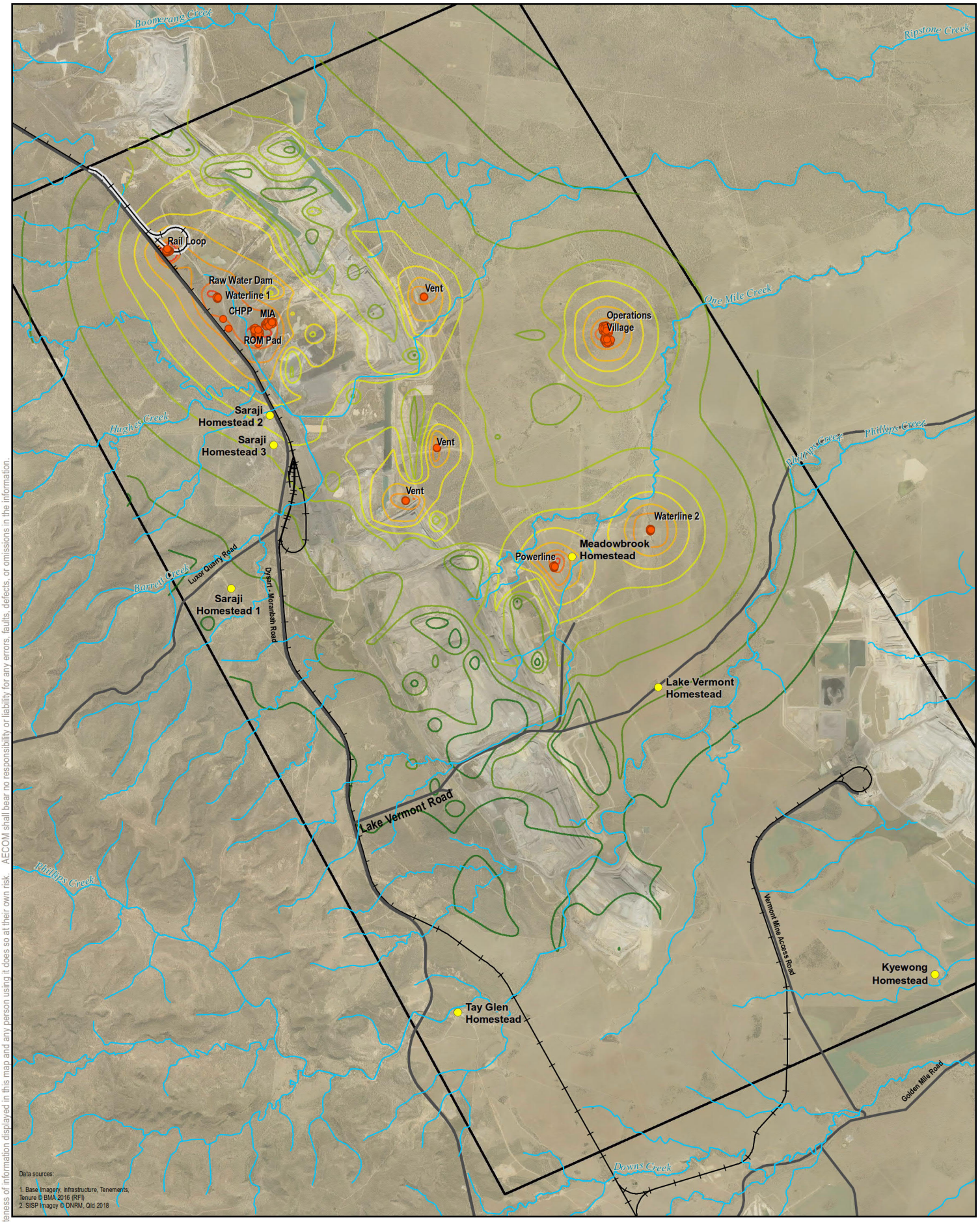
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Kilometres
Scale: 1:120,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 13
Construction Phase 2.1 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Meadowbrook Homestead
Neutral meteorological conditions $L_{Aeq(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

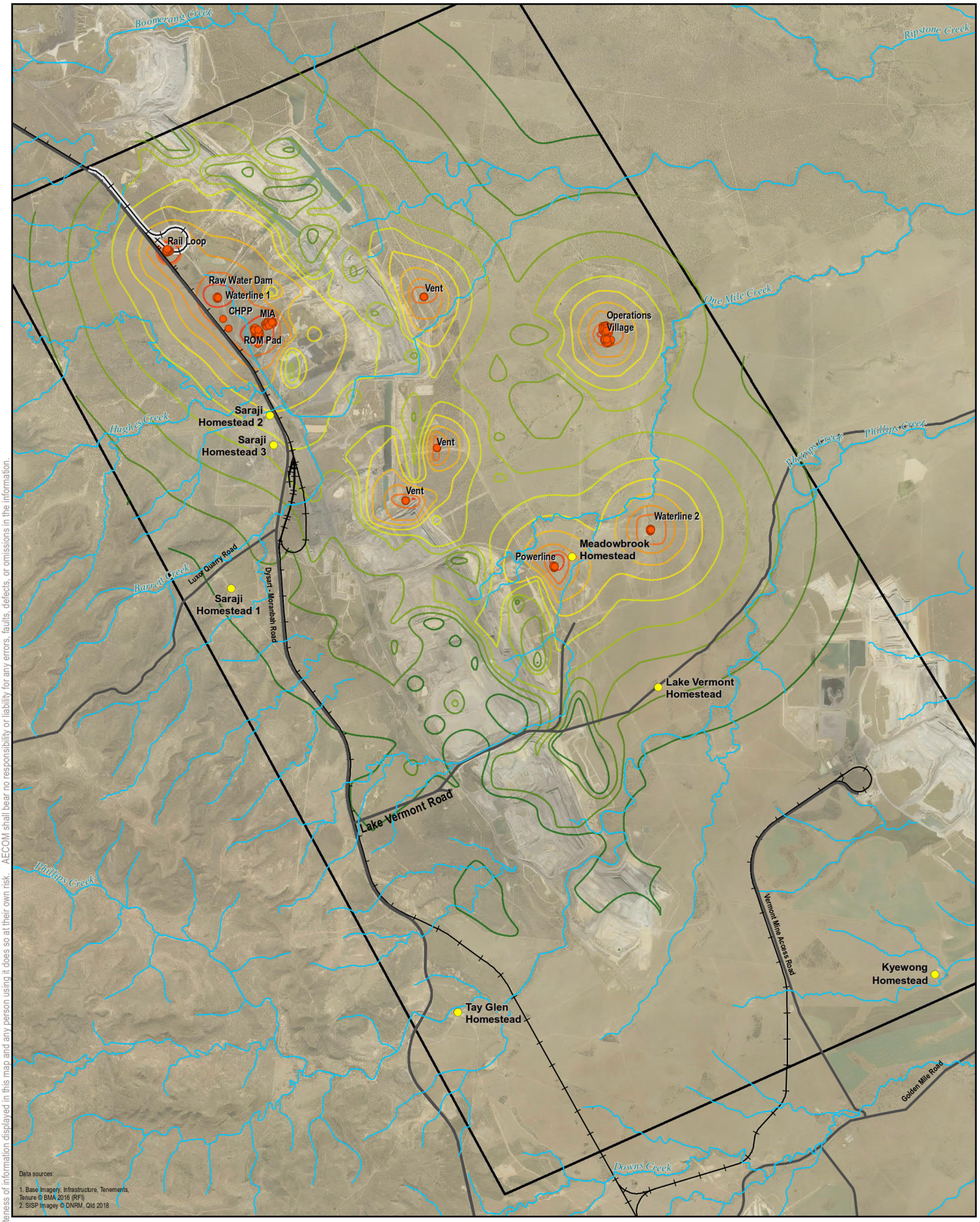
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Scale: 1:120,000 (when printed at A4)
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{A1(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

