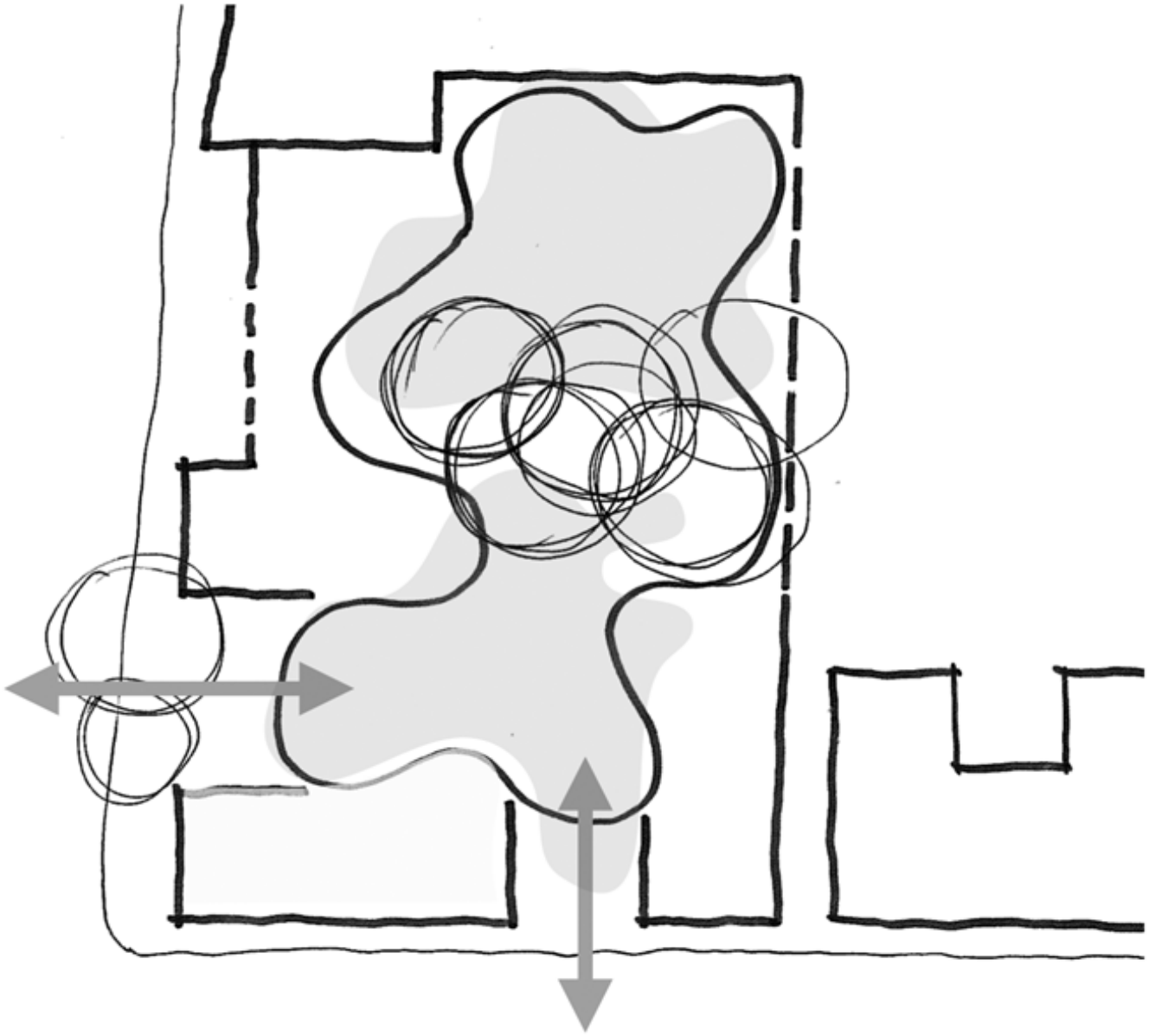
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix G — Noise and Vibration Assessment

SSD-9914

Prepared by Acoustic Logic

For NSW Department of Education



MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

Darlington Public School, 417 Abercrombie Street, Darlington

SSDA Acoustic Assessment

SYDNEY
9 Sarah St
MASCOT NSW 2020
(02) 8339 8000

ABN 11 068 954 343
www.acousticlogic.com.au

Project ID	20200343.1
Document Title	SSDA Acoustic Assessment
Attention To	FJMT

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	15/04/2020	20200343.1/1504A/R0/JM	JM		
1	1/05/2020	20200343.1/0105A/R1/JM	JM		JM
2	4/06/2020	20200343.1/0406A/R2/JM	JM		JM

TABLE OF CONTENTS

1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the redevelopment of the existing school grounds at Darlington Public School, located at 417 Abercrombie Street, Darlington.

This report has been prepared to assess the potential acoustic impacts of the development. In this report, we will:

- Identify nearby noise sensitive receivers and operational noise sources with the potential to adversely impact the nearby development.
- Identify relevant noise emission criteria applicable to the development.
- If necessary, determine building and/or management controls necessary to mitigate potential noise impacts.
- Provide a preliminary review of construction noise and vibration impacts from the proposed development.

ALC have utilised the following documents and regulations in the assessment of noise associated with the development:

- Secretary's Environmental Assessment Requirements (SEARs) for SSD – 9914;
- NSW EPA Noise Policy for Industry (NPfI) 2017;
- NSW DECC Interim Construction Noise Guideline 2009;
- Assessing Vibration: A Technical Guideline 2006; and
- Development Near Rail Corridors and Busy Roads – Interim Guideline Department of Planning 2008.

This assessment has been conducted using FJMT's Architectural Drawing for 70% Schematic Design, Revision A, Date: 01/04/2020.

2 RESPONSE TO SEARS

An environmental noise and vibration assessment is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD – 9914. This table identifies the SEARs and relevant reference within this report.

Table 1 – SEARs and Relevant Reference

SEARs Item	Report Reference
Item 11	
• Identify and provide a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation construction-related work. Outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.	Section 11
• Identify and assess operational noise, including consideration of any public address system, school bell, mechanical services (e.g. air conditioning plant), use of any school hall for concerts etc. (both during and outside of school hours) and any out of hours community use of school facilities, and outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.	Section 7
• Relevant policies and guidelines: o NSW Noise Policy for Industry 2017 (EPA) including Fact Sheets A and B o Interim Construction Noise Guideline (DECC) o Assessing Vibration: A technical Guideline 2006 o Development Near Rail corridors and Busy Roads – Interim Guideline (Department of Planning 2008)	See entire report

3 SITE DESCRIPTION & PROPOSED WORKS

3.1 SITE DESRIPTION

Darlington Public School is located on the corner of Golden Grove Street and Abercrombie Street, Darlington, within the City of Sydney Local Government Area. The school is adjacent to the University of Sydney Darlington Campus and within walking distance to Redfern and Macdonaldtown train stations. The site is legally described as Lot 100 in DP 623500 and Lot 592 in DP 7523049.

The SSD application seeks consent for demolition of existing school buildings and construction of a new part 2, part 3-storey building, increasing the school capacity from 230 to 437 students. The works also include replacement of the existing child-care facility (to the same capacity of 60 students), earthworks and landscaping. For a detailed project description refer to the EIS prepared by Ethos Urban.

Surrounding land uses and potential noise impacts associated with this site are as follows:

- King Street is located north-west of the site, over existing residential developments. The proposed school site is located 90m from the roadway at the closest point. King Street is currently listed as a mandatory road under SEPP (Infrastructure), indicating that it carries an annual average daily traffic volume in excess of 40, 000 vehicles per day;

- Roadways immediately surrounding the site generally consist of local roadways and through traffic for the surrounding residential developments;

- Existing residential developments surround the site on the north, south and west of the school over each of their respective local roads. Residents in this location consist of double storey townhouses and multi-storey apartment buildings.

- Existing commercial educational facilities to the Eastern boundary of the site, The University of Sydney Business School. This development is made up of multiple multi-storey buildings, the use of these buildings includes student accommodation, teaching spaces, and offices.

3.2 NEARBY NOISE RECEIVERS

The nearest noise sensitive receivers around the project site are as follows:

- **Receiver 1:** Regiment Building within the collection of University of Sydney owned buildings. This development is used as student accommodation and is located on the north-west corner of the site at 2-10 Golden Grove Street, Darlington;
- **Receiver 2:** Residential townhouses located north of the school over Darlington Lane, at 118 – 132 Darlington Road, Darlington;
- **Receiver 3:** The Abercrombie Building (H70) within the collection of University of Sydney owned buildings. This development contains teaching spaces and offices and is located east of the school, at 297-303 Rose Street, Darlington;
- **Receiver 4:** Abercrombie Student Accommodation within the collection of University of Sydney owned buildings. This development is located east of the school, at 403-415 Abercrombie Street, Darlington;
- **Receiver 5:** Residential townhouses located south of the school over Abercrombie Street, at 420-454 Abercrombie Street, Darlington.
- **Receiver 6:** Residential development located west of the school over Golden Grove Street, at 11 Golden Grove Street, Darlington.

See figure 1 below for a site map detailing the location of receivers and acoustic measurements.

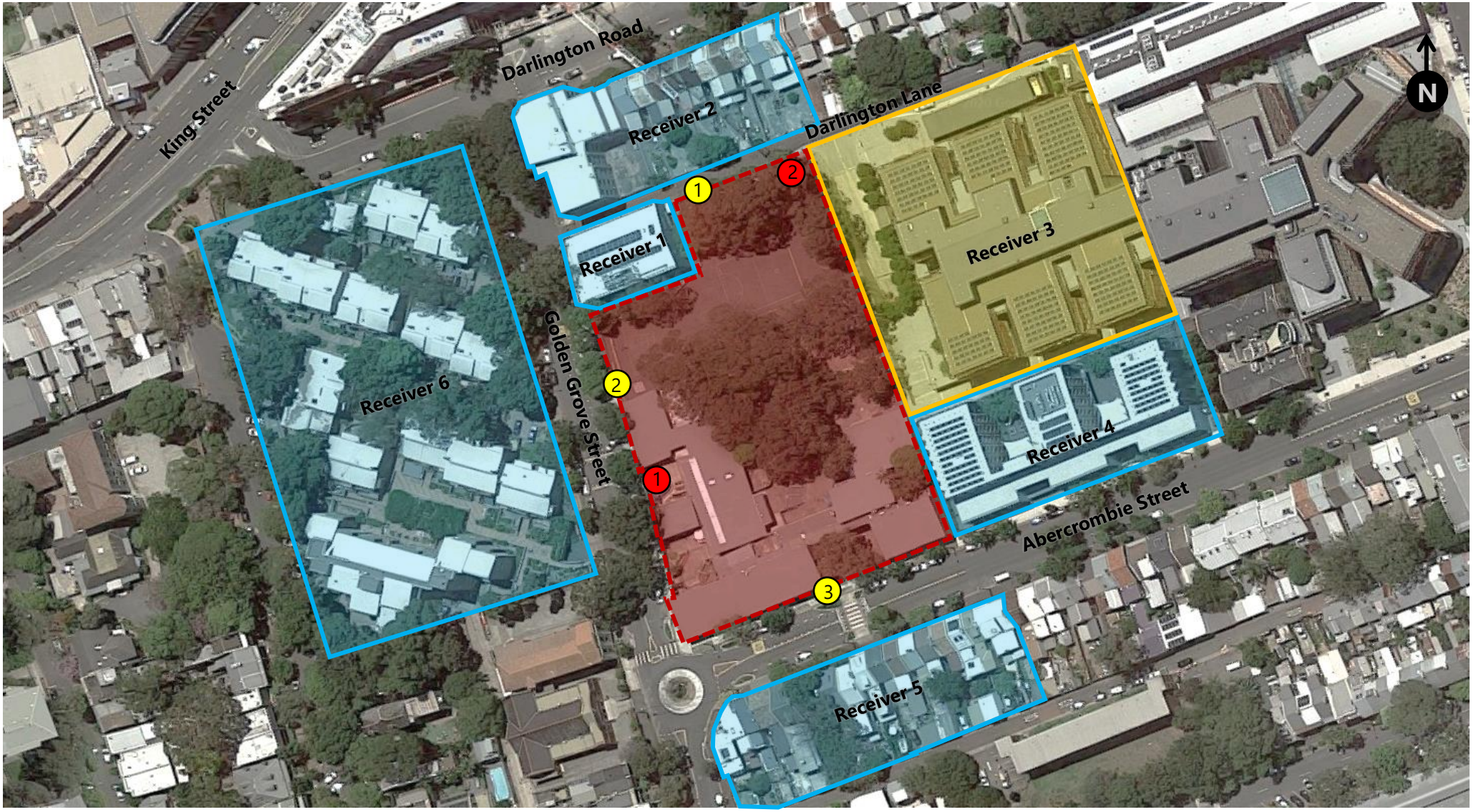
3.3 PROPOSED OPERATION / HOURS

The proposed redevelopment will allow the school to approximately double its capacity. Accommodating 25 staff members and 415 students. The school will cater for Preschool, Kindergarten through to year six.

The following table describes the general operation of the school as currently proposed.

Table 2 – School Uses and Operating Times

Item	Use	Times
General	Schooling for Preschool, Kindergarten through to Year 6, with a capacity of 415 students.	Monday to Friday: 8am – 5pm
Community Hall	Intended use by school during school hours. Occasional evening use for music performance, presentations, parent/teacher nights. Hall to be made available to the community through a booking system arranged by the school.	Maximum operating time will be 10pm
OSHC	Out of school hours (OSHC) use of the school	Vacation care: 7am -6pm Weekday Mornings: 7am – 9am Weekday Afternoons: 2pm – 6pm
Library	Intended use by school only. Occasional evening use for presentations, parent/teacher nights, extra-curricular programs.	Maximum operating time will be 7pm
Shared Use/ Community Use	DOE is currently exploring shared use opportunities of the proposed school facilities for community use	Maximum operating time will be 10pm.



Attended Noise Measurement

Unattended Noise Measurement

Figure 1 – Aerial View of Site & Receivers

(Sourced from Six Maps 2019)

Project Site

Residential Receiver

Non-Residential Receiver

4 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

The L_{max} level represents the loudest noise event during a measurement period.

5 SURVEY OF AMBIENT NOISE

Unattended long-term monitoring and attended short term measurements were conducted to quantify the existing acoustic environment.

ALC confirm that all monitoring/measurement procedures, measured noise levels and calculated rating background (RBL) noise levels, were carried out in accordance with the requirements of the NSW EPA Noise Policy for industry and Australian Standard 1055.2 Acoustics – Description and measurement of environmental noise.

5.1 ATTENDED NOISE MEASURMENTS

In addition to the unattended noise logging, a series of attended noise measurements were also conducted by this office, to assess the existing background noise levels.

Attended measurements were obtained using a Norsonics Type 140 Sound Level Analyser. The sound analyser was calibrated at the beginning and end of the measurement using a Norsonics type 1251 Sound Level Calibrator. No significant drift was noted. All measurements were conducted on A-weighted fast response mode. There were no significant periods of adverse weather conditions during the measurement period. Measurements were conducted as follows.

Table 3 – Attended Noise Measurements

Measurement Location	Time of Day	Measured Noise Level	Comments
1. Darlington Lane	Wednesday 3rd April 2019 1:30pm – 2:00pm	53 dB(A)$L_{eq(Period)}$ 47 dB(A)$L_{90(Period)}$	Distant Mechanical Noise from University of Sydney Building
2. Golden Grove Street	Wednesday 3rd April 2019 2:00pm - 2:30pm	54 dB(A)$L_{eq(Period)}$ 47dB(A)$L_{90(Period)}$	Typical Local road with minimal traffic
3. Abercrombie Street	Wednesday 3rd April 2019 2:30pm – 3:00pm	54 dB(A)$L_{eq(Period)}$ 46 dB(A)$L_{90(Period)}$	Distant Mechanical Noise from University of Sydney Building

*Please see Figure 1 for detail of the location of each of the attended measurements.

5.2 UNATTENDED, LONG TERM NOISE LOGGING

Unattended noise monitoring was conducted using two Acoustic Research Laboratories noise monitors. The monitors were set to an A-weighted fast response mode, recording continuously at 15-minute intervals. Both monitors were calibrated at the start and end of the monitoring period using a Rion NC-73 Calibrator. No significant drift was noted. Monitoring was conducted as follows;

- **Monitor 1** – Installed along the western boundary of the site, in the Darlington Pre-School courtyard, Darlington. The background noise levels measured at this location will be representative of the ambient noise levels at the residential receivers to the west, across Golden Grove Street. This measurement was also verified by attended noise measurements conducted along the western boundary of the site at the residential properties located at 11 Golden Grove Street, Darlington, as detailed in figure 2-1. The noise monitor was located onsite between the 3rd and the 15th of April 2019, and attended measurements were taken on the 3rd of April 2019. Simultaneous attended

measurements conformed the backgrounds noise level was the same o both sides of the road. Noise monitoring data is attached in Appendix 1.

- **Monitor 2** – Installed along the northern boundary of the project site adjacent to Darlington Lane. The background noise levels measured at this location will be representative of the ambient noise levels at the residential receivers to the north, across Darlington Lane. This measurement was also verified by attended noise measurements conducted along the northern boundary of the site at the residential properties located at from 118 – 132 Darlington Lane, Darlington, as detailed in figure 2-1. The noise monitor was located onsite between the 3rd and the 15th of April 2019, and attended measurements were taken on the 3rd of April 2019. Simultaneous attended measurements conformed the backgrounds noise level was the same o both sides of the road. Noise monitoring data is attached in Appendix 1.

Table 4 – Unattended Long-Term Noise Monitoring

Monitor Location	Measured Noise Level – Time of Day		
	Daytime (7am – 6pm)	**Evening (6pm -10pm)**	**Night (10pm – 7am)**
Western Location Darlington Preschool (Monitor 1)	55 dB(A)$L_{eq(Period)}$ 45 dB(A)$L_{90(Period)}$	53 dB(A)$L_{eq(Period)}$ 43 dB(A)$L_{90(Period)}$	48 dB(A)$L_{eq(Period)}$ 35 dB(A)$L_{90(Period)}$
Northern Location Darlington Lane (Monitor 2)	60 dB(A)$L_{eq(Period)}$ 45 dB(A)$L_{90(Period)}$	54 dB(A)$L_{eq(Period)}$ 44 dB(A)$L_{90(Period)}$	49 dB(A)$L_{eq(Period)}$ 41 dB(A)$L_{90(Period)}$

5.2.1 Weather affected Noise data

Fact Sheet A: Determining Existing Background Noise Levels part A4 of the NSW EPA Noise Policy for Industry document outlines the following with regards to meteorological impacts on noise monitoring:

"Noise monitoring should not be conducted (or the data should be excluded) when average wind speeds (over 15-min periods or shorted) at microphone height are greater than 5 meters per second, or when rainfall occurs."