Figure 14
Construction Phase 2.1 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Meadowbrook Homestead
Neutral meteorological conditions
$L_{A1(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

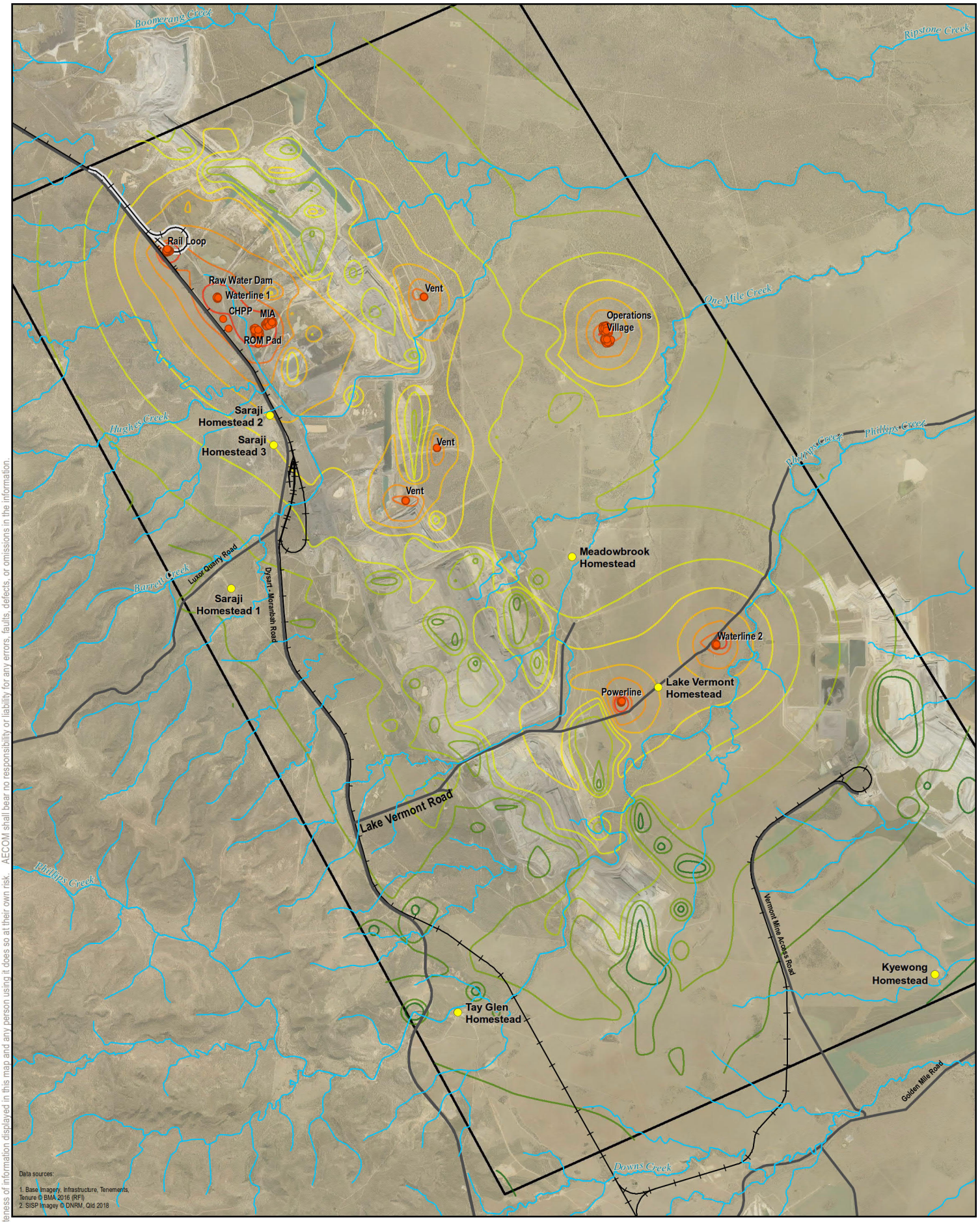
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Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 15
Construction Phase 2.2 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Lake Vermont Homestead
Worst-case meteorological conditions $L_{Aeq(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

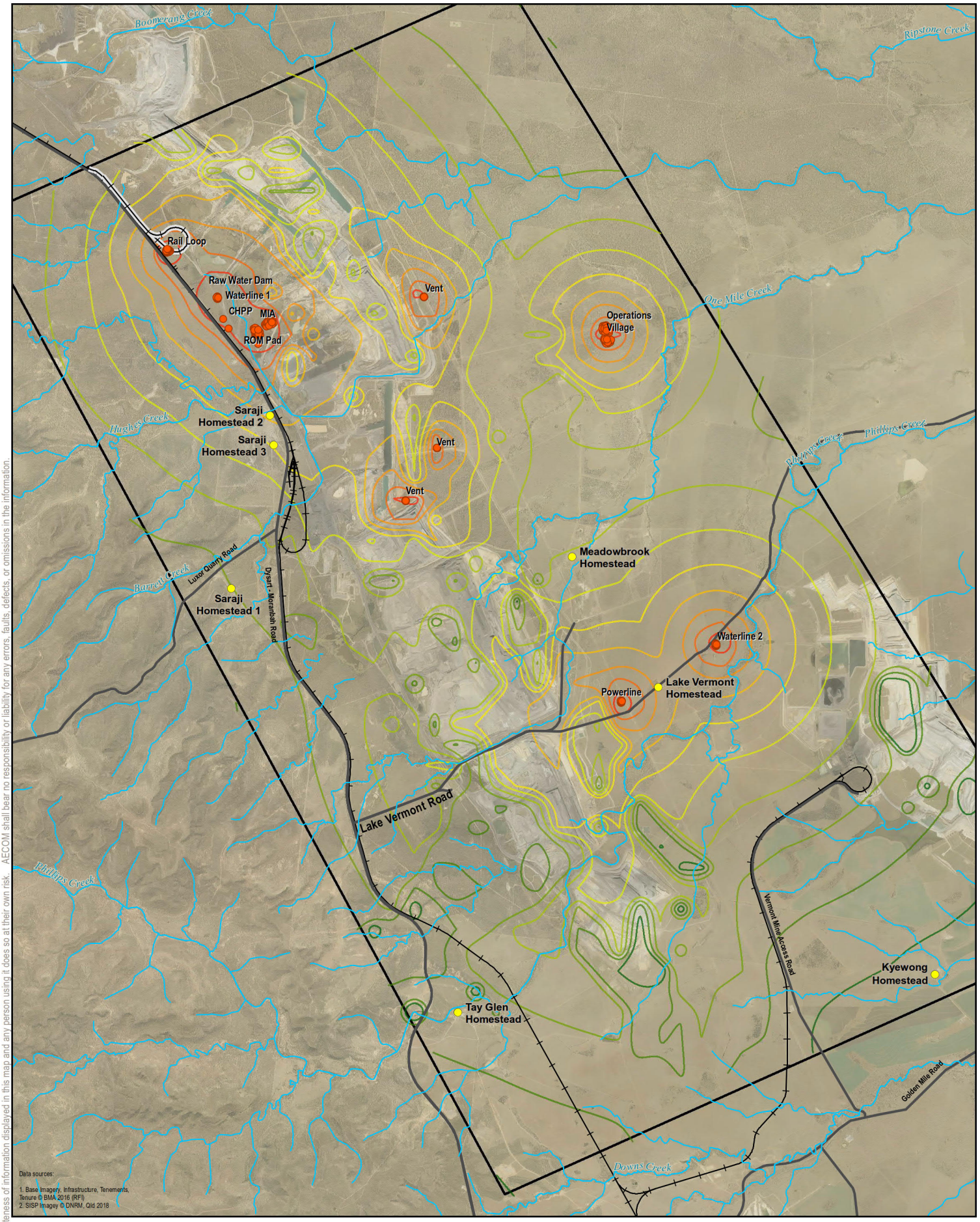
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{A1(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

Figure 16

Construction Phase 2.2 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Lake Vermont Homestead
Worst-case meteorological conditions $L_{A1(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

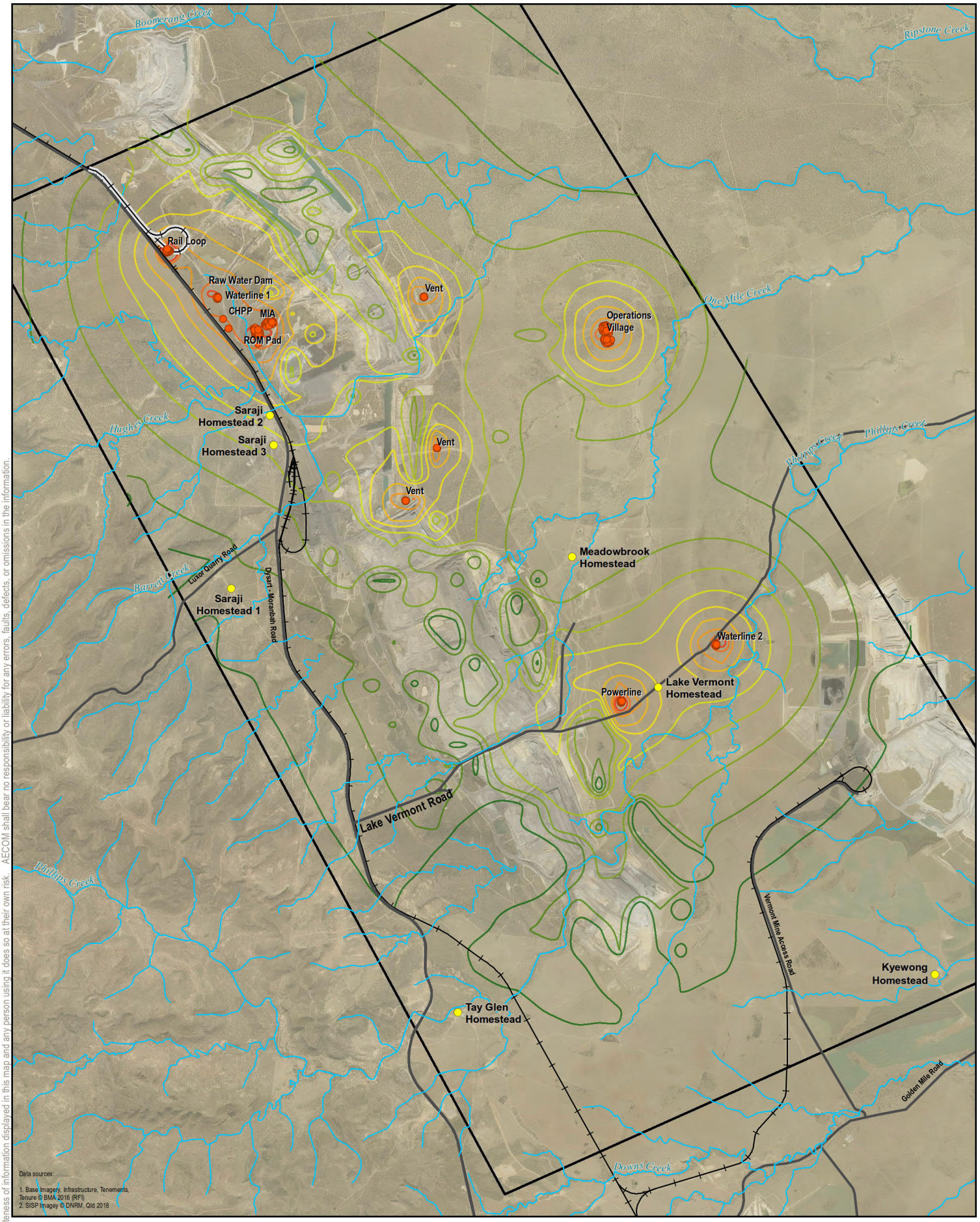
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 17
Construction Phase 2.2 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Lake Vermont Homestead Neutral meteorological conditions $L_{Aeq(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report Saraji East Mining Lease Project