However, the same section of this policy also outlines that;

"Exceptions to this rule are allowed provided the proponent is able to show that the wind-induced noise on the microphone, and sound levels due to rain, are at least 10 dB below the noise levels under investigation."

Inclement weather conditions recorded at the Randwick (Randwick Street) weather station during monitoring periods are highlighted in Appendix 1.

- No rain was recorded during the monitoring period between the 3rd and the 14th of April 2019.
- No periods of high wind speeds (>5m/s) were noted during the monitoring period.

6 NOISE INTRUSION CRITERIA

6.1 DEVELOPMENT NEAR RAIL CORRIDORS AND BUSY ROADS INTERIM GUIDELINE

The Development Near Rail Corridors and Busy Roads –Interim Guideline (Department of Planning 2008) is used to assess the impact of adjacent road and rail corridors on noise sensitive development. The guideline recommends a maximum noise level within classrooms of 40 dB(A) $L_{eq,1hr}$.

7 OPERATIONAL NOISE EMISSION CRITERIA

The SEARS requires a consideration of noise emissions including any public address system, school bell, mechanical services (e.g. air conditioning plant), use of any school hall for concerts etc, (both during and outside school hours) and any out of hours community use of school facilities, and outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.

There are no specific EPA criteria applicable to the acoustic assessment of schools. The NSW Educational SEPP requirement relating to noise emissions is:

> ***6. Noise***
>
> *A new building or (if the development is an alteration or addition to an existing building for the purpose of changing its use) an existing building that is to be used for the purpose of a school or school-based child care must be designed so as not to emit noise exceeding an Laeq of 5 dB(A) above background noise when measured at any lot boundary.*

Guidelines referenced in the SEARs, as well as other guidelines are provided below:

- EPA Noise Policy for Industry 2017 (applicable for plant/equipment noise)
- EPA Road Noise Policy (for the assessment of noise from traffic generation by the site)
- Assessing Vibration: A Technical Guideline (EPA, 2006)
- Development Near Rail Corridors and Busy Roads – Interim Guideline (Development of Planning 2008) (to assess noise from traffic on the subject development)

We note that the EPA Noise Policy for Industry noise trigger levels are not strictly applicable to school developments, they are primarily intended to assess noise emissions from industrial/commercial developments. However, it is the most useful guideline policy for the assessment of plant and equipment noise impact to surrounding receivers.

In our experience it is extremely common in the assessment of the noise generation by schools that compliance with acoustic guidelines (in particular noise from playgrounds and during pickup and drop off) is not required (and for schools located in residential areas, it is in fact generally not achievable). The NSW Educational SEPP requires noise emissions from school buildings to be limited, and there is no requirement related to external uses.

An outline of relevant acoustic criteria is presented below.

7.1 EDUCATIONAL SEPP

The following table outlines the criteria to assess noise emissions from school buildings:

Table 5- NSW Educational SEPP Criteria

Location	Time of Day	Rating Background Noise Level dB L_{A90}	Intrusiveness Noise Objective dB $L_{Aeq(15min)}$
Residents Located to the North & East	Day Time (7am – 6pm)	45	50
	Evening (6pm-10pm)	44	49
	Night (10pm – 7am)	41	46
Residents Located to the South & West	Day Time (7am – 6pm)	45	50
	Evening (6pm-10pm)	43	48
	Night (10pm – 7am)	35	40

7.2 EPA NOISE POLICY FOR INDUSTRY

The NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NPfI has two requirements which both have to be complied with, namely an intrusiveness criterion and an amenity criterion.

7.2.1 Intrusiveness Assessment

Section 2.3: Project Intrusiveness Noise Level

"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.

Table 6 – EPA Intrusiveness Criteria

Location	Time of Day	Rating Background Noise Level – dB(A)L_{90}	Intrusiveness Noise Objective dB(A)L_{eq} (Background + 5dB)
Residents Located to the North & East	Daytime (7am – 6pm)	45	50
	Evening (6pm – 10pm)	44	49
	Night (10pm – 7am)	41	46
Residents Located to the South & West	Daytime (7am – 6pm)	45	50
	Evening (6pm – 10pm)	43	48
	Night (10pm – 7am)	35	40

7.2.2 Amenity Criteria

Section 2.4: Amenity Noise Levels and Project Amenity Noise Levels

"To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location."

Table 2.2 on page 11 of the policy has four categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. The subject site has been assessed against noise emission criteria in accordance with the 'urban' category.

Table 7 – NPfI Project Amenity Criteria

Type of Receiver	Time of day	Recommended Acceptable Noise Level dB(A) L_{eq}
Residential (Suburban)	Daytime (7am – 6pm)	53
	Evening (6pm – 10pm)	43
	Night (10pm – 7am)	38
School Classrooms & other Educational Institutes	Noisiest 1-hour Period	35
Commercial	When in Use	63

7.2.3 Sleep Disturbance Criterion

The NPfI states the following with regards to sleep disturbance, 'Maximum noise level event assessment':

> *"The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages. Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*
>
> *a detailed maximum noise level event assessment should be undertaken.*
>
> *The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy.*
>
> *Other factors that may be important in assessing the extent of impacts on sleep include:*
>
> - *how often high noise events will occur;*
> - *the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development.*

- whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods)
- current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under 'fast' time response.

The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels."

Table 8 – NPfI Sleep Disturbance Criteria

Receiver	Period	Background Noise Level	Sleep Disturbance Criteria
Residents Located to the North & East	Night 10:00pm – 6:30am	41 dBL_{A90}	43 $dBL_{Aeq,15min}$
			53 dBL_{AFmax}
	Morning Shoulder 6:30am – 7:00am	43 dBL_{A90}	45 $dBL_{Aeq,15min}$
			55 dBL_{AFmax}
Residents Located to the South & West	Night 10:00pm – 6:30am	35 dBL_{A90}	42 $dBL_{Aeq,15min}$
			52 dBL_{AFmax}
	Morning Shoulder 6:30am – 7:00am	41 dBL_{A90}	43 $dBL_{Aeq,15min}$
			53 dBL_{AFmax}

7.3 ROAD NOISE POLICY

The (RNP) provides guidelines for assessing noise emission from public roads, including the impact of traffic generated by developments.

Abercrombie Street, Golden Grove Street and Darlington Lane would be defined as sub-arterial roads.

The applicable assessment criteria for residential receivers are (measured at the façade of dwellings):

- Sub-arterial – 60dB(A) L_{eq}, 15hr (7am to 10pm) and 55 dB(A) L_{eq}, 9hr (10pm to 7am)

The policy also states that:

- Consideration of the noise increase should be made for sub-arterial and arterial roads
- Noise impacts from increases in noise levels of 2 dB(A) or less are minor, and by implication do not require mitigation.

8 OPERATIONAL NOISE EMISSION ASSESSMENT

An assessment of operational noise emissions is presented below. The following noise sources are assessed:

- Noise from internal areas;
- Noise from mechanical plant, PA system and school bells;
- Traffic generation;
- Waste removal; and
- External activities.

8.1 NOISE FROM INTERNAL SPACES

8.1.1 Learning and Administration Spaces

The administration and teaching spaces generate low to medium levels of noise. The teaching spaces are 25 meters from the nearest residential receiver and emissions from these buildings and therefore would be considered acoustically acceptable.

8.1.2 Communal Hall

The communal hall that may be used for presentations and performances opens out to the north, onto the ground level Covered Outdoor Learning Area (COLA). The most potentially impacted receivers would be the residential receivers to the west (receiver 6) as the building structure of the school shields the northern residential receivers from the Hall. There are also no openings/doors located along the southern faced of the hall.

Noise emissions to the surrounding properties was calculated based on the following assumptions:

- Hall internal level of 80dB(A)$L_{eq,15min}$ representing the sound level during a music performance.
- North facing doors and ventilation openings are closed.
- Door to have minimum sound transmission loss of R_w 20 when closed.

The predicted noise levels to the worst affected receiver (Receiver 6: 11 Golden Grove) are as follows:

- Doors Open 46 $dBL_{Aeq,15min}$
- Doors Closed < 30 $dBL_{Aeq,15min}$

The background + 5 dB(A) noise emissions criteria are not exceeded at all times. Closing the doors during the evening is recommended when amplified music is proposed to be played within the hall.

Noise producing activities on the covered external terrace should be restricted to normal school hours.

8.2 NOISE FROM MECHANICAL PLANT, SCHOOL BUILDINGS PUBLIC ADDRESS SYSTEM AND SCHOOL BELL

8.2.1 Mechanical Plant to Receiver

Detailed acoustic design of mechanical plant cannot be undertaken at approval stage, as plant selections and locations are not finalised. However, detailed acoustic assessment of all ventilation or other plant items should be undertaken at CC stage, once equipment items are selected and location is finalised.

Given the proposed buildings are remote from existing residential buildings, it is both possible and practical to treat noise from the operation of the proposed mechanical equipment to comply with the EPA NPfI criteria using standard acoustic treatments such as lined ductwork, silencers, screens and the like.

8.2.2 School Bell and Public Address Systems

School bell system/PA system, the system should minimise noise spill to adjacent properties.

- Speaker positioning/selection:
    - Speaker location and direction can be used to reduce noise spill to neighbouring properties while still maintaining suitable noise levels within the school grounds (typically 70-75dB(A)).
    - Broadly speaking, more speakers, closer to the noise receiver is a more effective way to provide coverage of external areas while reducing noise spill to neighbouring properties.
    - Similarly, highly directional speakers (angled downwards) will also reduce noise spill. Speakers with a drop of at least 5dB(A) for mid-frequencies noise for each 10 degrees in the horizontal plane outside of the coverage area should be considered.

8.3 TRAFFIC GENERATION

There are no on-site car parking spaces available in the school campus, only two car bays for delivery purposes. The school also has a 'kiss and ride' area allocated along Golden Grove Street where parents will be able to drop off their children. Some car bays which are existing along Golden Grove Street will be removed the accommodate the kiss and ride. No significant changes are proposed along Abercrombie Street.

Currently parents already drop off kids along Golden Grove. Given the distance to the nearest residential receiver is approximately 20m, with no change or increase in spaces to be used by parents dropping off or picking up school kids no significant impact from the pupil drop off bay is anticipated.

The primary period of traffic generation on Abercrombie street and Golden Grove Street is the AM drop off period (8:00-9:30am), and the PM pick up period (2:30-4:00pm).

The above traffic generation is almost identical to the existing traffic which is created by the existing school. Given all of the above, the traffic generation is unlikely to affect residence to the southern and western boundaries.

8.3.1 Traffic Noise Measurement

The traffic noise levels were determined based on the attended noise levels are presented below. Monitoring results are attached at the end of this report. In determination of acoustic treatment, the measured level is adjusted for distance, barrier attenuation and orientation.

Table 9 – Measured Traffic Noise Levels, dB(A) Leq

Location	Traffic Noise Level, dB(A)$L_{eq(worst\ 1hr)}$
	Day time 11am 12pm
Golden Grove Street	54
Abercrombie Street	54

8.4 WASTE REMOVAL

Waste would be stored near the northern boundary of the school adjacent to the preschool building The waste removal truck would park approximately 35 m from the nearest residential building. Waste removal times should time to occur between 7am and 6pm. This distance separation and the proposed time restrictions adequately address noise impact from waste removal operations.

8.5 EXTERNAL ACTIVITIES

The expected external school activities include:

- Use of all external spaces immediately before school commencing and recess/lunch periods.
- Use of courts for sports lessons during the normal school day, plus occasional afternoon and Saturday use for sports tournaments/competitions.

We note that the proposed new school outdoor play area includes a basketball court located at the northern end of the lot. The court is not part of this SSDA scope.

There are no criteria to be met regarding normal activities conducted by the school, nor is its assessment a specific requirement of the SEARS. The external spaces are separated from any existing and future by significant distance buffers, as well as, for the receivers to the west and north, screening from structures.

Noise emissions from the use of the outdoor play areas is predicted based on the following assumptions/information:

- Number of students:
    - Primary School – 415 Students Planned (Max 437)
- General Playground noise measurements:
    - Primary School - noise level per student of 83dB(A) (sound power level one in two students), based on measurements conducted Anzac Park Public School.
- All play areas in operation at once.

8.5.1 Predicted Noise Emissions

The most impacted residential receivers from general playground activity would be those to the north of the site having direct line of sight to parts of the playground and the courts. The remainder of the residential receivers would have much lower levels of noise exposure.

We note that the proposed new school outdoor play area includes a basketball court located at the northern end of the lot. This court is located in the same location as the existing court, and therefore no significant increase in noise impact from the use of the court is anticipated.

The predicted noise levels at the most impacted residential receivers to the north (Receiver 1: Regiment Building) are:

- General recess/lunch – 69dB(A) $L_{eq,15min}$

The predicted noise levels at the most impacted residential receivers to the north (Receiver 2: 118 – 132 Darlington Road) are:

- General recess/lunch – 66dB(A) $L_{eq,15min}$

The predicted noise levels exceed the rating background level by up to 16 dB(A). The level of impact at all other residences will be significantly lower due to the screening effects provide by the school buildings, and because of additional distance loss.

With respect to the above for playground use it is typical to apply a less stringent indicator of noise impact than "background + 5 dB(A)" given that it is present for short periods through the day and it is regarded as "community" noise.

However, in our opinion, the higher exceedances for the most exposed residences are not unreasonable for the following reasons:

- Noise from school playgrounds a noise source intended to be governed by documents such as the EPA Noise Policy for Industry (NPfI) 2017. It is common (and almost unavoidable) in school development that a playground is located in close proximity to residential development. In this regard we note that in *Meriden v Pedavoli [2009 NSWLEC 183]* the NSW Land and Environment Court noted "*All noise that emanates from the normal activities at a school is not offensive*". The Court had regard to the fact that there was other school development in the local government area in which playgrounds adjoin residential development and the fact the proposed use was permissible in the zone. This is consistent with the proposed development.

- As noted above, a playground located near a residential boundary is a common scenario in school developments. At the subject site, the main play areas are located well away from residential receivers.

- Given that there is already significant distance and barrier separation between the play areas and residences, the only way of minimising noise impact is to erect noise barriers around the school, However, these barriers have other negative impacts which, while technically feasible, may not be a reasonable response to a level of impact that typically occurs with schools placed within residential zonings and appears to be a generally accepted level of impact.

The school is existing, and is getting refurbished, and are therefore "play" noise is already part of the normal noise environment.

8.6 NON-SCHOOL USES, AND AFTER HOURS SCHOOL ACTIVITIES

After hour school activities would largely relate to use of the school hall as assessed above. There could also be other "quiet" activities that may occur externally or within the buildings that would not result in significant emissions. This would include parent/teacher nights, election activities, etc. Where music practice occurs within a school classroom outside of normal hours the windows of the rooms should be kept closed. External activities by non-school uses may include use of the external spaces and the hall as described in Table 2. The recommendations regarding the use of the hall by the school should also be adopted for these uses. Use of the COLA and basketball courts should be limited to 7am to 9pm.

9 OPERATIONAL VIBRATION EMISSION ASSESSMENT

There would be no vibration impact from the proposal as there would be no vibration sources that would produce perceptible vibration on any surrounding property.

- Peak hour traffic volumes in the Darlington public school proposed school expansion Traffic Assessment Transport and Traffic Planning Associates Report - 19043 dated May 2019

10 NOISE INTRUSION ASSESSMENT

The school is not impacted by any local environmental noise sources except local traffic on the surrounding streets. The most impacted buildings would be the western façade overlooking grove street as this façade would also experience traffic hum emanating from king street a near-by arterial road. Noise levels were calculated

The measured noise level along Golden Grove is 58dB(A)$L_{eq,wost\ 1hr}$ at the western building façade. If their traffic where to double with the increase in school capacity, the new traffic noise level will be 61dB(A)$L_{eq,worst\ 1hr}$. With the predicted noise level of 61 dB(A) $L_{eq,worst\ 1hr}$. with standard windows the noise level in the classrooms would be expected to be reduced by at least 20dB(A), meaning the 40dB(A) criterion would be achieved, providing the recommendations below are installed.

10.1 RECOMMENDED TREATMENT

The following is recommended to meet the recommended internal noise levels:

- The North, East and South facing windows of the proposed development at Darlington Public School is recommended to have a minimum of 10.38mm glass fitted into openable frames to give a minimum R_w of 35.
- All remaining facades, internally facing, are recommended to have a minimum of 6.38mm glass fitted into openable frames to give a minimum R_w of 31

10.2 WASTE REMOVAL

Waste would be stored near the preschool boundary adjacent to the northern most block of preschool classrooms. Waste removal times should be coordinated with the preschool to avoid child rest periods.

11 CONSTRUCTION NOISE ASSESSMENT

An assessment of likely construction noise impacts has been undertaken. The assessment includes:

- Identification of the noise and vibration guidelines which will be applicable to this project.
- Identification of potentially impacted nearby sensitive receivers.
- Identify likely sources of noise and vibration generation and predicted noise levels at nearby development.
- Formulation of a strategy to address the guidelines identified and including mitigation treatments

Construction works for the proposed school will consist primarily of three construction phases, namely site works/demolition, general construction activities and completion landscaping/external works. The proposal consists of one major building to be erected a three level structure.

There is no below ground/ basement levels proposed, meaning that significant excavation and piling will not be required. Construction works (and typical loudest plant/equipment) expected for the project are as follows:

- Cleaning of the site and earthworks to level the site as required and excavate for footings and services (excavators, pneumatic hammers)
- Erection of structure (powered hand tools for formwork, concrete pump, vibrators);
- Internal fit out
- Landscaping

Work hours for the site are proposed as follows:

- Monday to Friday: 7am – 6pm
- Saturday: 7:30am – 3:30pm*
- Sundays or Public Holiday No work.

*The proposed Saturday construction hours fall outside of the standard hours proposed by the INCG. This extension has been proposed to give workers more time to complete tasks such as disposal of contaminated waste which cannot be completed during school hours during the week.

11.1 RECIEVER LOCATIONS

Sensitive receiver locations please see site description and figure 1.

11.2 NOISE AND VIBRATION GUIDELINES

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise management levels (based on ambient noise monitoring);
- Review of generated noise levels at nearby development;
- Recommendation of noise controls strategies when noise management levels are exceeded.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- "Noise affected" level. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)Leq(15min).
- "Highly noise affected level". Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)Leq(15min) at nearby residences.

The construction site will impact both residential and commercial receivers surrounding the site. However, commercial receivers have less stringent recommended management levels, and thus will be less impacted than the other residential receivers. Given this any noise mitigation needed to manage noise to the residential receivers will also adequately address noise to commercial receivers.

A summary of the above noise management levels from the ICNG is presented below.

With regards to the extended construction hours on Saturdays the same criteria applies as the extended hours still fall within the day time period (7:00am – 6:00pm) background noise level.