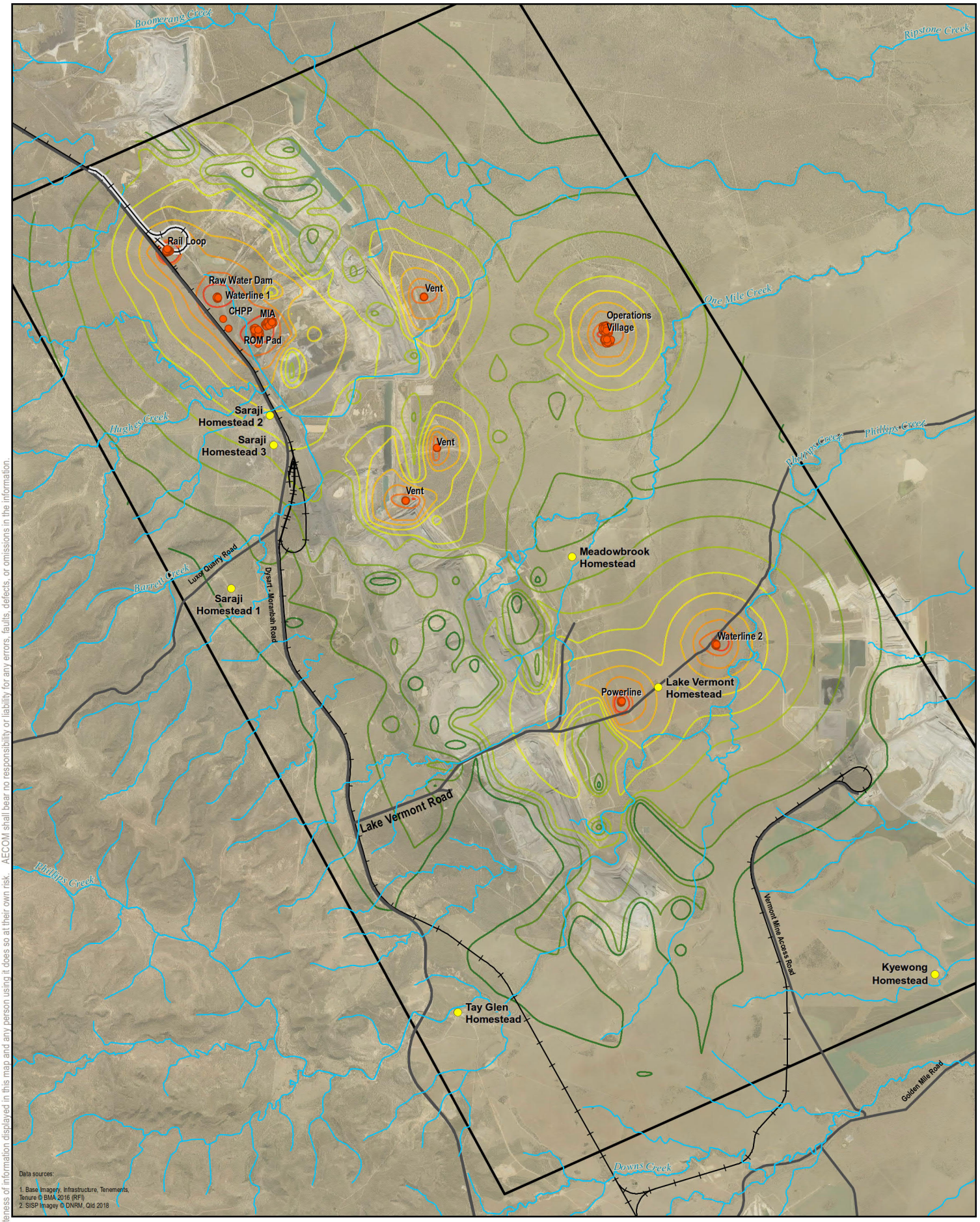
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Kilometres
Scale: 1:120,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Assessment Boundary
- Noise Sources

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{A1(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 18
Construction Phase 2.2 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Lake Vermont Homestead
Neutral meteorological conditions $L_{A1(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

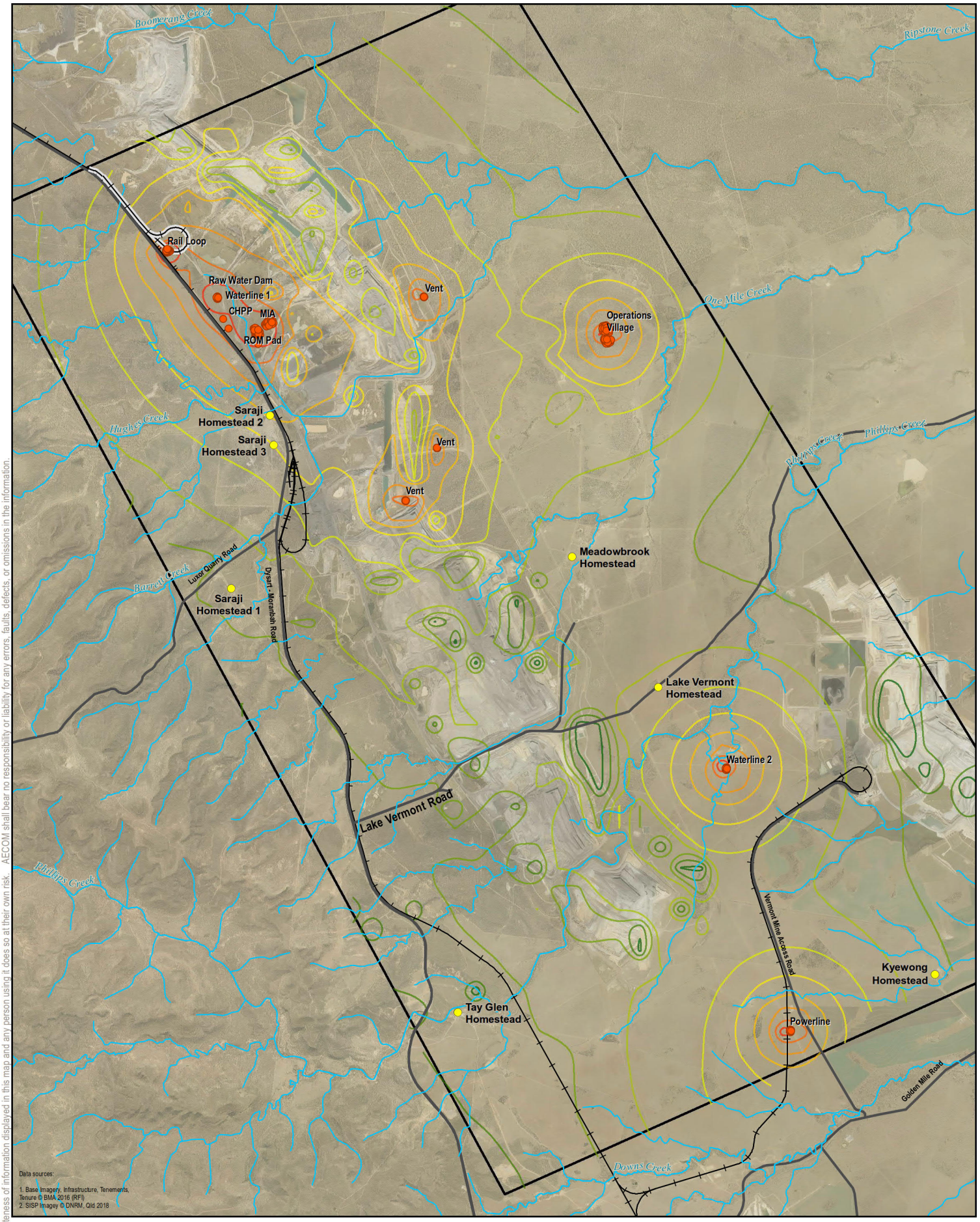
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 19
Construction Phase 2.3 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Kyewong and Tay Glen Homestead Worst-case meteorological conditions $L_{Aeq(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