Table 10 – Noise Management Levels - Residential

Location	"Noise Affected" level – dB(A) $L_{eq(15min)}$	"Highly Noise Affected" Level – dB(A) $L_{eq(15min)}$
All Residential Receivers	55	75

If noise levels exceed the noise management levels identified above, reasonable and feasible noise management techniques will be reviewed

11.3 VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 Structural Vibration: Effects of Vibration on Structures; and
- For human exposure to vibration, the evaluation levels presented in the British Standard BS 6472:1992 Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz) for low probability of adverse comment.

11.3.1 Structure Borne Vibrations (Building Damage Levels)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The vibration levels presented in DIN 4150-3 (1999-02) are detailed in Table 4. It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 11 – DIN 4150-3 (1999-02) SAFE LIMITS FOR BUILDING VIBRATION

Type of structure		PEAK PARTICALE VELOCITY (MMS^{-1})			
		At Foundation at a frequency			Plane of Floor of Uppermost Storey
		<10Hz	*10Hz to 50Hz*	*50Hz to 100Hz*	*All Frequencies*
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under preservation order)	3	3 to 8	8 to 10	8

The surrounding residential buildings would be considered a Type 2 structure.

11.3.2 Assessing amenity

The NSW EPA document "assessing Vibration: A technical Guideline" provides procedures for assessing tactile vibration and regenerating noise within potentially affected buildings and is used in the assessment of vibration impact on amenity. Relevant vibration levels are presented below.

Table 9 – EPA Recommended Vibration Levels

		RMS Acceleration (m/s^2)		RMS velocity (mm/s)		Peak Velocity (mm/s)	
Place	**Time**	**Preferred**	**Maximum**	**Preferred**	**Maximum**	**Preferred**	**Maximum**
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

11.4 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

Typically, the most significant sources of noise or vibration generated during a construction project will be demolition, ground works and building structure works. the following table presents assessment noise levels for typical construction equipment expected to be used during the construction of the proposal.

Table 12 – Sound Power Levels of the Typical Equipment

Equipment/ Process	Sound Power Level dB(A)*
Dozer/Excavator	112
Concrete Pump	110
Trucks	100
Bobcat	105
Crane (Electric)	85
Powered Hand Tools	95-100

The noise sources presented in the table above are derived from the following sources, namely;

- Table A1 of the Australian Standard 2436-2010/
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary)

11.5 NOISE PREDICTIONS

The predicted noise levels during excavation and construction will depend on:

- The activity undertaken.
- The distance between the work site and the receiver. The distance between the noise source and the receiver will vary depending on which end of the site the work is undertaken. For this reason, the predicted noise levels will be presented as a range.

Predicted noise levels are presented in the following tables. Predictions take into account the expected noise reduction as a result of distance only.

Table 13 – Predicted Noise Generation to Residential Receivers North of Site

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)
Dozer/Excavator	75-83
Concrete Pump	80-88
Trucks	65-73
Bobcat	70-78
Crane/hoist (electric)	65-73
Powered hand tools (Externally)	54-62

Table 14 – Predicted Noise Generation to Residential Receivers West of the Site.

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)
Dozer/Excavator	62-70
Concrete Pump	62-70
Trucks	57-65
Bobcat	62-70
Crane/hoist (electric)	57-65
Powered hand tools (Externally)	46-54

Table 15 – Predicted Noise Generation to Residential Receivers East of the Site.

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)
Dozer/Excavator	63-74
Concrete Pump	63-74
Trucks	58-69
Bobcat	63-74
Crane/hoist (electric)	58-69
Powered hand tools (Externally)	47-58

Table 16 – Predicted Noise Generation to Residential Receivers South of the Site.

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)
Dozer/Excavator	62-70
Concrete Pump	62-70
Trucks	57-65
Bobcat	62-70
Crane/hoist (electric)	57-65
Powered hand tools (Externally)	46-54

11.6 DISCUSSION – NOISE

Without mitigation noise at the sensitive receivers around the site will exceed the NML, and in some cases the HNML.

Therefore, "reasonable and feasible" mitigation should be applied in accordance with the "control of construction Noise and Vibration – Procedural Steps" outlined below.

11.7 DISCUSSION – VIBRATION

There are no significant sources of vibration envisaged.

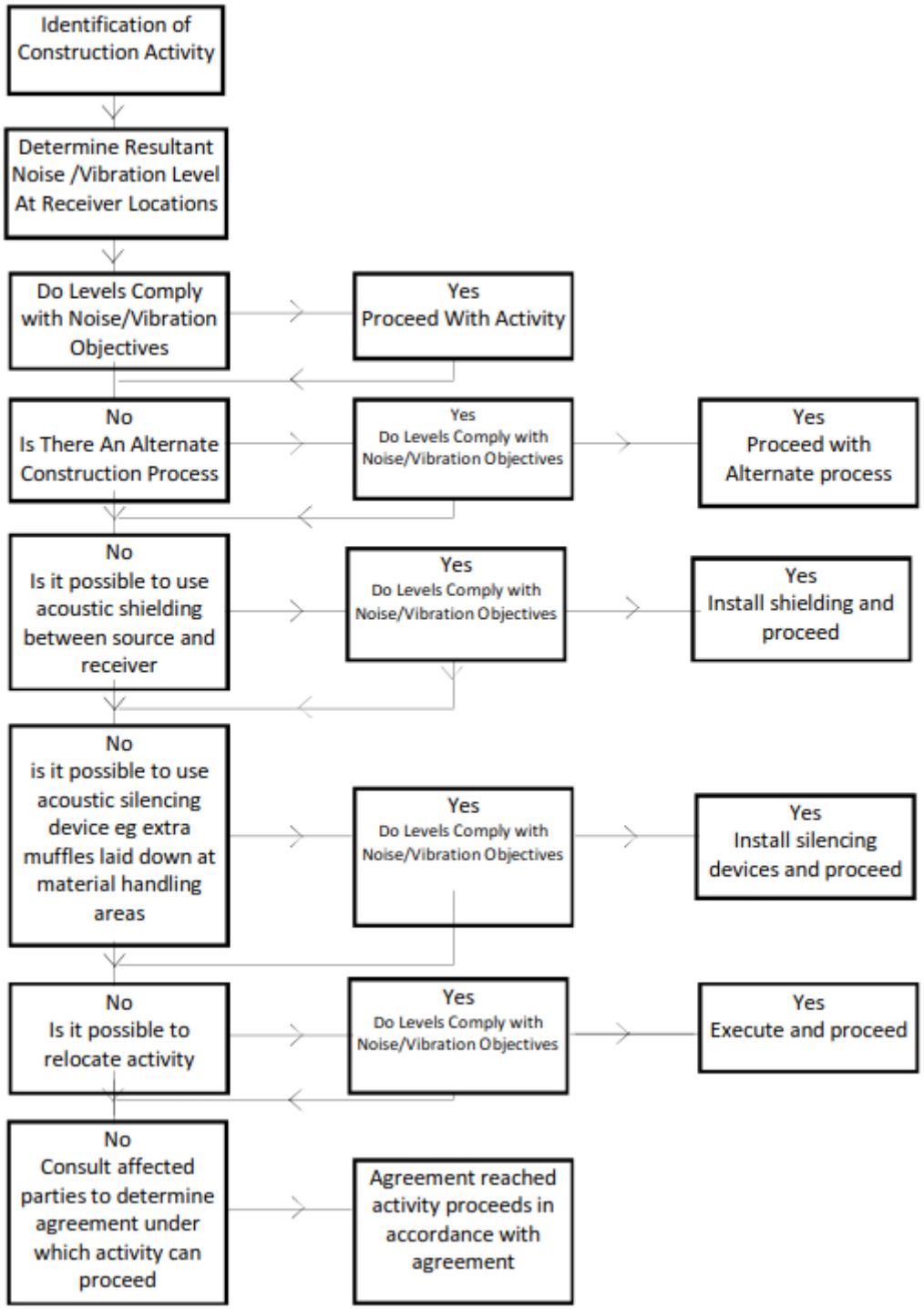
11.8 RECOMENDATIONS

In light of the above, the following recommendations are made to reduce construction noise activities during standard construction hours as well as extended construction hours proposed on Saturdays:

- Operation of large earthmoving equipment (bulldozers and Excavators) should not be operational until 8am.
- Quiet work methods/technologies:
    - The primary noise generating activity at the site will be the ground work period. As much as practicable, use of quieter methods should be adopted.
    - Concrete pumps should be located within bounds of the site (rather than on nearby roads at the perimeter of the site) where possible. We note however, given site constraints concrete pumps may need to be located on the road. Where this is required the concrete pump is to be located on the side of the road closest to site.
    - Materials handling/vehicles:
        - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of residential receivers.
        - Avoid carless dropping of construction materials into empty tucks. (i.e. ensure works are placing materials, not throwing them).
        - Trucks, trailers and concrete trucks (if possible) should turn off their engines during idling to reduce noise impacts
- In respect of pneumatic/hydraulic hammering (if required) noise impacts should be addressed via the imposition of respite periods, typically limiting operation to:
    - 9am -12pm, Monday to Friday
    - 3pm – 5pm, Monday to Friday; and
    - 9am to 12pm, Saturday
- Noisy activities (exceeding the NML) should not be carried out after 1pm Saturdays.
- Complaints handling - In the event of complaint, the procedures outlined in Sections 11.9, 11.10 and the applicable construction management plan should be adopted.
- A detailed noise management plan should be developed by the main contractor that describes in detail the construction phases, programme, processes and equipment used, noise impact assessment and proposed mitigation and management.
- Site induction:
    - A copy of the noise management plan is to be available to contractors. The location of the noise Management plan should be advised in any site induction.
    - Site induction should also detail the site contact is to be notified in the event of a noise complaint.

11.9 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PRCEDURAL STEPS

The flow chart presented below illustrates the process that will be followed in assessing construction activities.



11.10 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

In the event of complaints, there are a number of noise mitigation strategies available which can be considered.

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

11.10.1 Selection of Alternate Appliance or Process

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. Undertaking this activity using bulldozers, ripping and/or milling machines will result in lower noise levels. This measure has the potential to reduce noise emissions by 10 dB(A) or more.

11.10.2 Acoustic Barriers

Given the position of the project site and receivers, it is unlikely that noise screens will provide significant acoustic benefit for the receivers but will provide noticeable improvement for those on ground level.

The placement of barriers at the source is generally only effective for static plant. Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be affected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

11.10.3 Material Handling

The installation of rubber matting over material handling areas can reduce the sound impacts due to material being dropped by up to 20dB(A).

11.10.4 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

11.10.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. A more detailed management plan will be developed for this project in accordance to the construction methodology outlining work procedures and methods for minimising noise.

11.10.6 Combination of Methods

In some cases, it mat be necessary that two or more control measures be implemented to minimise noise.

11.11 ADDRESSING COMPLAINTS

Should ongoing complaints of excessive noise or vibration levels occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices.

If a noise complaint is received the complaint should be recorded. Any complaint form should list:

The name and address of the complainant (if provided);

- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

12 SUMMARY OF RECCOMENDATIONS

We recommend the following acoustic treatments/management controls are implemented to mitigate acoustic impact as much as practicable:

- Operation of the school should be limited to the activities and times of operation indicated in table 2 of this report, subject to additional mitigation of noise for certain activities and operation and times as indicated below.
- Detailed acoustic review of all external plant items should be undertaken following equipment selection and duct layout design. All plant items will be capable of meeting noise emission requirements of Council and the EPA Noise Policy for Industry (2017), with detailed design to be done at CC stage.
- External speakers for PA and bells should designed to minimise noise spill, be directional facing away from residential receivers to comply with EPA Noise Policy for Industry (2017) guidelines (refer Sections 6.2.1 and 7.2).
- Waste removal times should be scheduled between 7am and 6pm and co-ordinated with the Preschool to avoid child rest periods.
- The proposal would not produce adverse vibration impacts on nearby structures or impact the amenity of the surrounding properties.
- Construction noise impacts should be managed as outlined in Section 10.8.

13 CONCLUSION

Noise emissions associated with the proposed redevelopment of Darlington Public School, Darlington have been assessed with reference to relevant EPA and relevant acoustic guidelines

The following noise emission sources have been addressed:

- Noise from internal areas
- Noise from PA system and school bell
- Traffic generation
- Waste removal
- External activities
- Construction activities

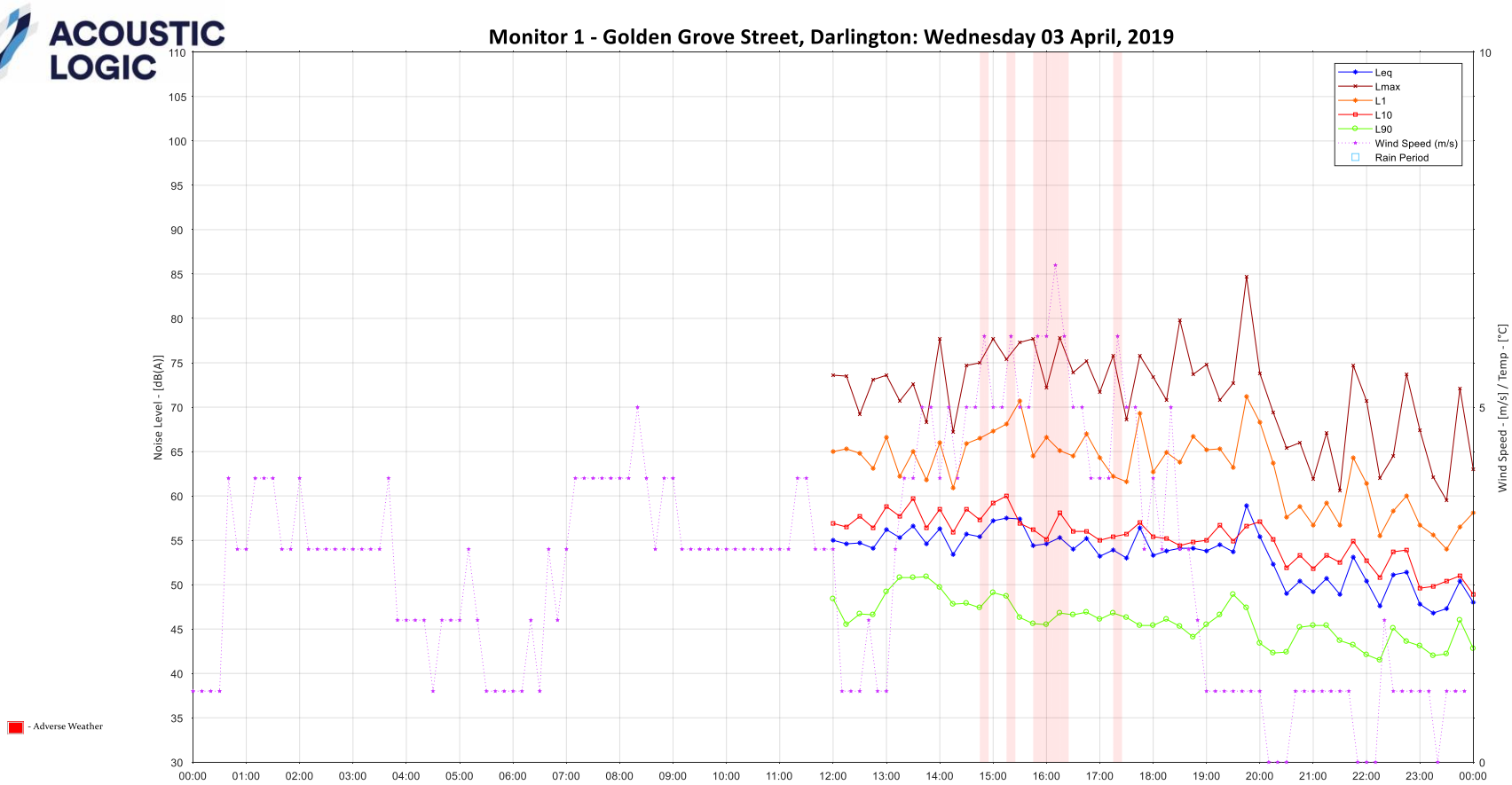
Recommendations have been made to ensure that noise emissions from the school do not adversely impact the surrounding properties.

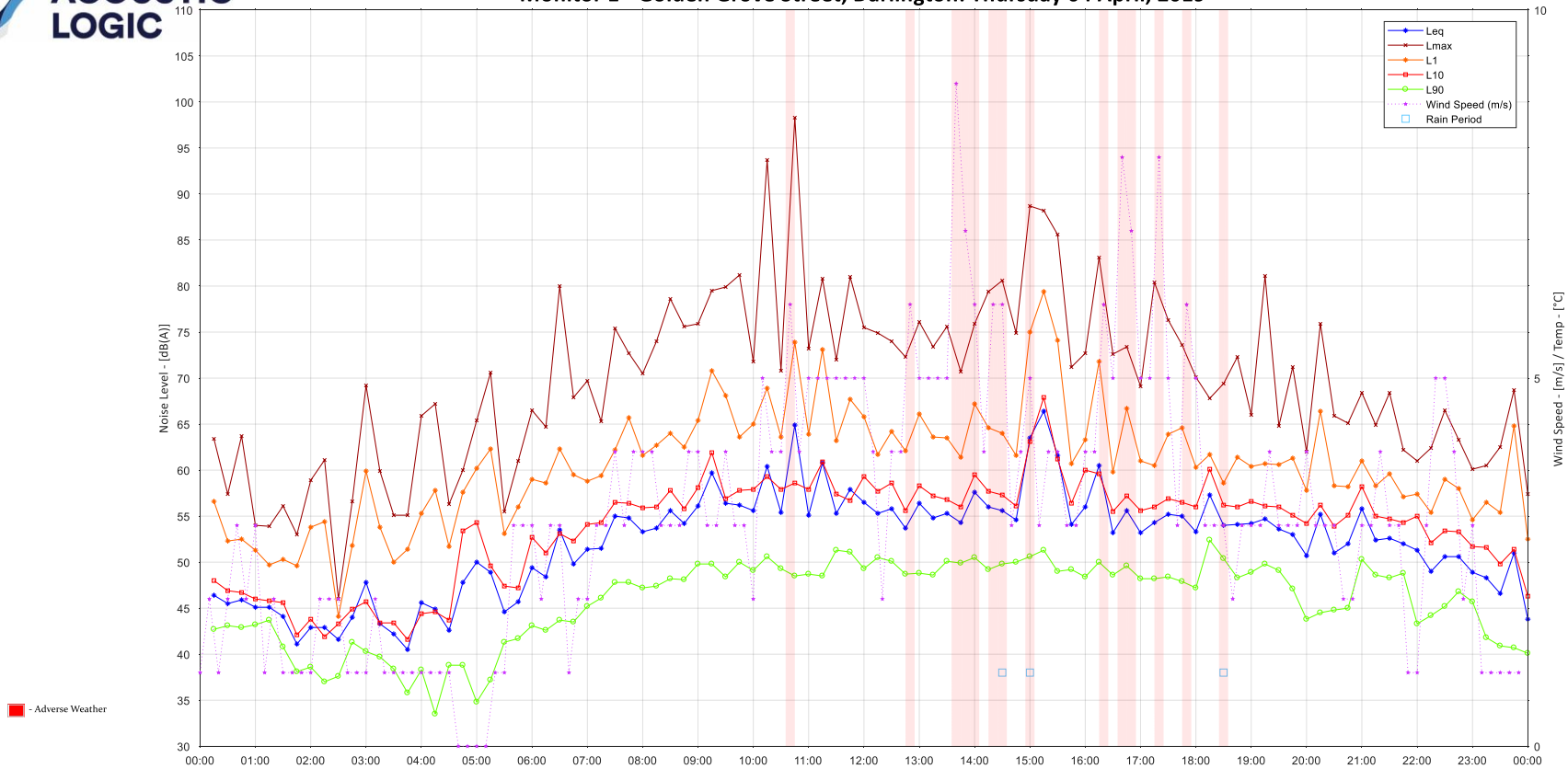
Please contact us should you have any further queries.

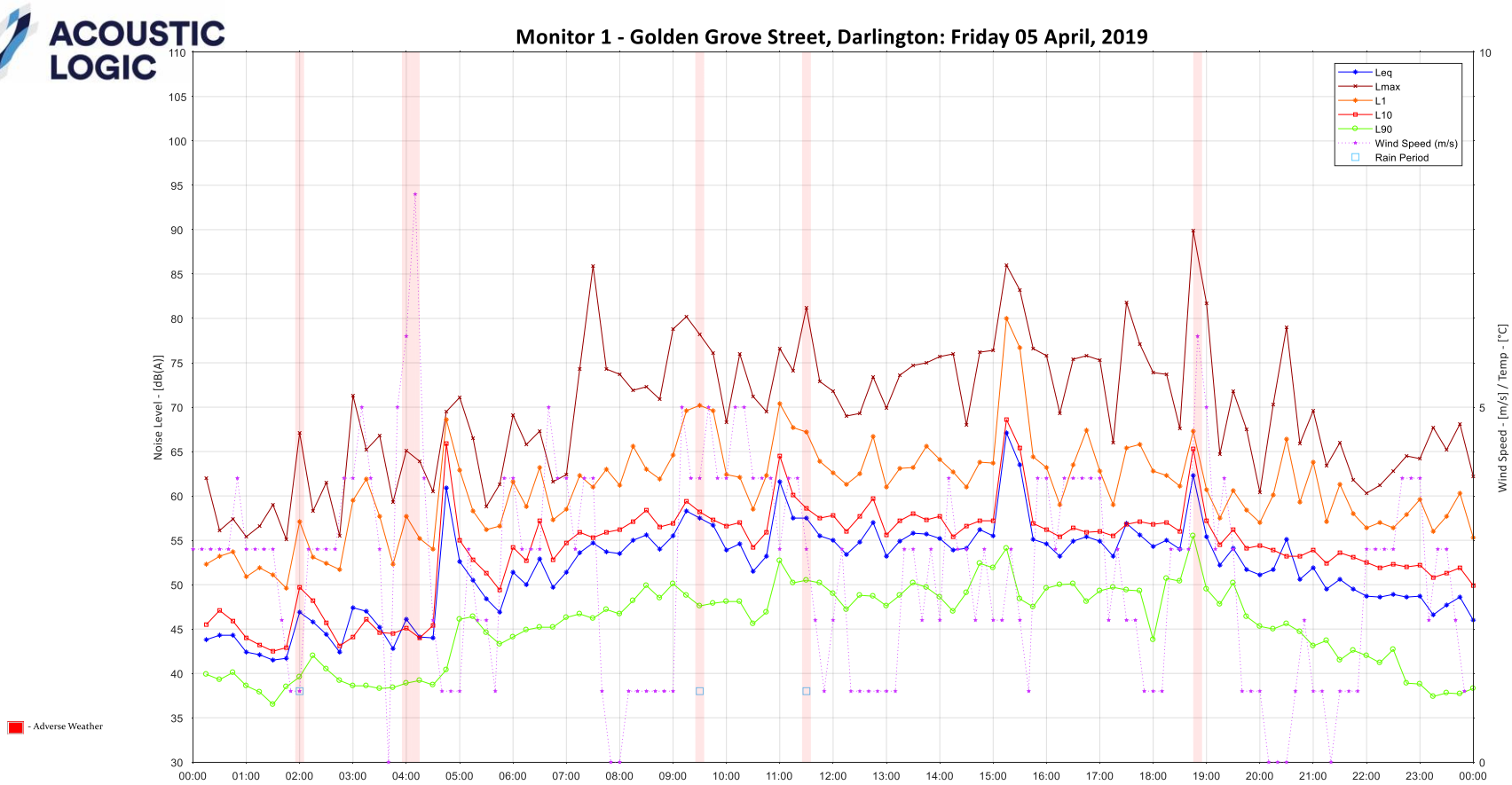
Yours faithfully,

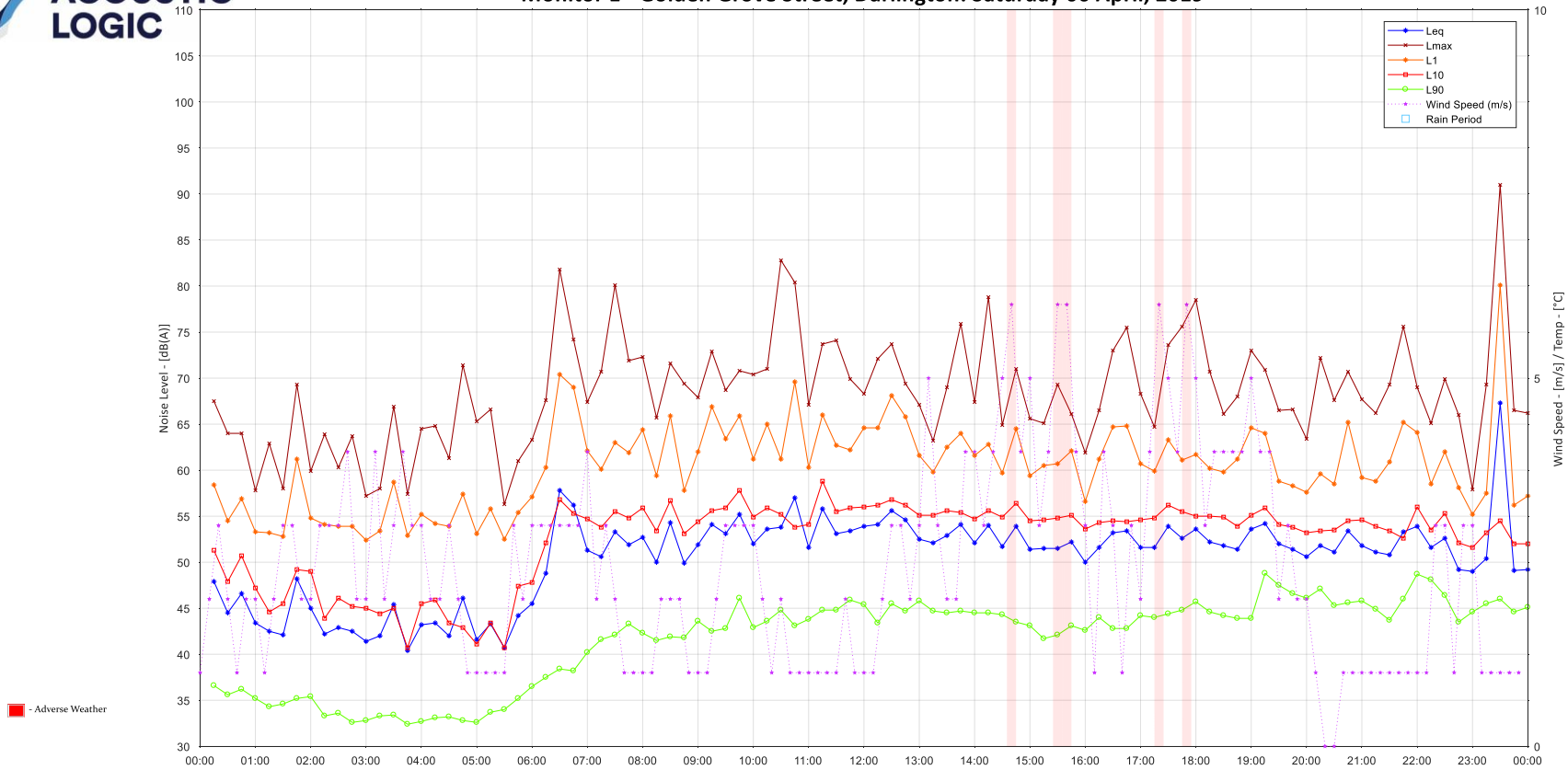
Acoustic Logic Consultancy Pty Ltd
Jenna MacDonald

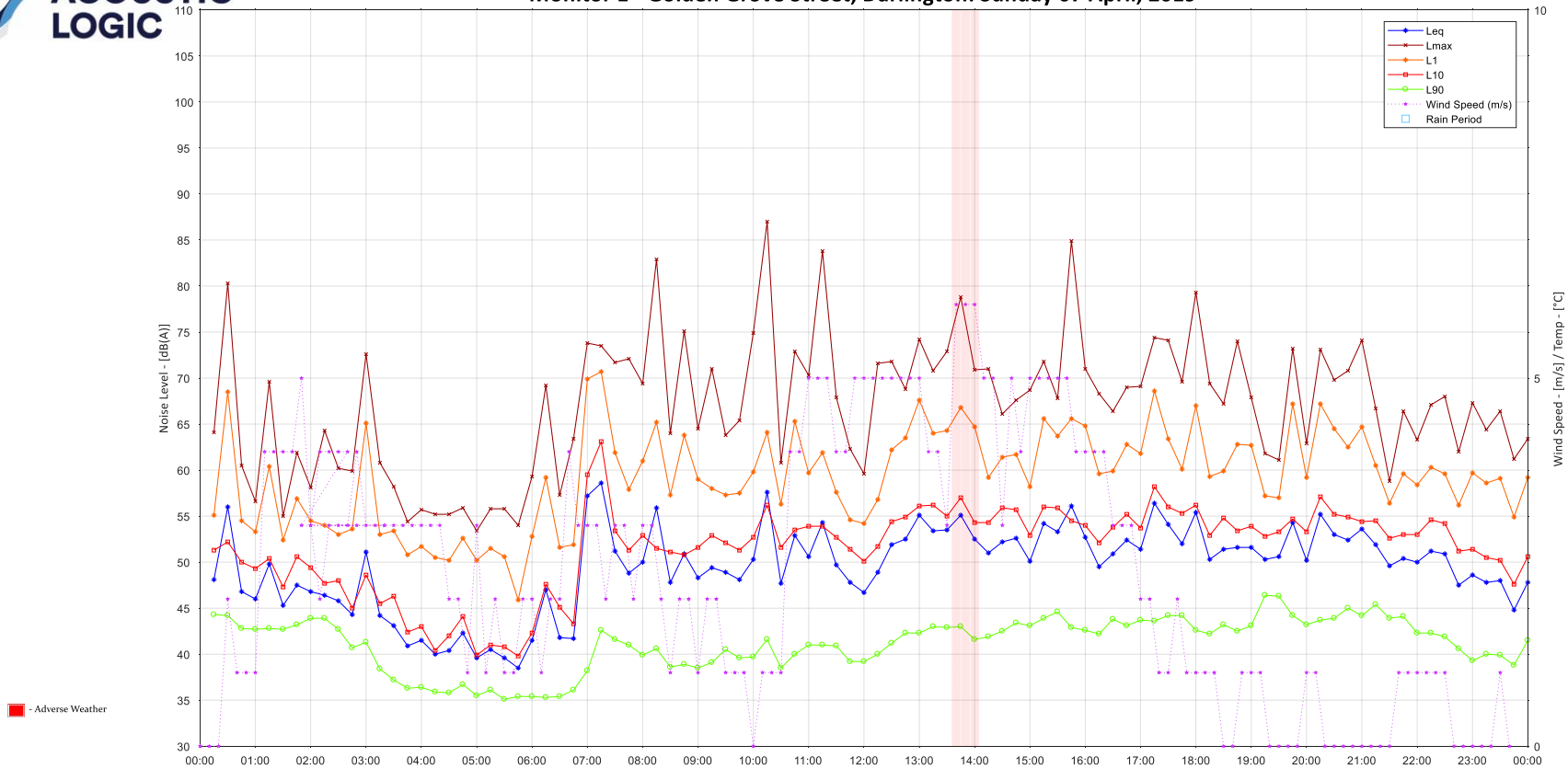
APPENDIX ONE:
UNATTENDED NOISE MONITORING DATA

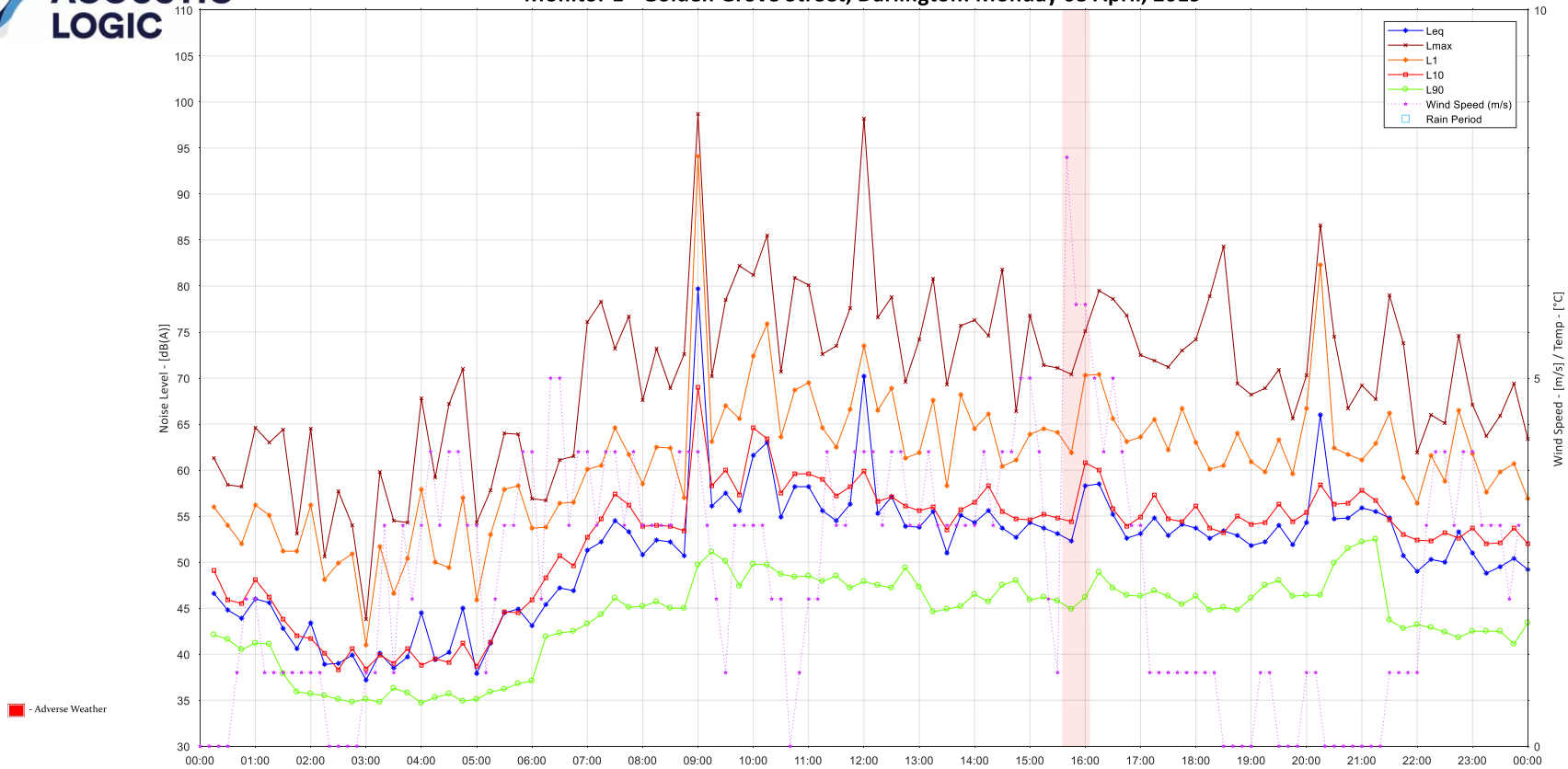

Monitor 1 - Golden Grove Street, Darlington: Wednesday 03 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

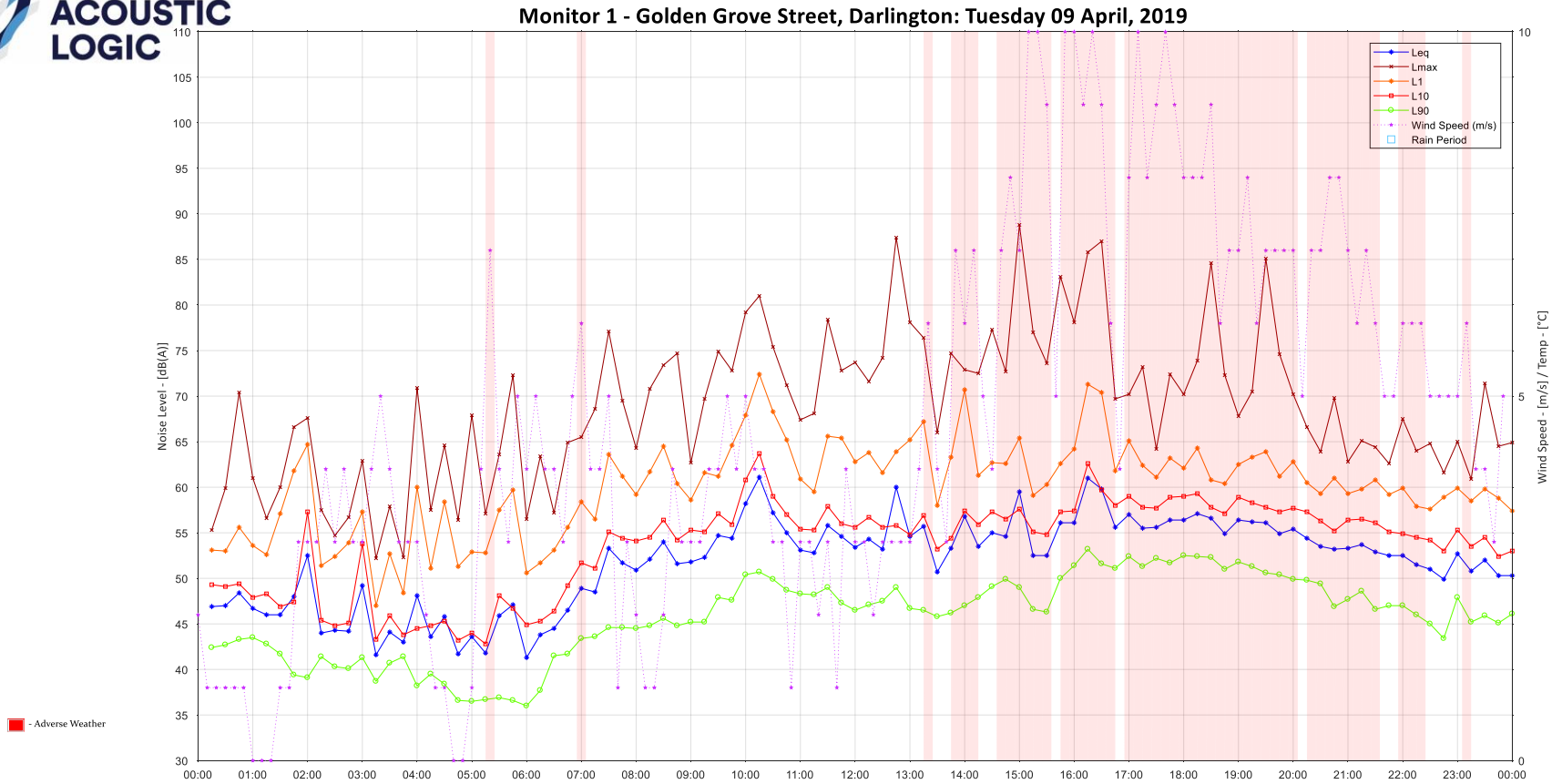

Monitor 1 - Golden Grove Street, Darlington: Thursday 04 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