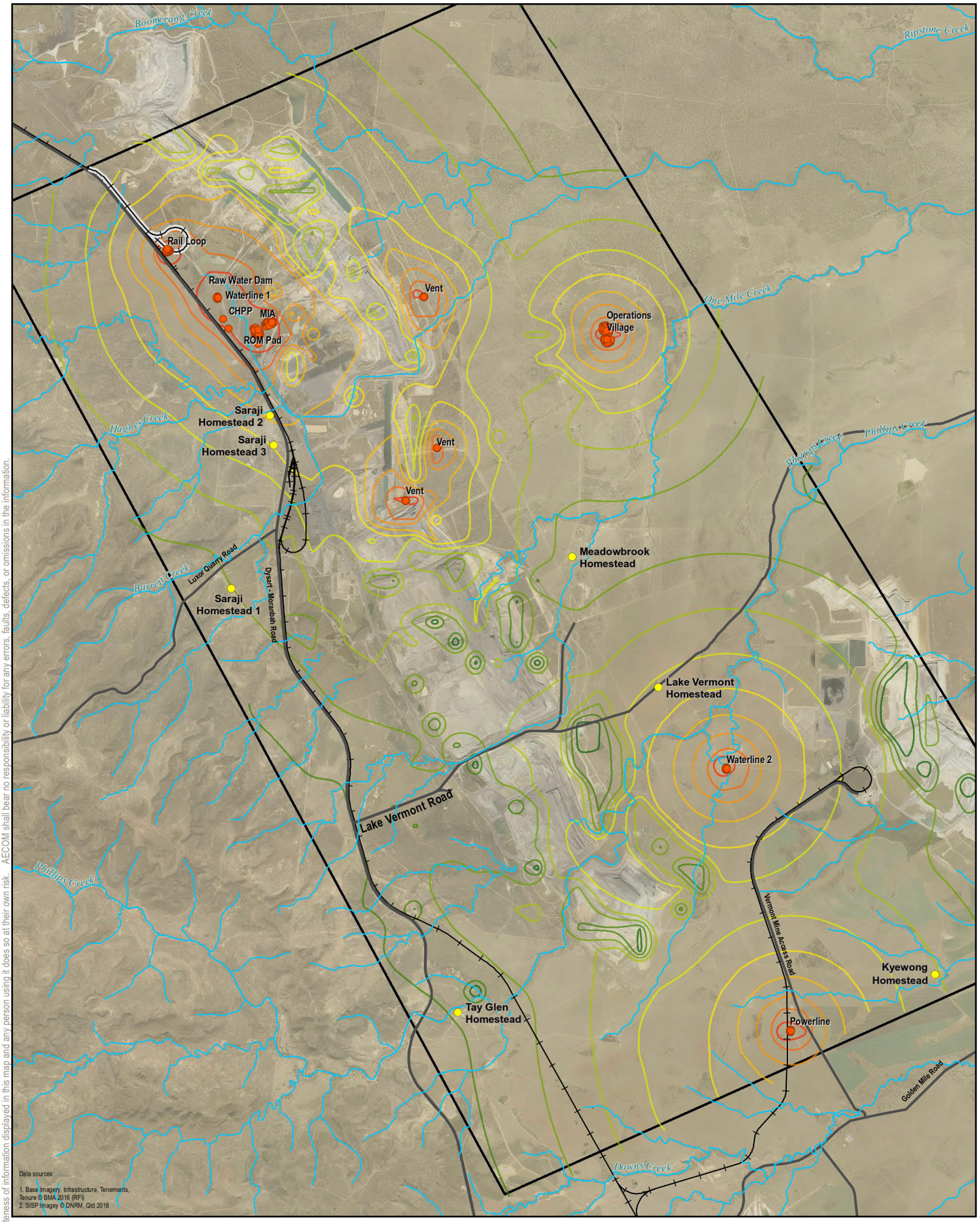
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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{A1(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 20
Construction Phase 2.3 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Kyewong and Tay Glen Homestead Worst-case meteorological conditions $L_{A1(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report Saraji East Mining Lease Project

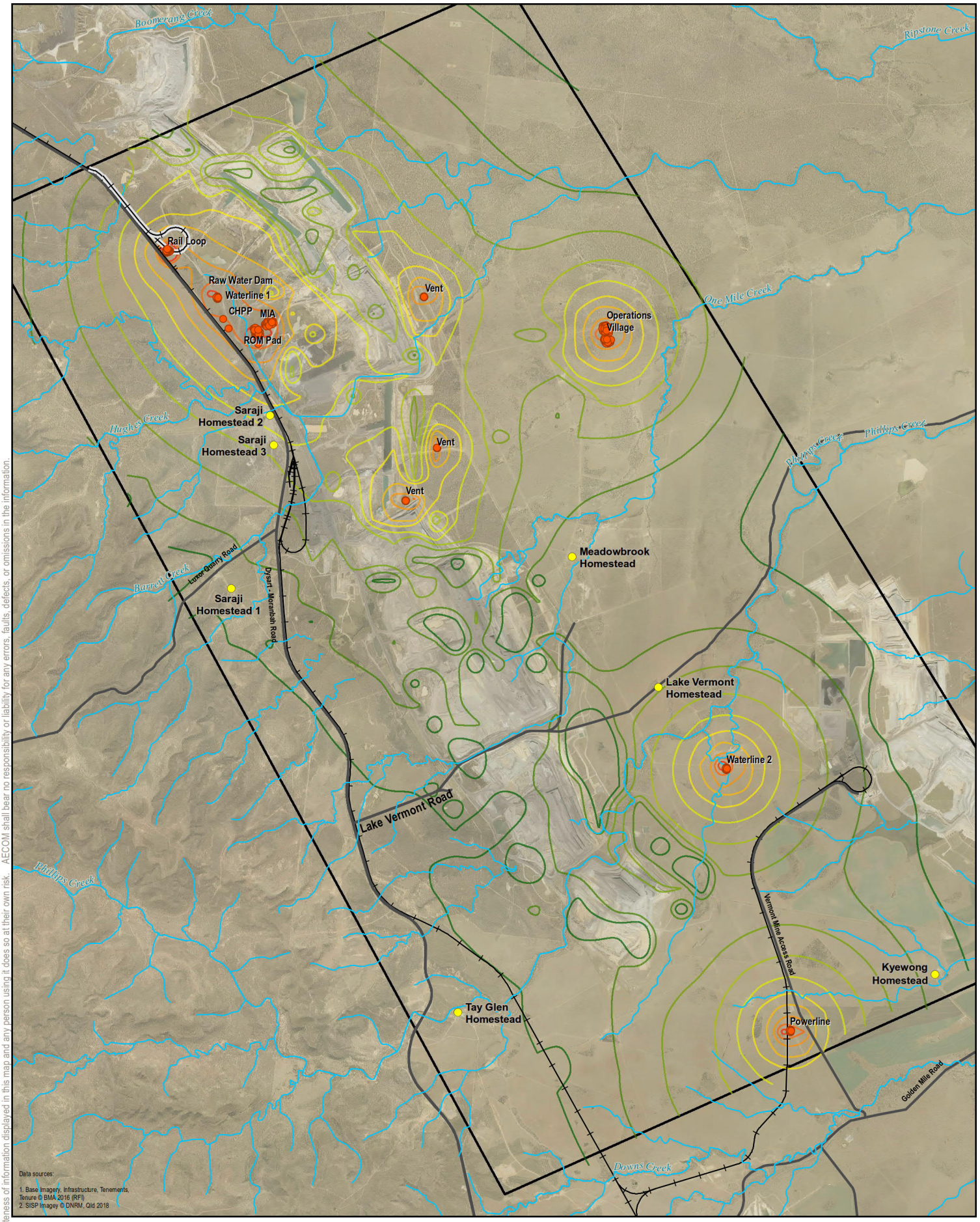
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Scale: 1:120,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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LEGEND