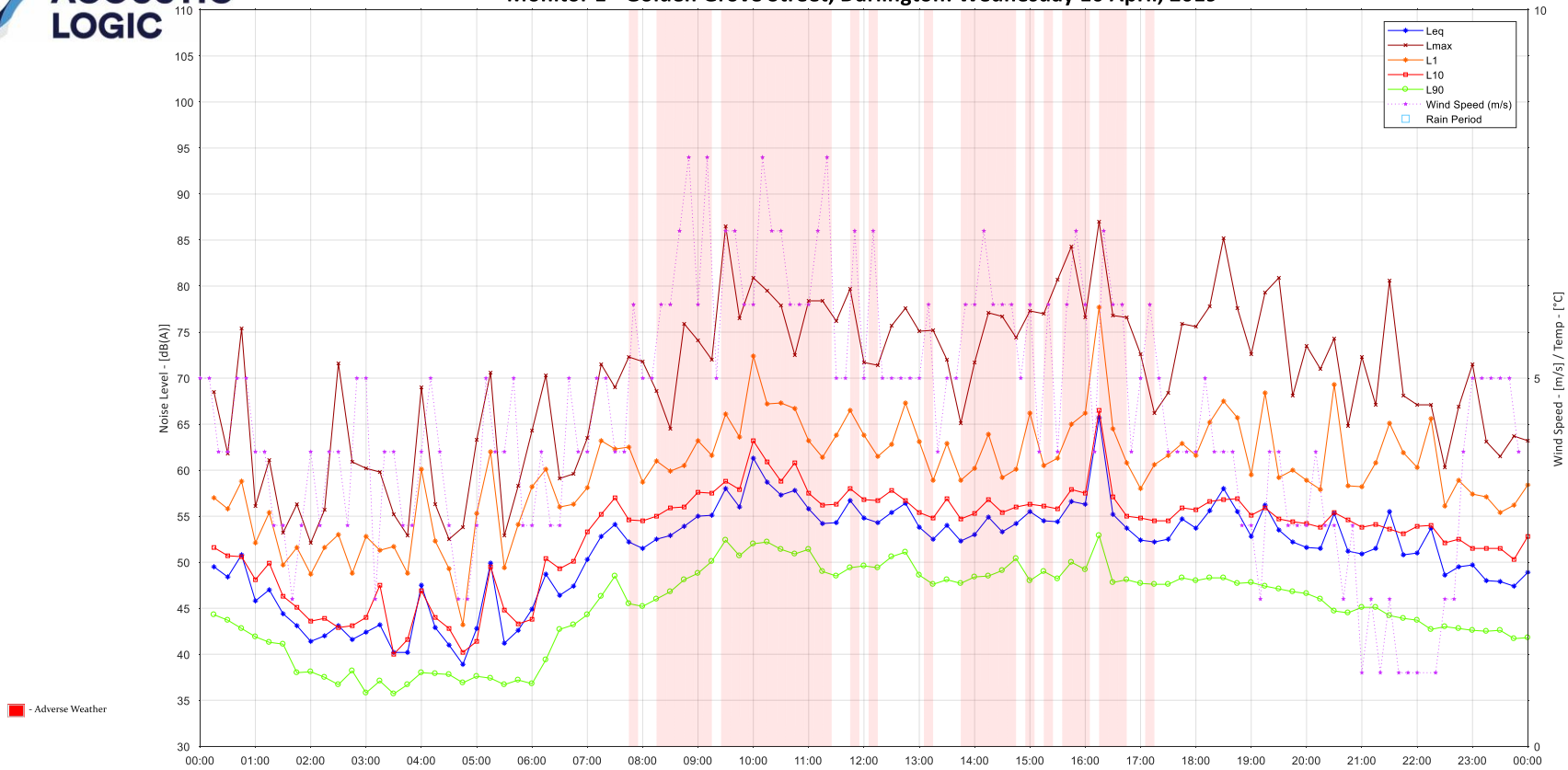

Monitor 1 - Golden Grove Street, Darlington: Friday 05 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

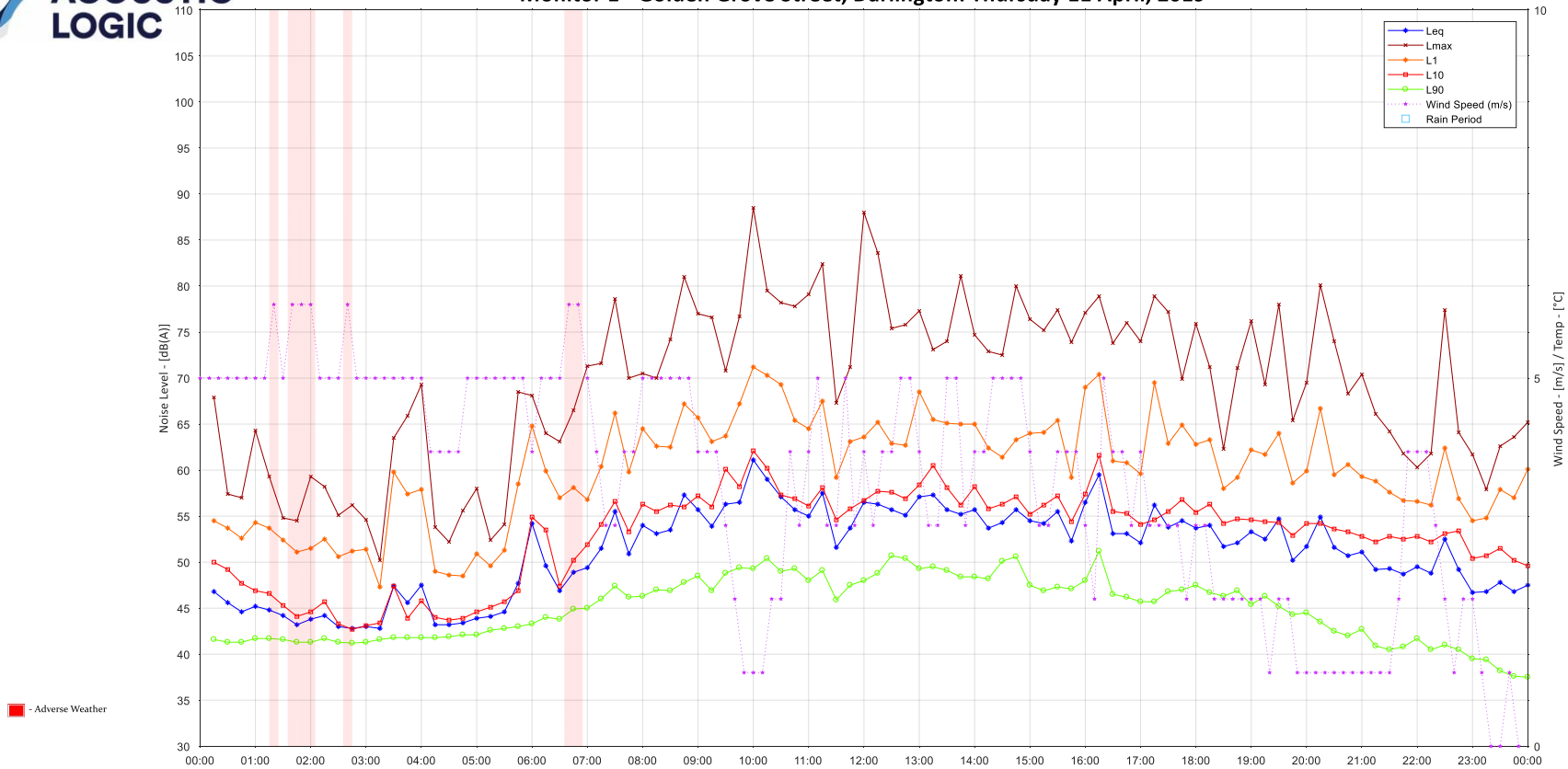

Monitor 1 - Golden Grove Street, Darlington: Saturday 06 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

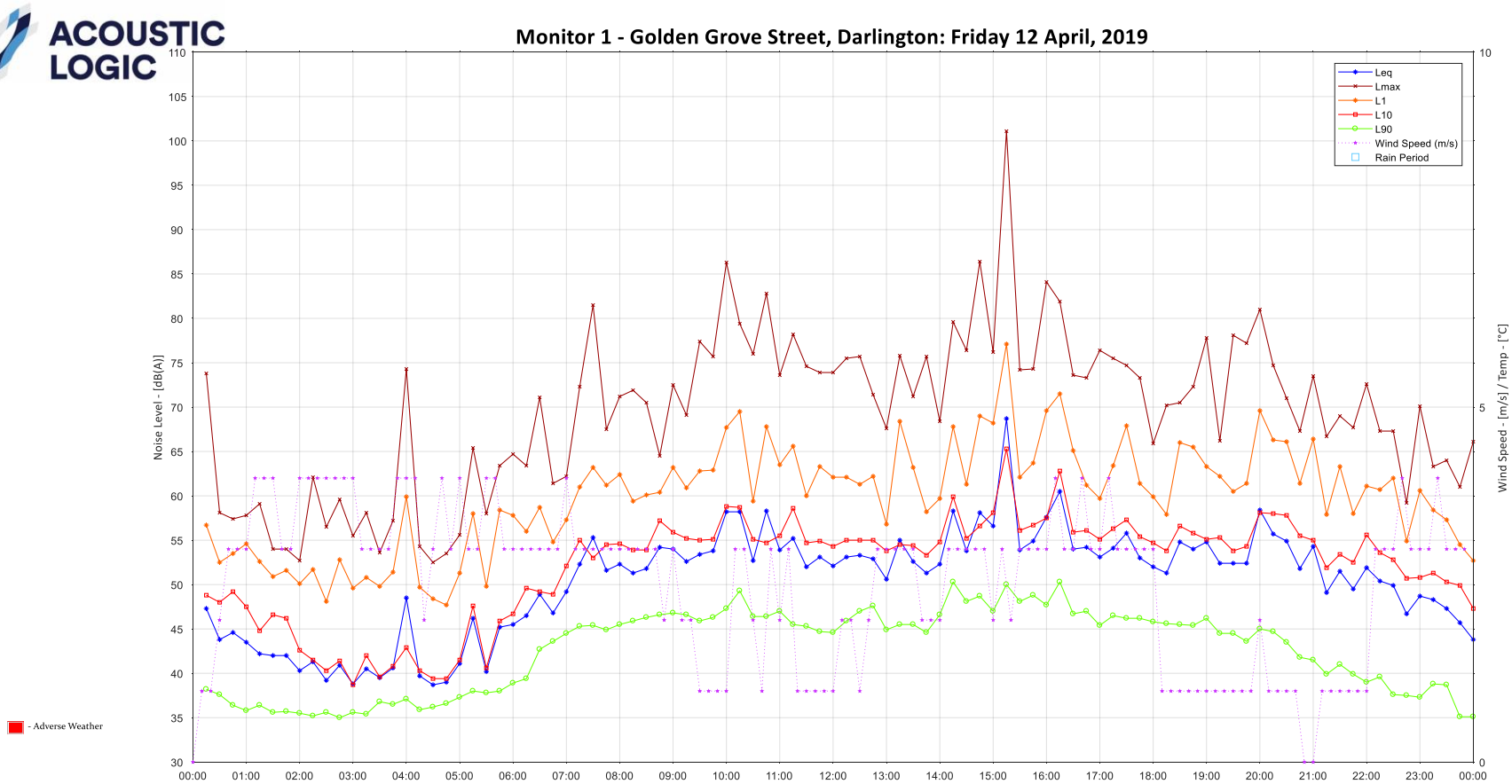

Monitor 1 - Golden Grove Street, Darlington: Sunday 07 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather


Monitor 1 - Golden Grove Street, Darlington: Monday 08 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

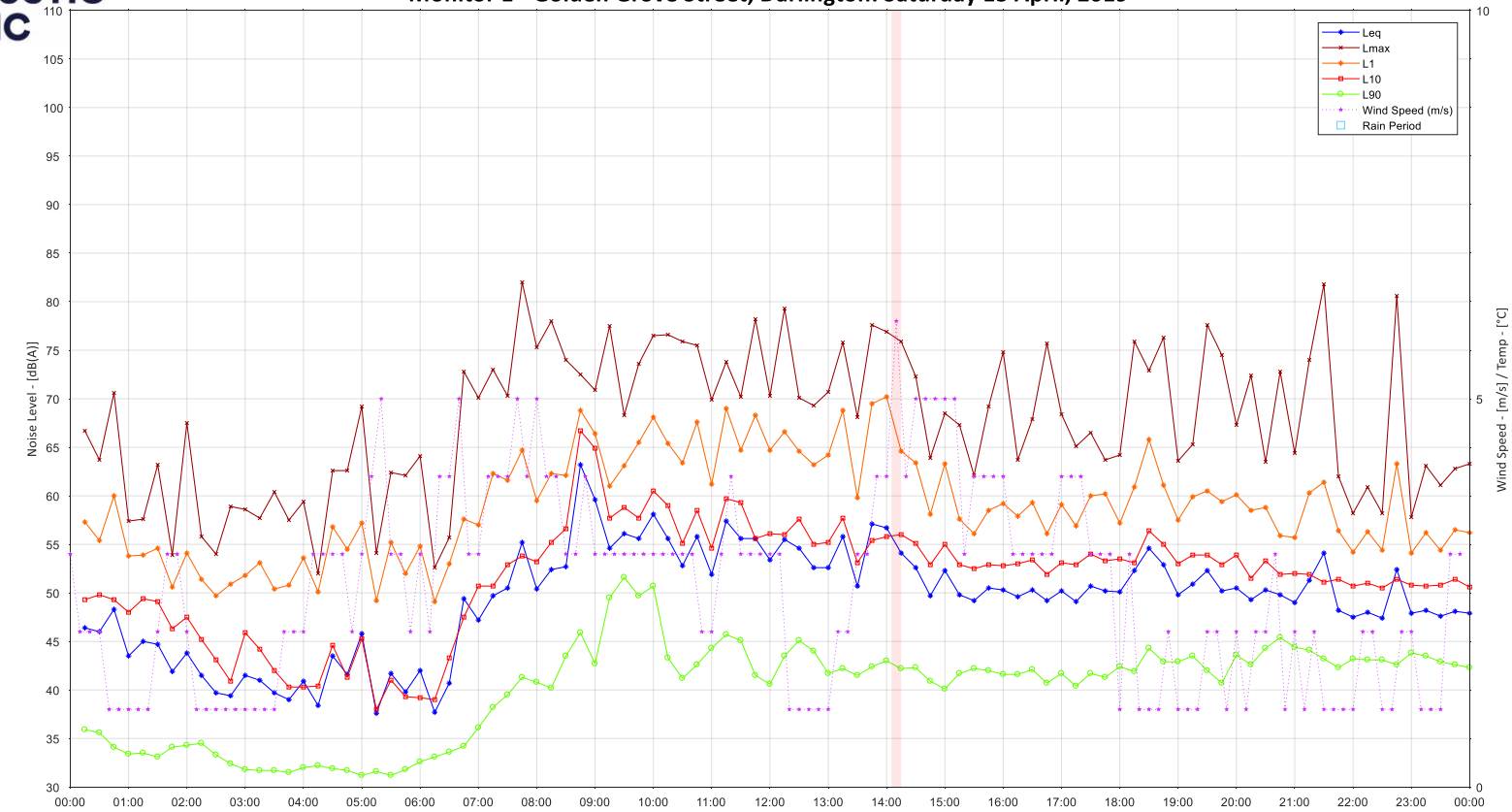

Monitor 1 - Golden Grove Street, Darlington: Tuesday 09 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather


Monitor 1 - Golden Grove Street, Darlington: Wednesday 10 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