- Assessment Boundary
- Noise Sources
- **Sensitive Receptors**: Homestead
- Watercourse
- Public Road
- Rail Loop
- Existing Railway
- **Predicted Noise Levels dB(A) $L_{Aeq(1h)}$**: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70

N

Figure 21
Construction Phase 2.3 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Kyewong and Tay Glen Homestead
Neutral meteorological conditions $L_{Aeq(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

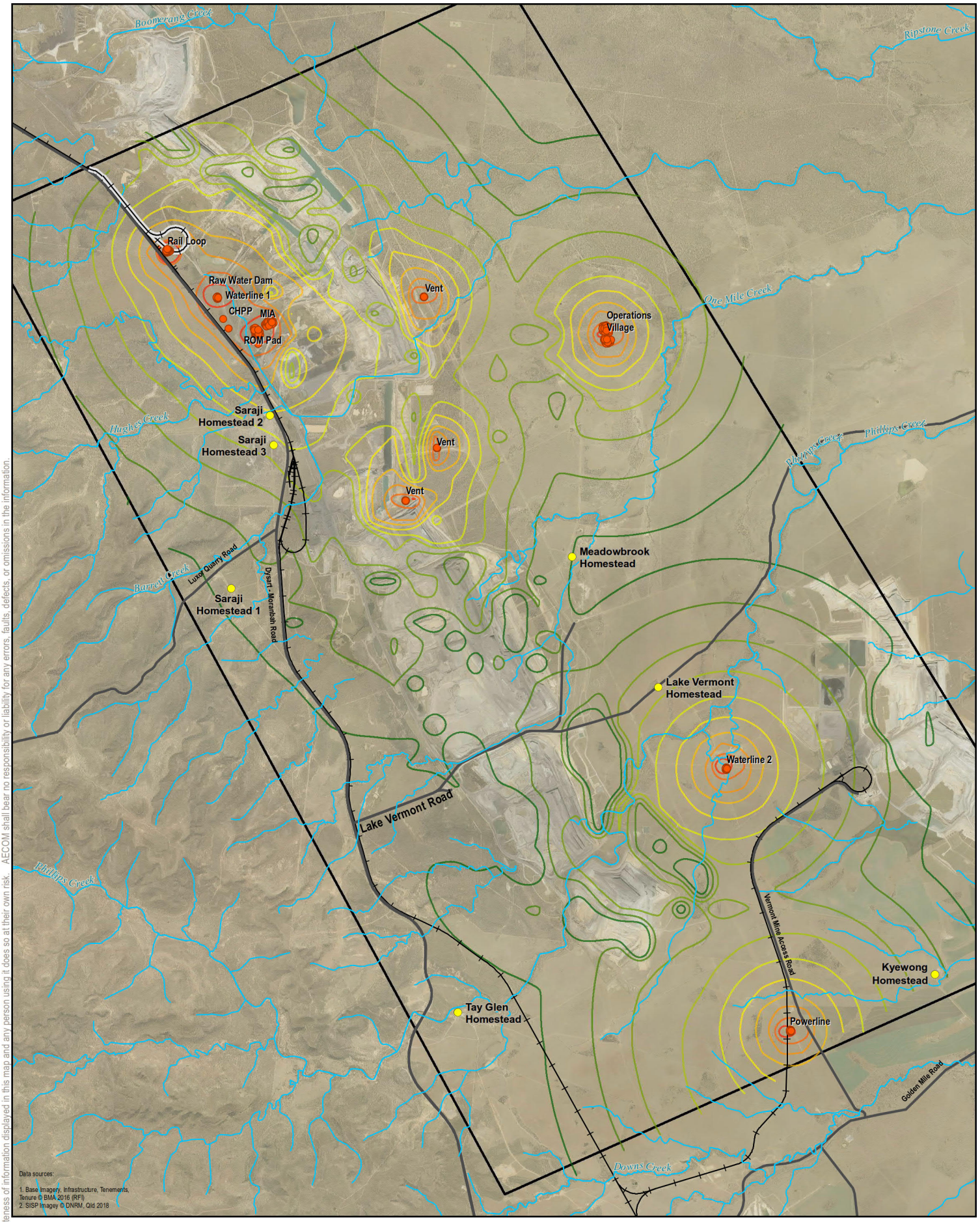
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LEGEND

- Assessment Boundary
- Noise Sources

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{A1(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 22
Construction Phase 2.3 (2022-2023) and Operational Phase (2023) - Powerline and Waterline Construction near Kyewong and Tay Glen Homestead
Neutral meteorological conditions $L_{A1(1h)}$ Free-Field Noise Levels
Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

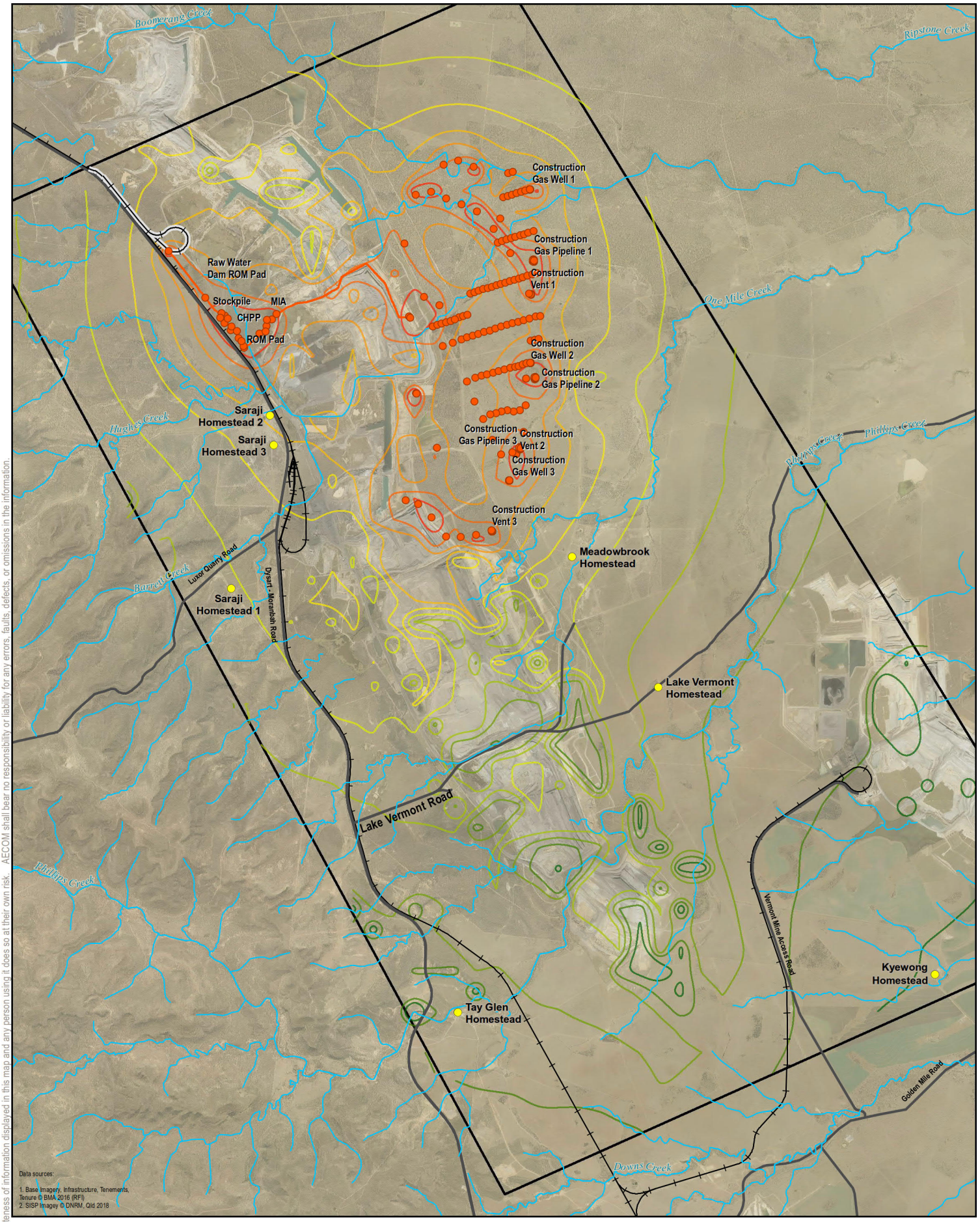
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LEGEND

- Assessment Boundary
- Noise Sources
- Conveyor Belt

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{Aeq(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 23

Operational Phase (2024-2043)
Worst-case meteorological conditions
$L_{Aeq(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

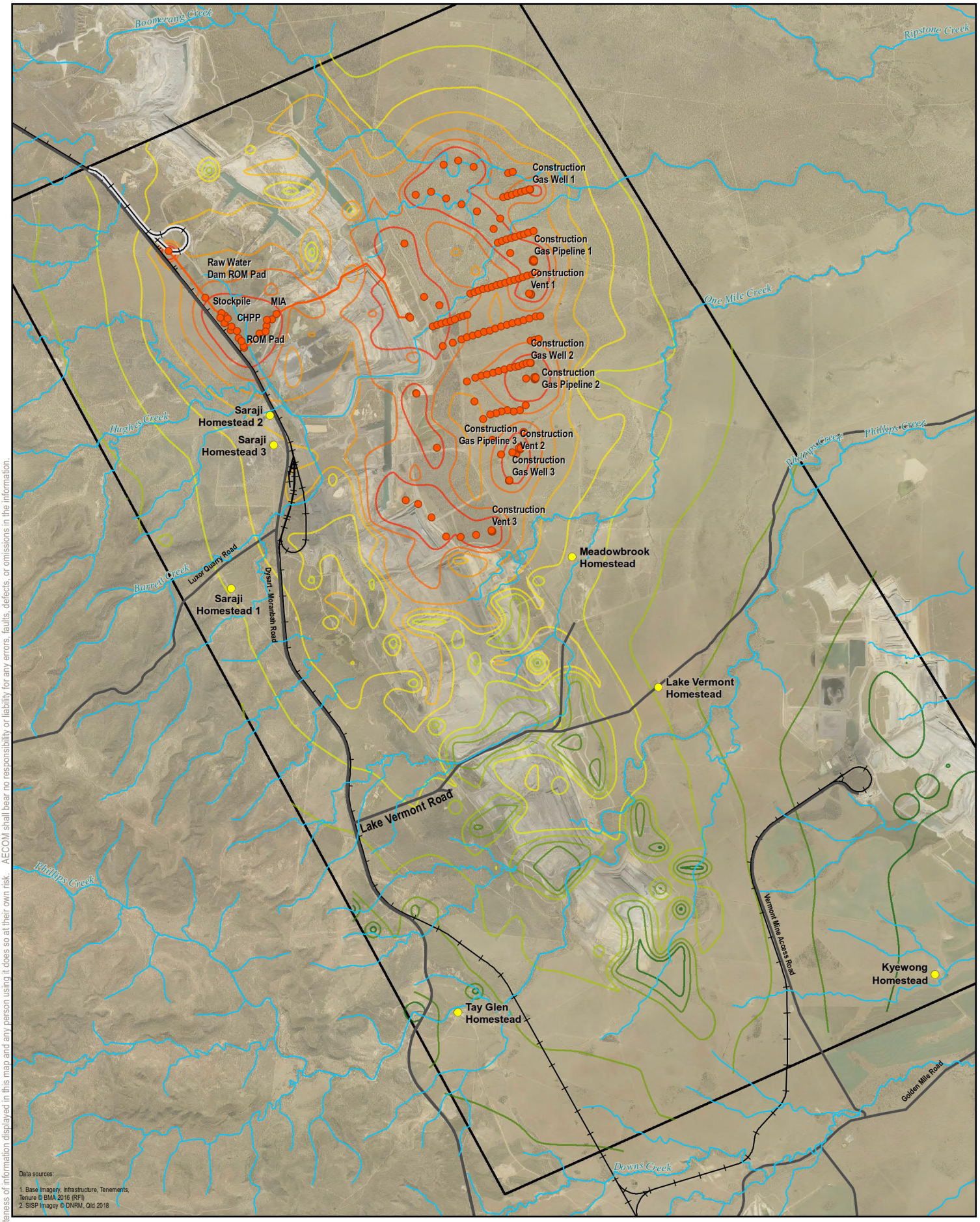
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Data sources:

1. Base Imagery, Infrastructure, Tenements, Tenure © BMA 2016 (RFI)
2. SISP Imagery © DNRM, Qld 2018

LEGEND

- Assessment Boundary
- Noise Sources
- Conveyor Belt

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{A1(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 24

Operational Phase (2024-2043)
Worst-case meteorological conditions
$L_{A1(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