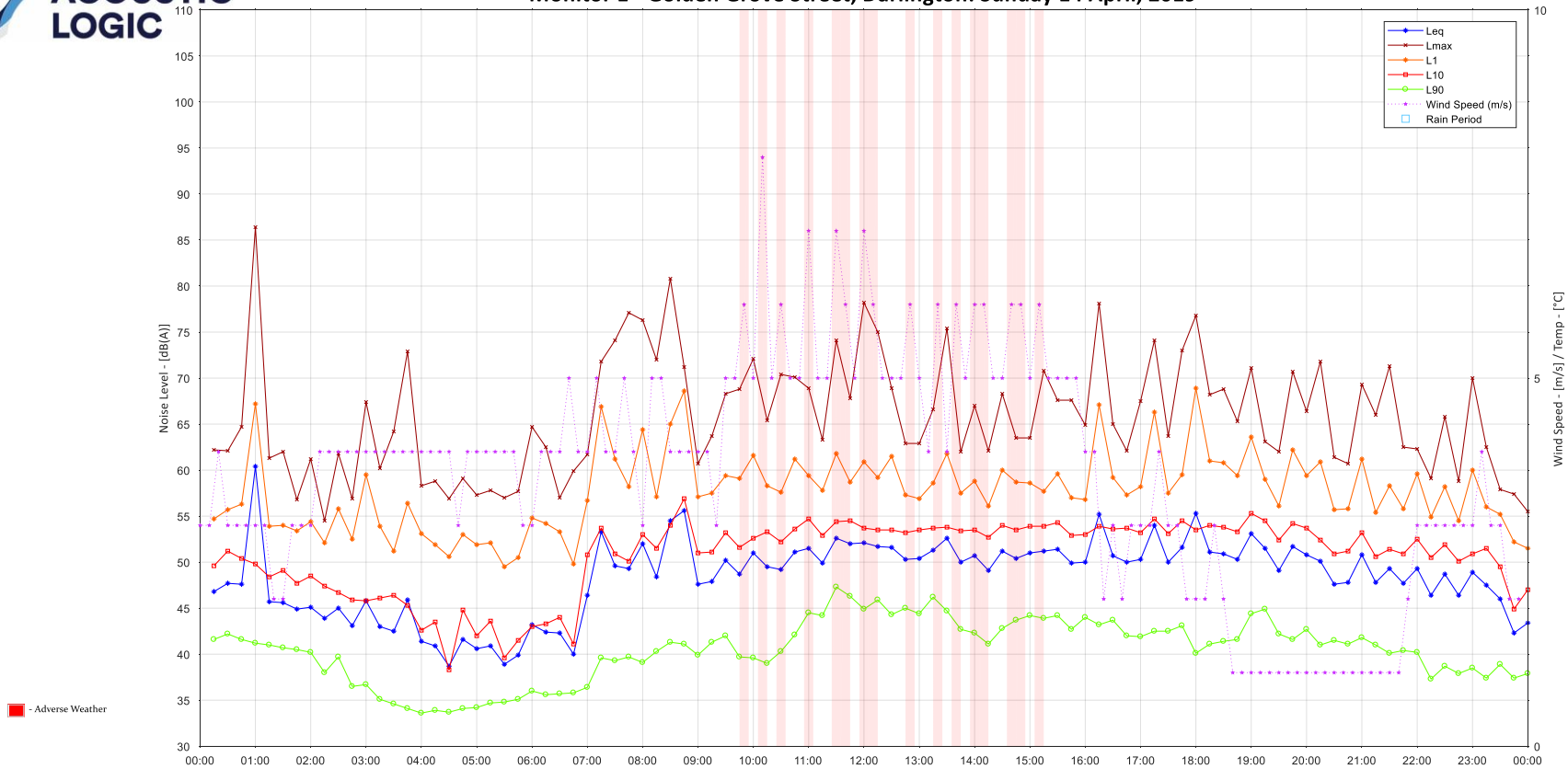

Monitor 1 - Golden Grove Street, Darlington: Thursday 11 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

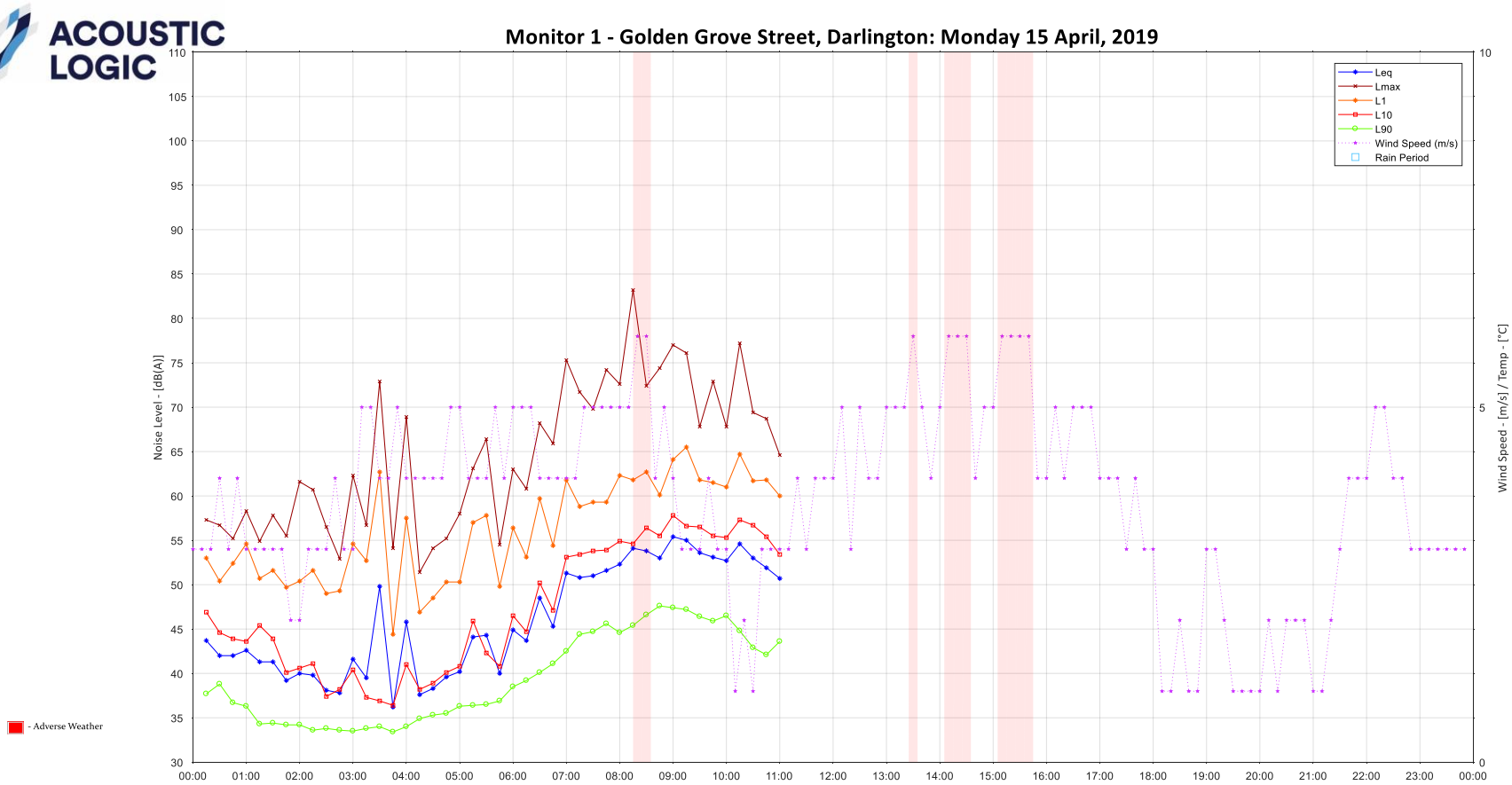

Monitor 1 - Golden Grove Street, Darlington: Friday 12 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

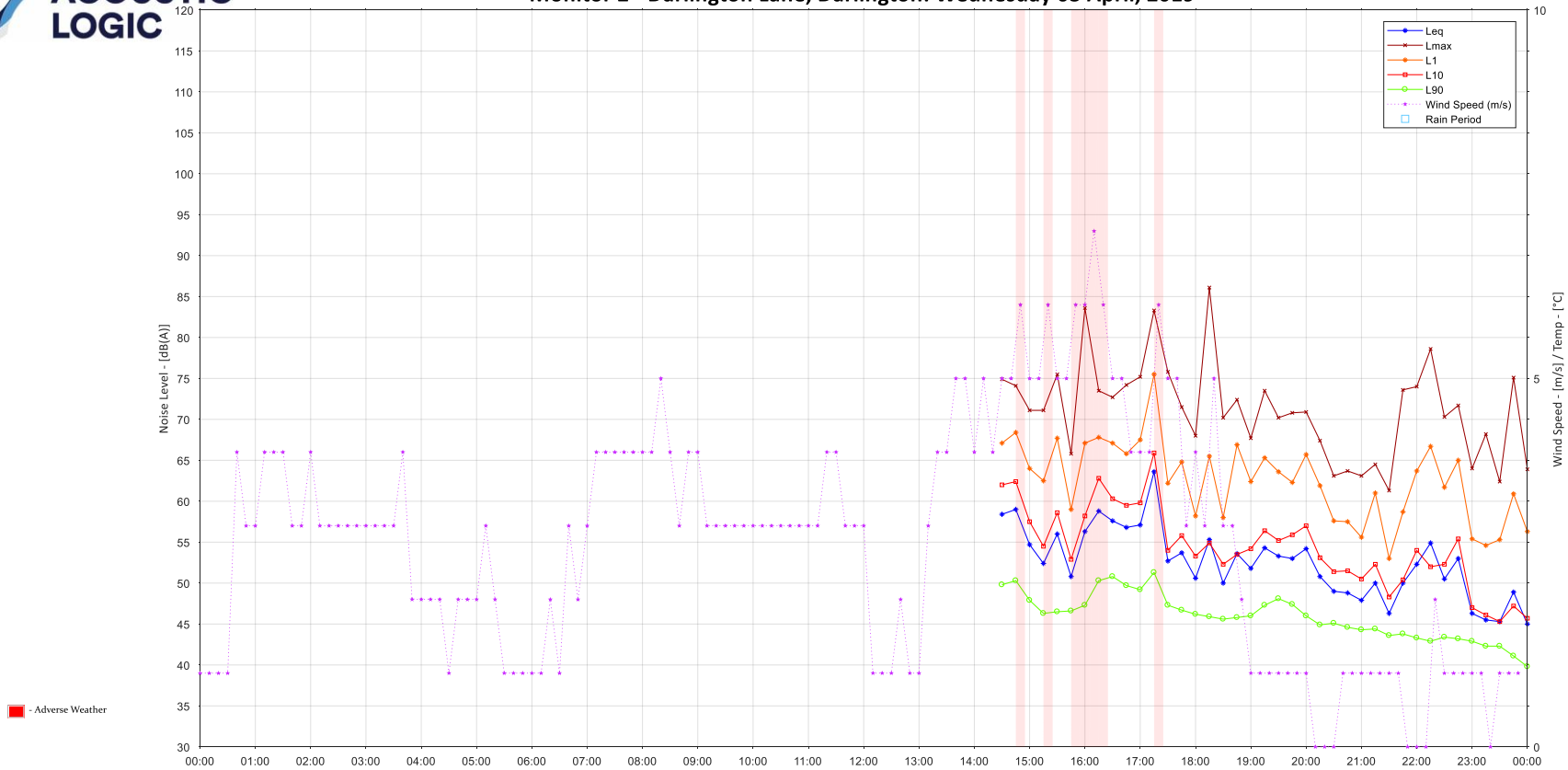
Monitor 1 - Golden Grove Street, Darlington: Saturday 13 April, 2019



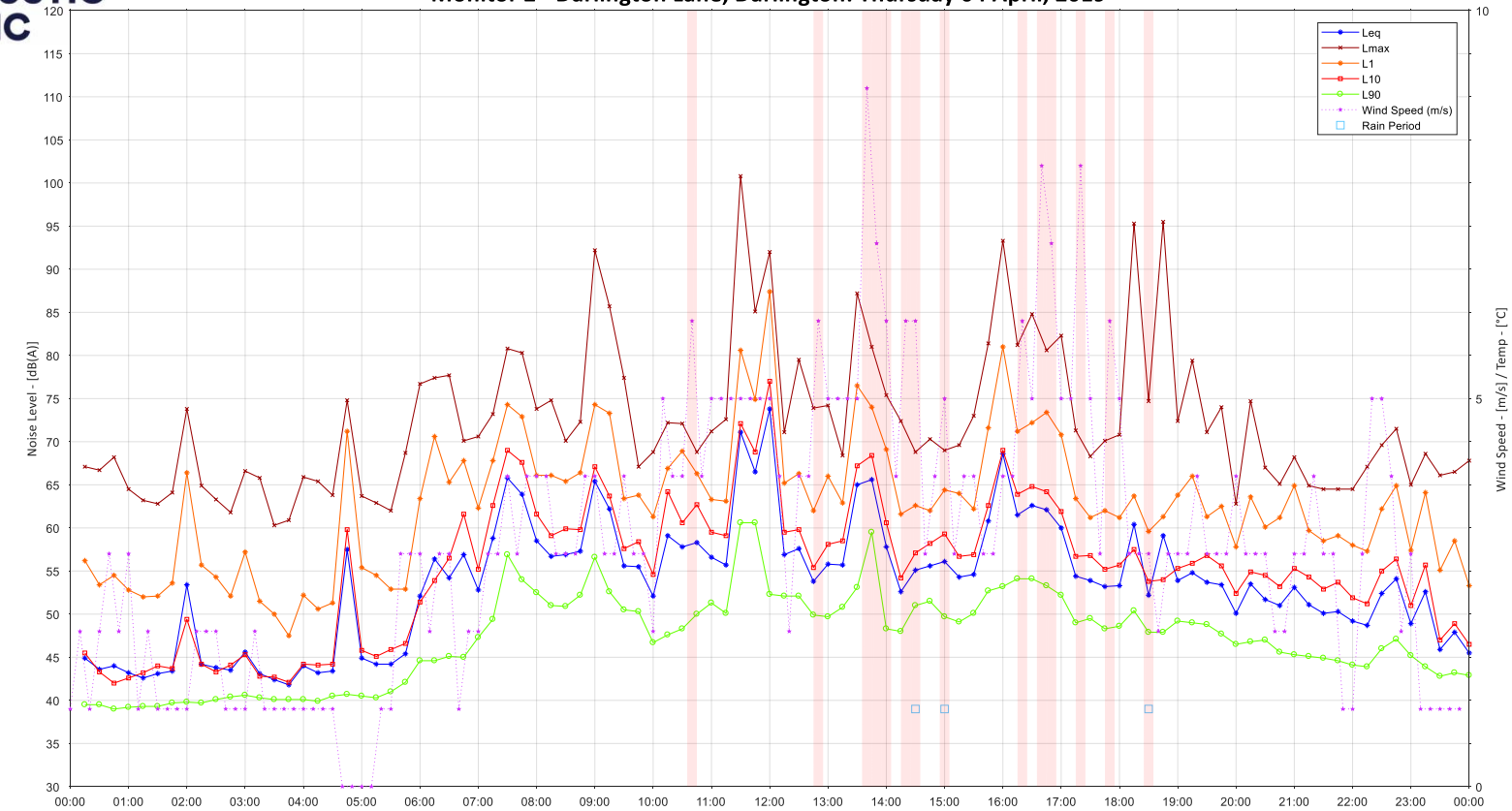
- Adverse Weather


Monitor 1 - Golden Grove Street, Darlington: Sunday 14 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

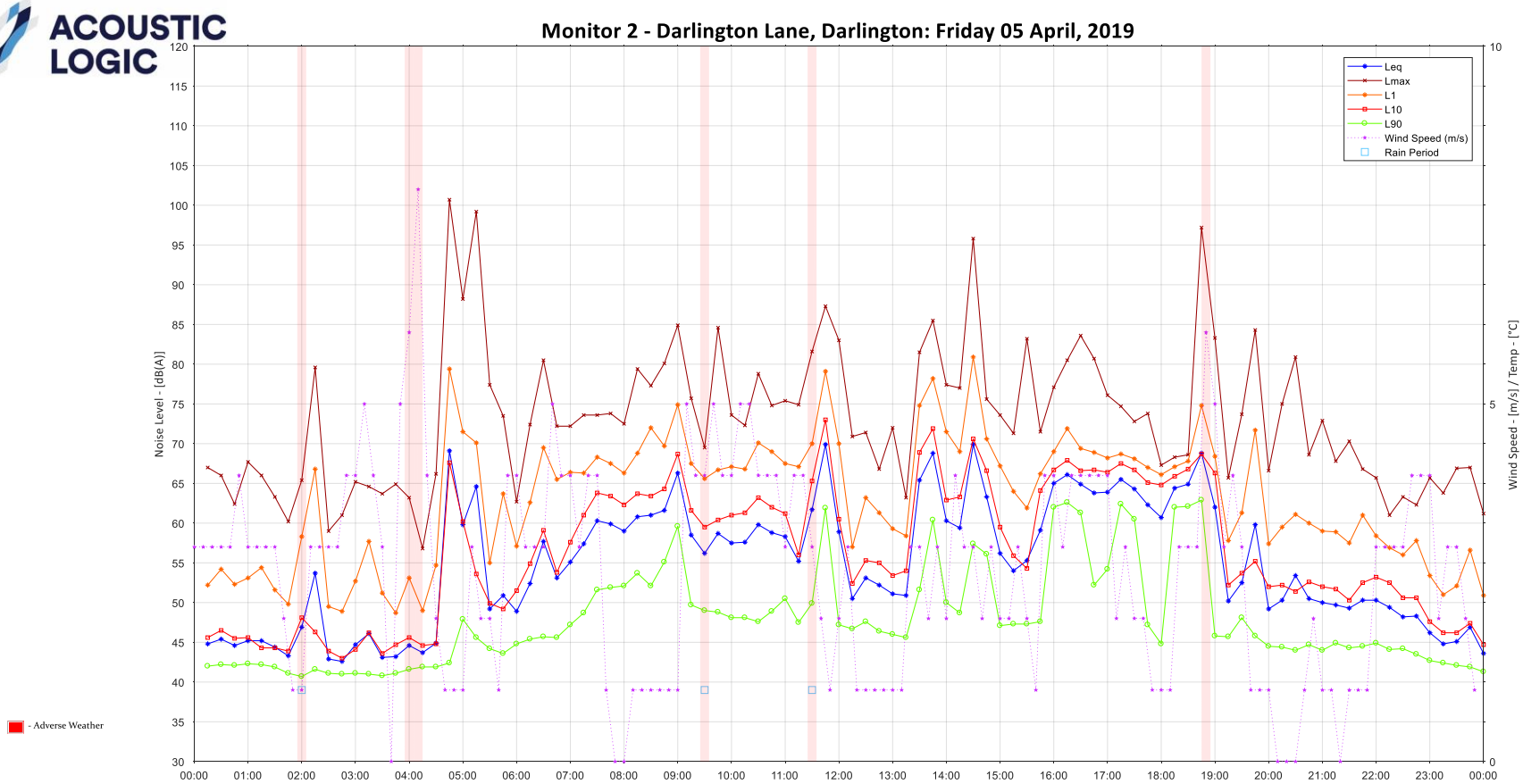

Monitor 1 - Golden Grove Street, Darlington: Monday 15 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