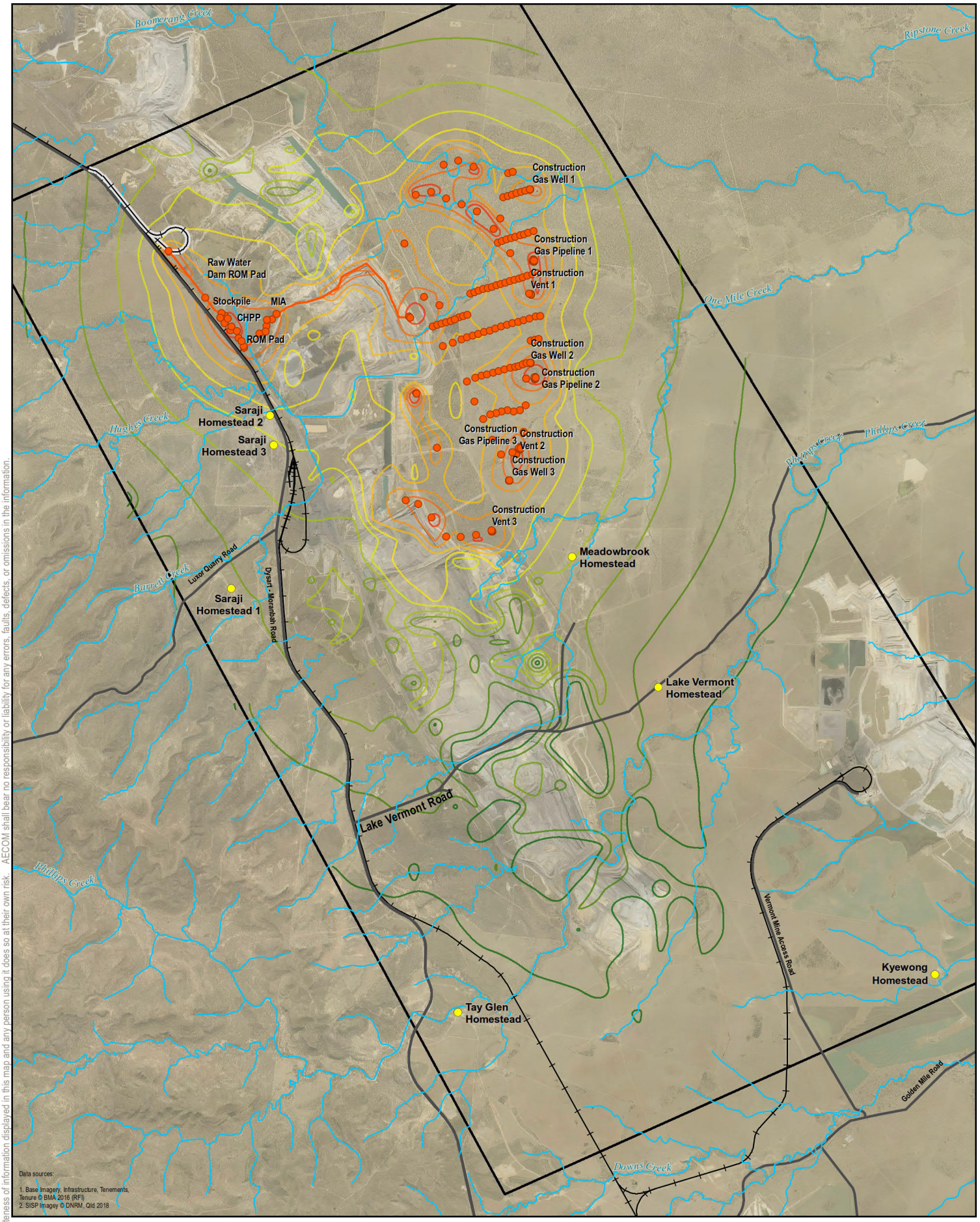
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LEGEND

- Assessment Boundary
- Noise Sources
- Conveyor Belt

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{Aeq(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 25

Operational Phase (2024-2043)
Neutral meteorological conditions
$L_{Aeq(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

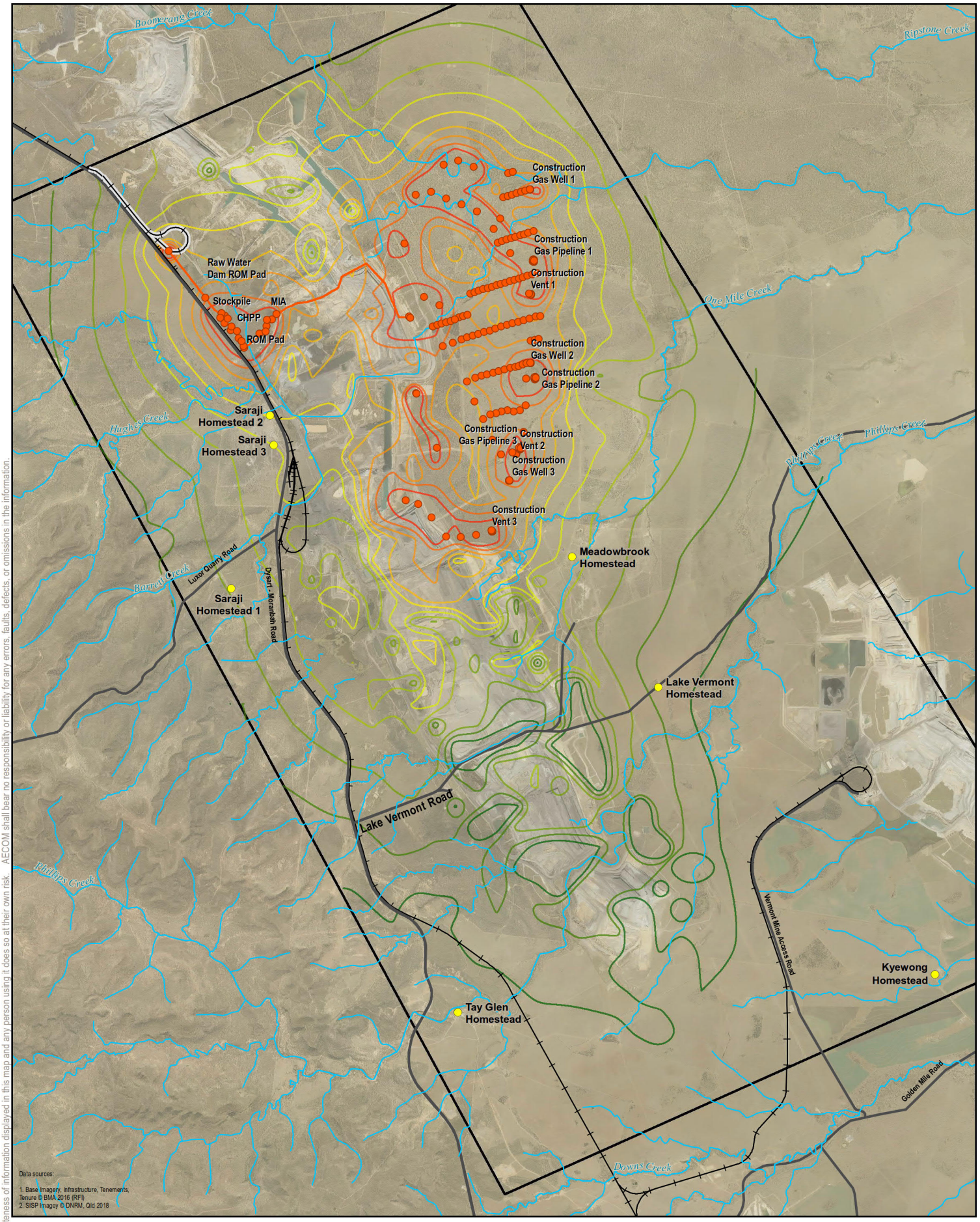
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LEGEND

- Assessment Boundary
- Noise Sources
- Conveyor Belt

Sensitive Receptors

- Homestead

- Watercourse
- Public Road
- Rail Loop
- Existing Railway

Predicted Noise Levels dB(A) $L_{A1(1h)}$

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70

N

Figure 26

Operational Phase (2024-2043)
Neutral meteorological conditions
$L_{A1(1h)}$ Free-Field Noise Levels

Noise and Vibration Technical Report
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:120,000 (when printed at A4)

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