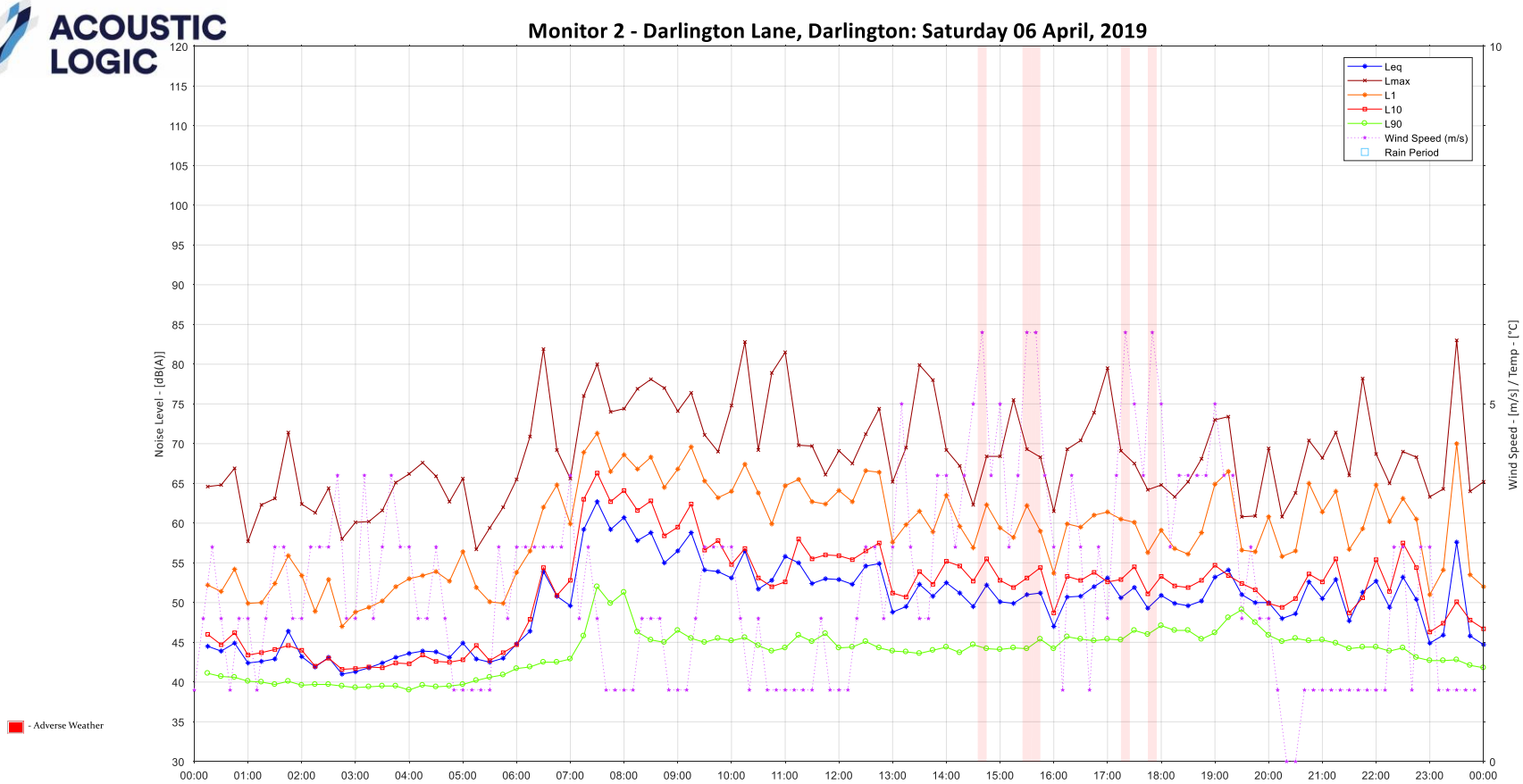

Monitor 2 - Darlington Lane, Darlington: Wednesday 03 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

Monitor 2 - Darlington Lane, Darlington: Thursday 04 April, 2019

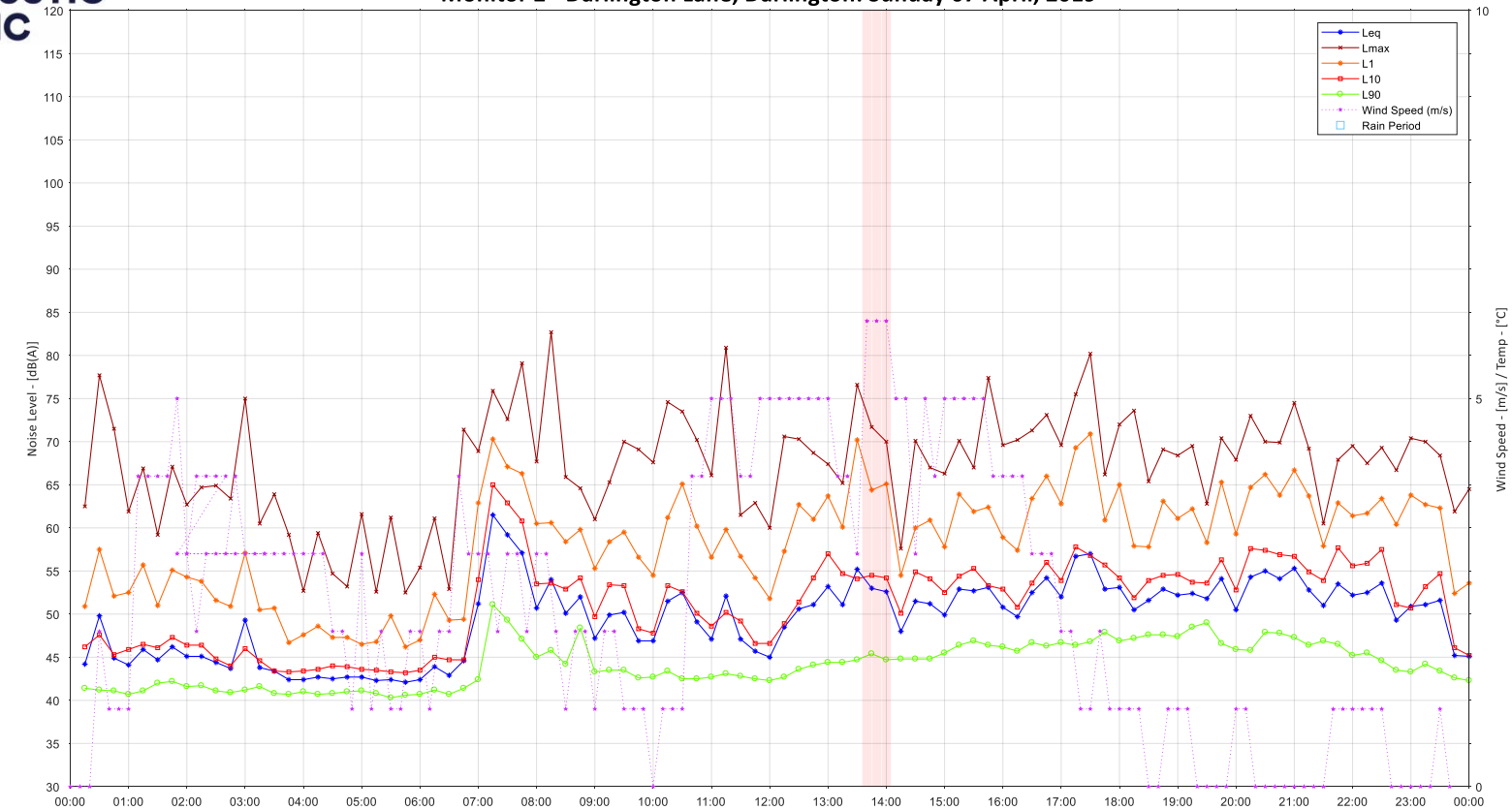


- Adverse Weather

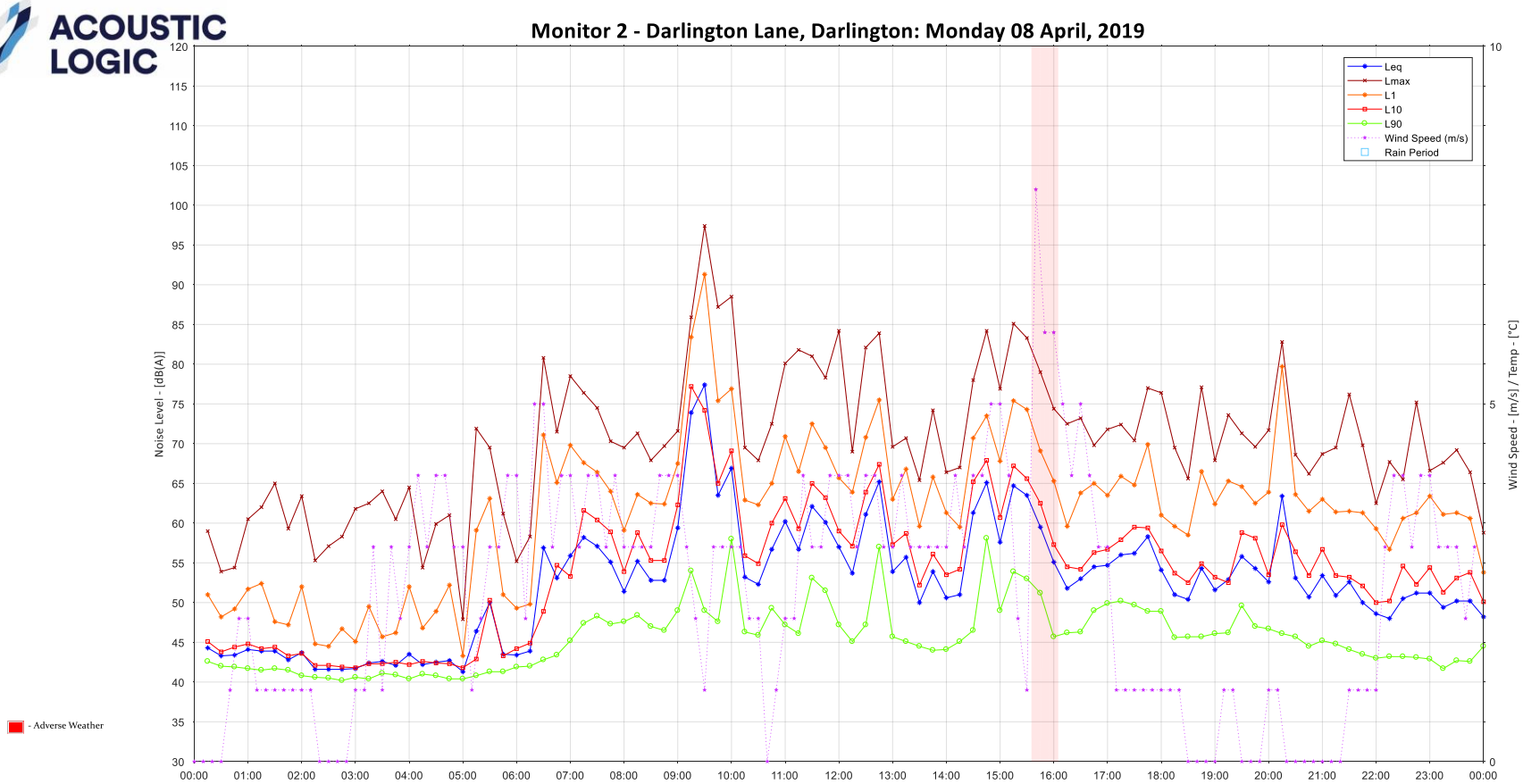

Monitor 2 - Darlington Lane, Darlington: Friday 05 April, 2019
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather

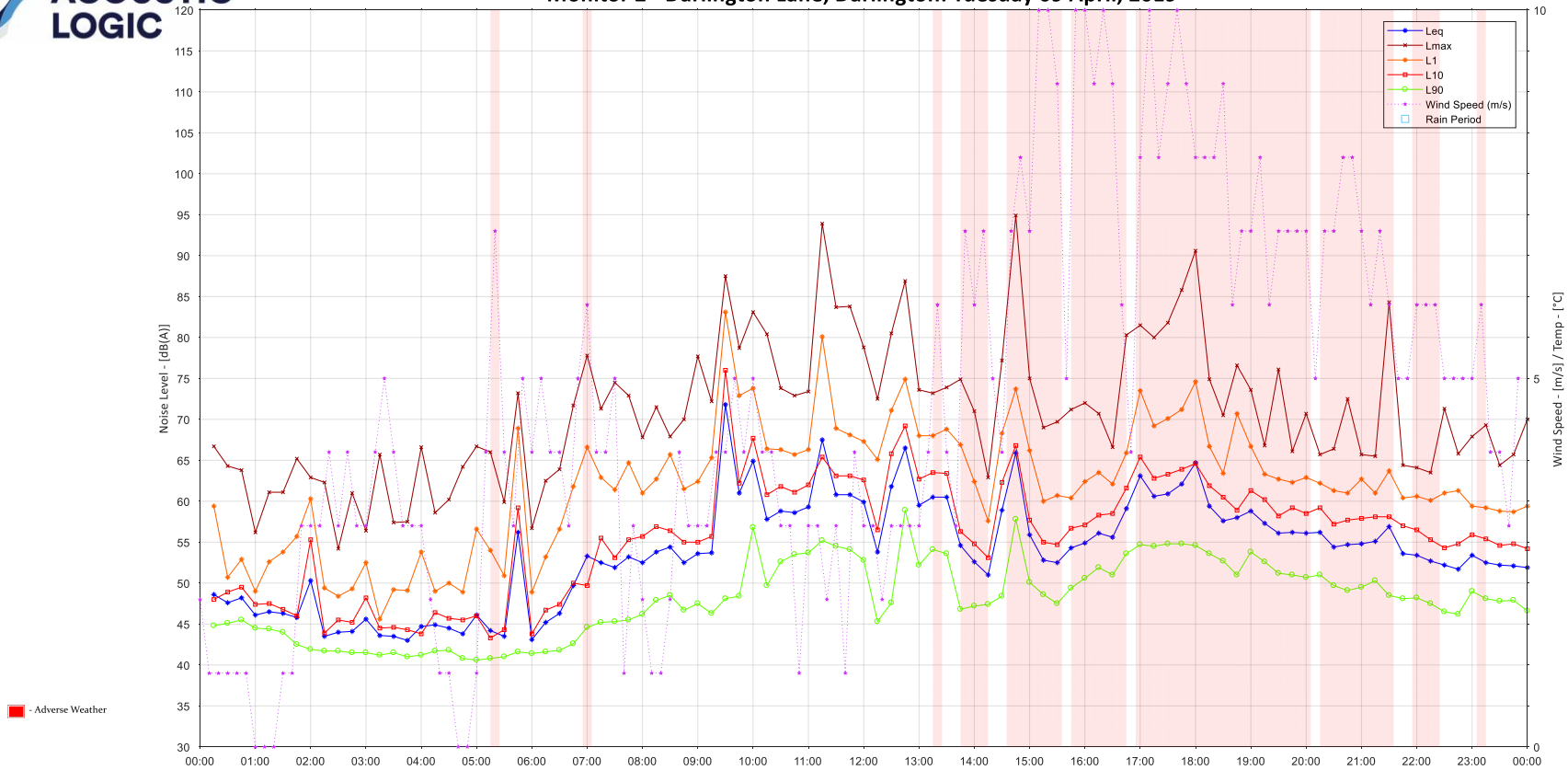

Monitor 2 - Darlington Lane, Darlington: Saturday 06 April, 2019
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather

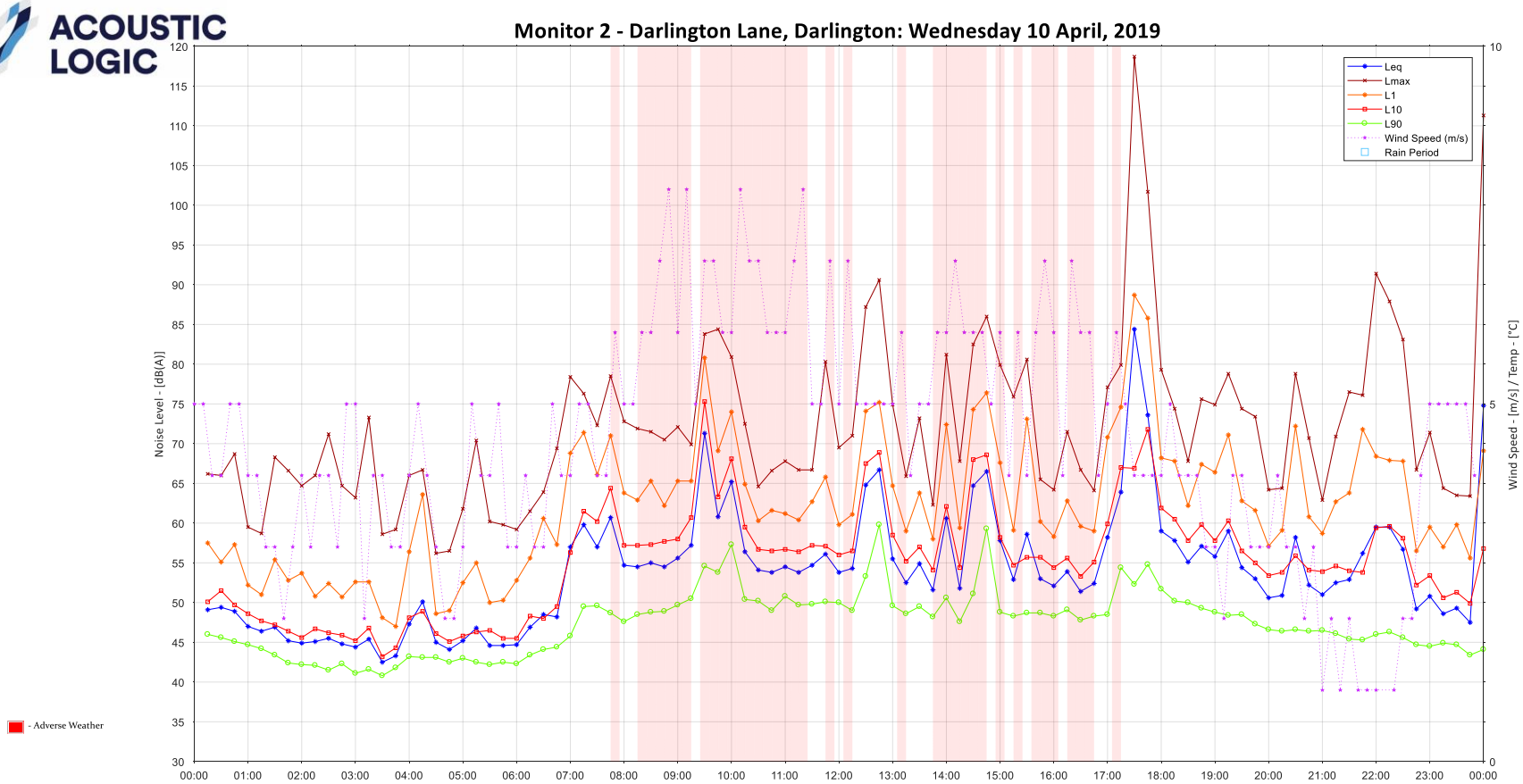
Monitor 2 - Darlington Lane, Darlington: Sunday 07 April, 2019

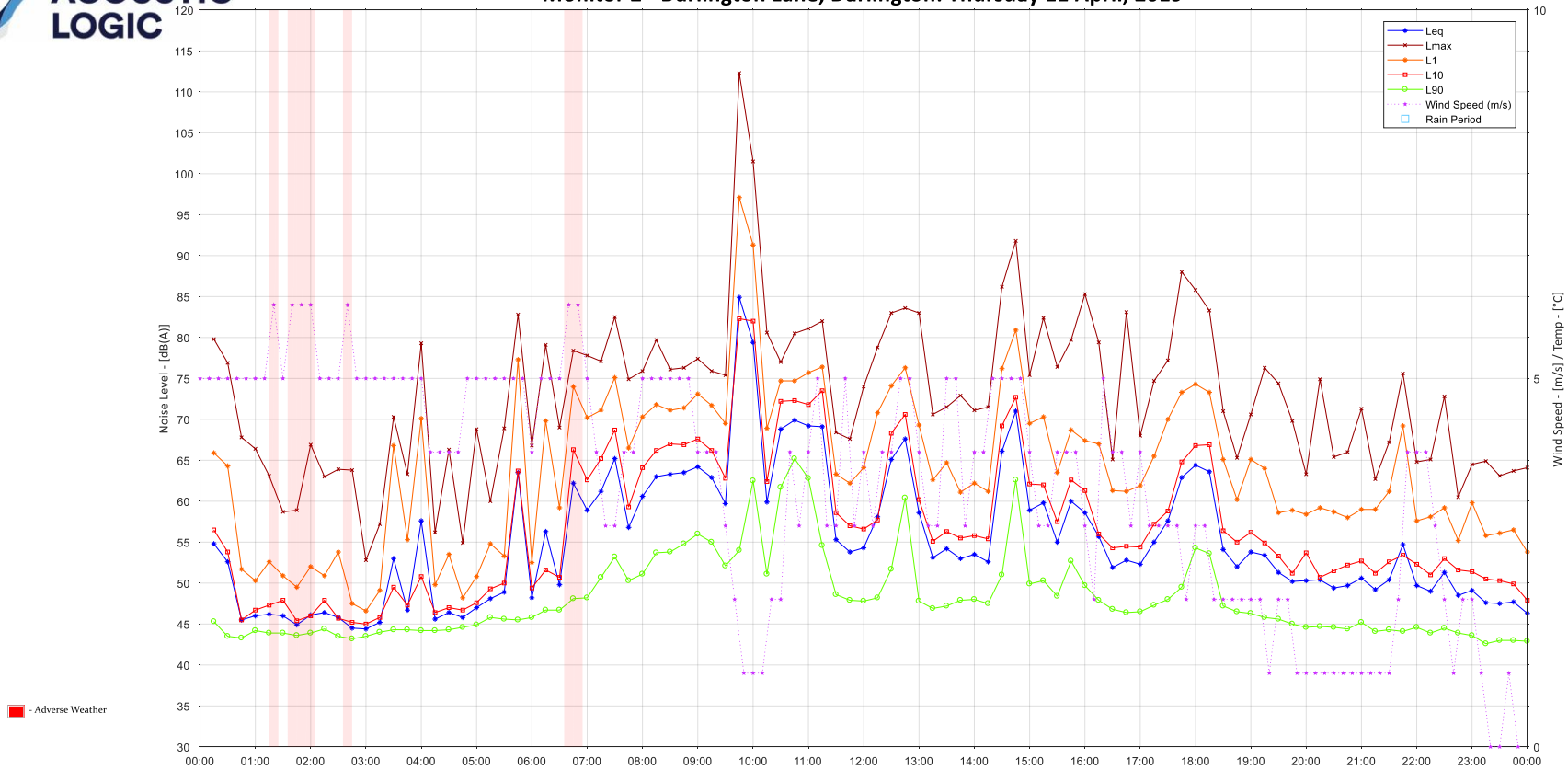


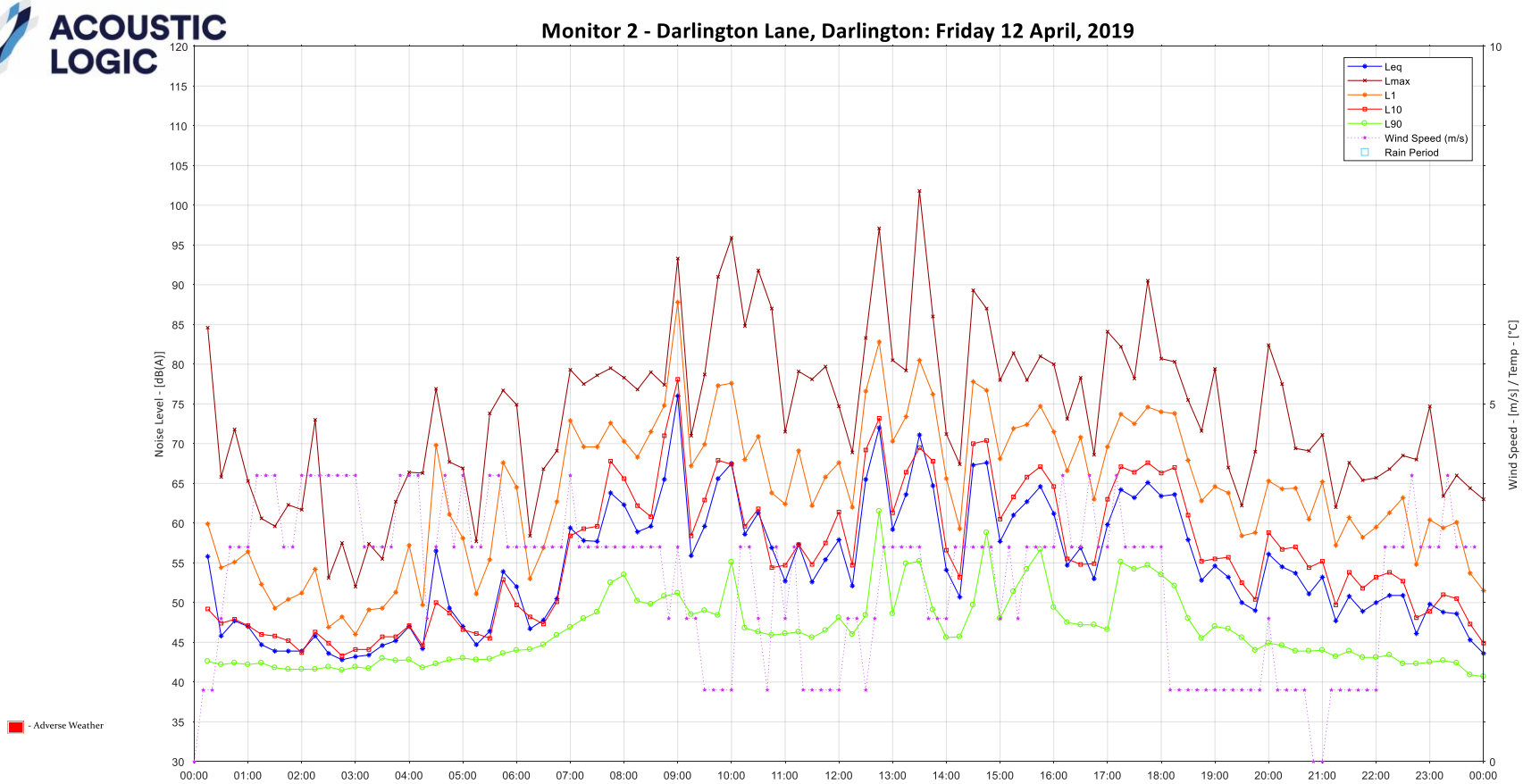
- Adverse Weather

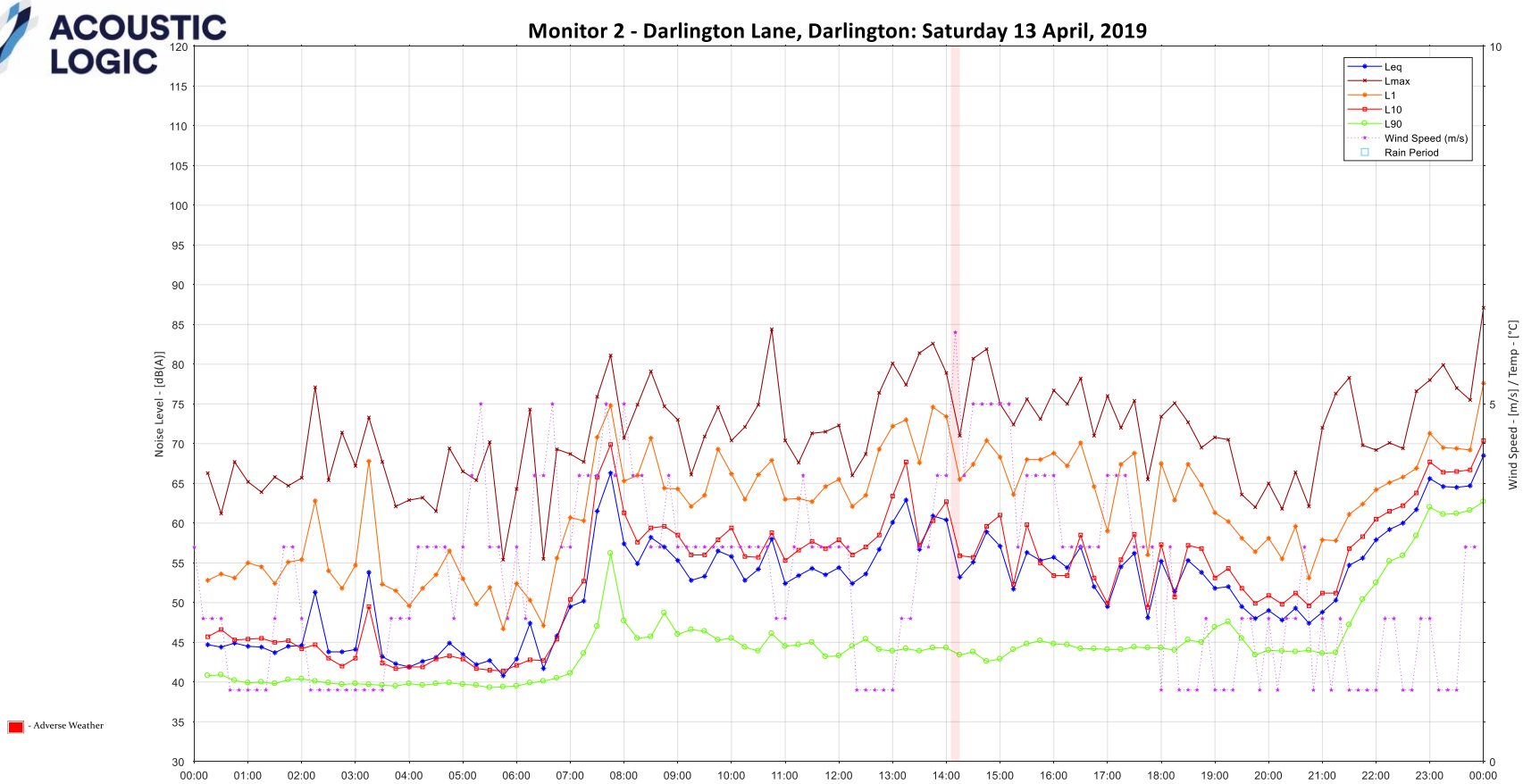

Monitor 2 - Darlington Lane, Darlington: Monday 08 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather


Monitor 2 - Darlington Lane, Darlington: Tuesday 09 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

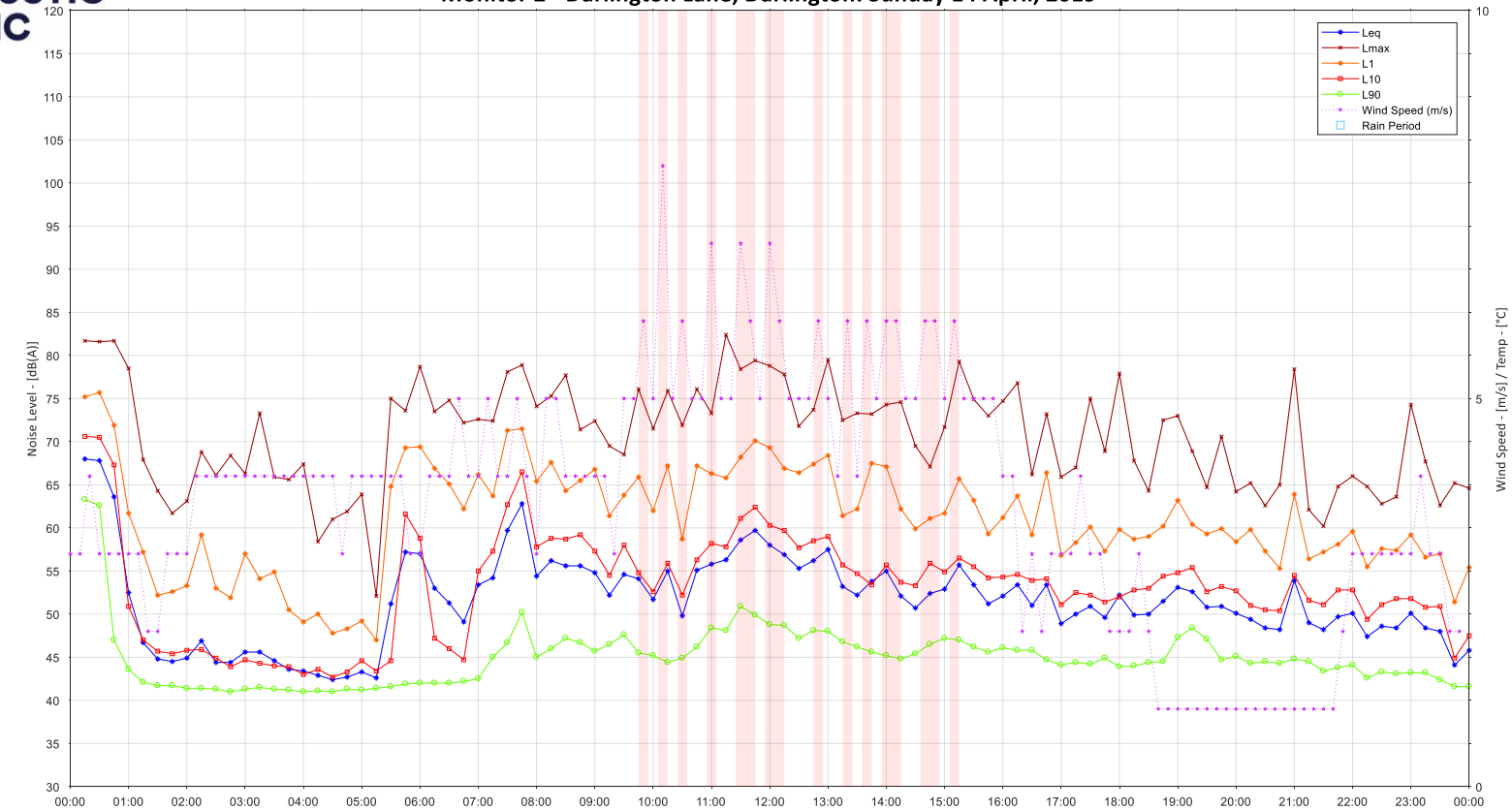

Monitor 2 - Darlington Lane, Darlington: Wednesday 10 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather


Monitor 2 - Darlington Lane, Darlington: Thursday 11 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather


Monitor 2 - Darlington Lane, Darlington: Friday 12 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

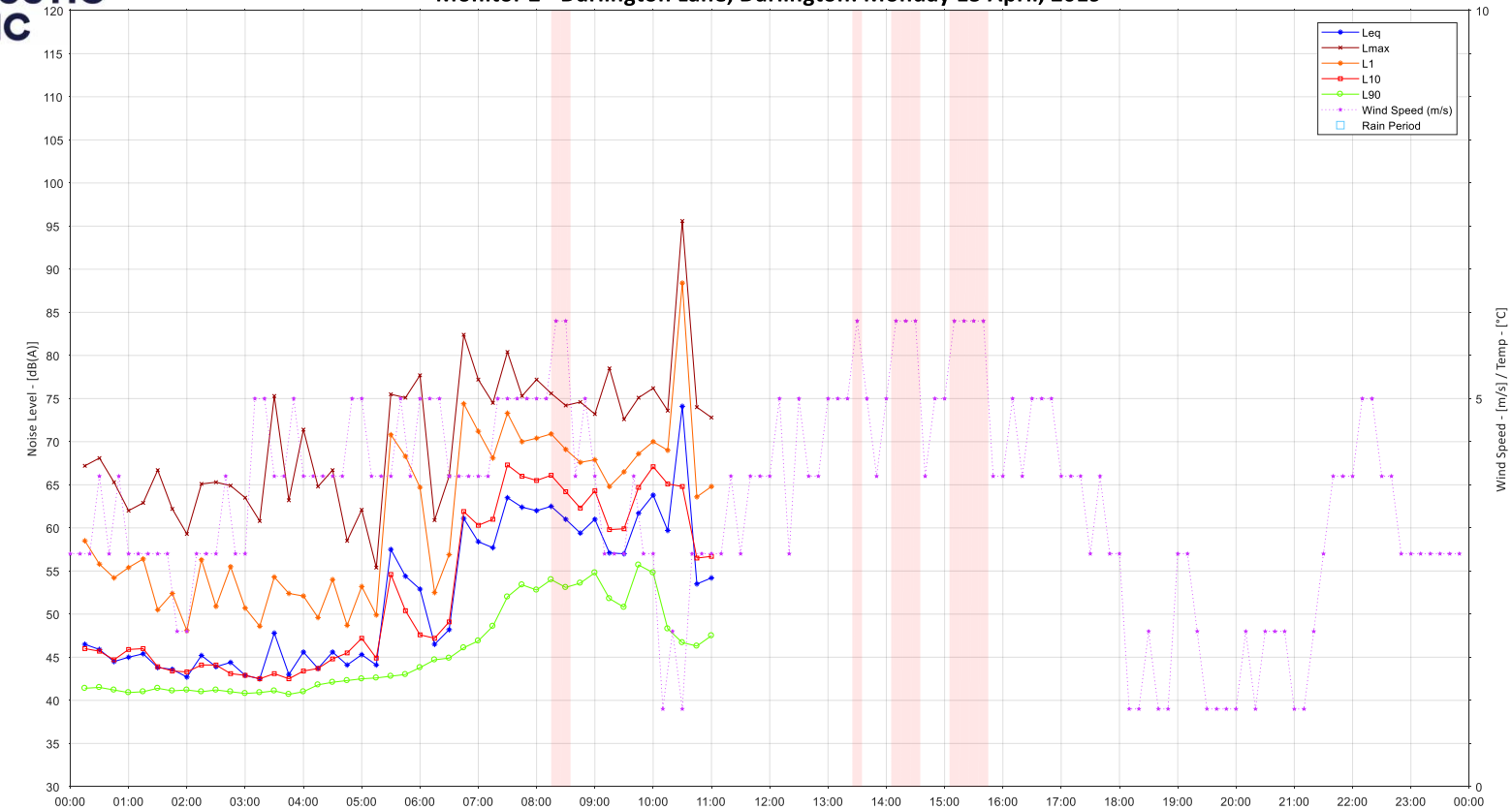

Monitor 2 - Darlington Lane, Darlington: Saturday 13 April, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather

Monitor 2 - Darlington Lane, Darlington: Sunday 14 April, 2019



- Adverse Weather

Monitor 2 - Darlington Lane, Darlington: Monday 15 April, 2019



- Adverse Weather