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Blayney MPS Redevelopment

Noise & Vibration Impact Assessment

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1 INTRODUCTION

Acoustic Logic have been engaged to conduct an assessment of noise impacts associated with the proposed upgrade to Blayney Multi Purpose Service, located at 3 Osman Street, Blayney.

This document addresses noise & vibration impacts associated with noise/vibration sources impacting the site (primarily traffic), as well as operational noise & vibration from the proposed development. This includes

- Usage of the on-grade carpark and associated driveway.
- Delivery truck movements and associated operation of the loading dock.
- Indicative mechanical plant operation.

AL have utilised the following documents and regulations in the noise assessment of the development:

- Australian and New Zealand AS/NZS 3671:1989 - 'Acoustics - Road traffic noise intrusion - Building siting and construction
- Australian and New Zealand AS/NZS 2107:2016 - 'Recommended design sound levels and reverberation times for building interiors'.
- NSW Department of Planning Development near rail corridors and busy roads – Interim Guideline.
- NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPI) 2017.
- AS2436:2010 - "Guide to Noise Control on Construction, Maintenance and Demolition Sites."
- DIN 4150-3 (2016) – "Vibration in Buildings – Part 3."
- BS 7385 Part 2-1993 – "Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to damage levels from groundborne vibration."
- NSW EPA document – "Assessing Vibration: A technical Guideline."
- NSW EPA document – "Interim Construction Noise Guideline"

This assessment is based on architectural plans provided by NBRS Architects, dated 03.08.2023.

An assessment of noise & vibration impacts associated with the development has determined that the proposal can achieve the requirements of the aforementioned authorities and regulations for all time periods of the day, evening and night.

2 PROPOSAL & SITE DESCRIPTION

2.1 PROPOSAL

The development of Blayney MPS is proposed over three stages, ultimately providing a complete rebuild of the site. A summary of the stages is presented below:

- Stage 1 – Demolition of external roadways and ancillary buildings in the western portion of the site, and construction of a new residential aged care, clinical support and inpatient unit building.
- Stage 2 – Demolition of hospital buildings in the northern portion of the site, and construction of new building containing emergency, support, Health One and administration uses.
- Stage 3 – Demolition of remaining existing hospital buildings, and construction of new carparks, access roads and landscaping.

Whilst the project will be completed in stages to maintain operation of the hospital, this assessment will consider the final arrangement of the proposal as part of the assessment.

2.2 SITE DESCRIPTION

The site is bound by the Mid Western Highway (A41) to the south, and Osman Street to the east. Residents are located to the north and east of the site, as well as residential aged care to the north west. The existing hospital is proposed to remain fully operational during the construction process.

The closest potentially affected sensitive receivers within the vicinity of the site are as follows:

- **R1:** Multiple residential receivers to the east of the hospital, along Osman Street and Mid Western Highway.
- **R2:** Multiple residential receivers to the north of the hospital, along Osman Street and Queen Street.
- **R3:** Residential aged care development (Lee Roshana Care)
- **R4:** Residential development to the south across the Mid Western Highway

Refer Figure 1 for detailed receiver locations and monitor locations.

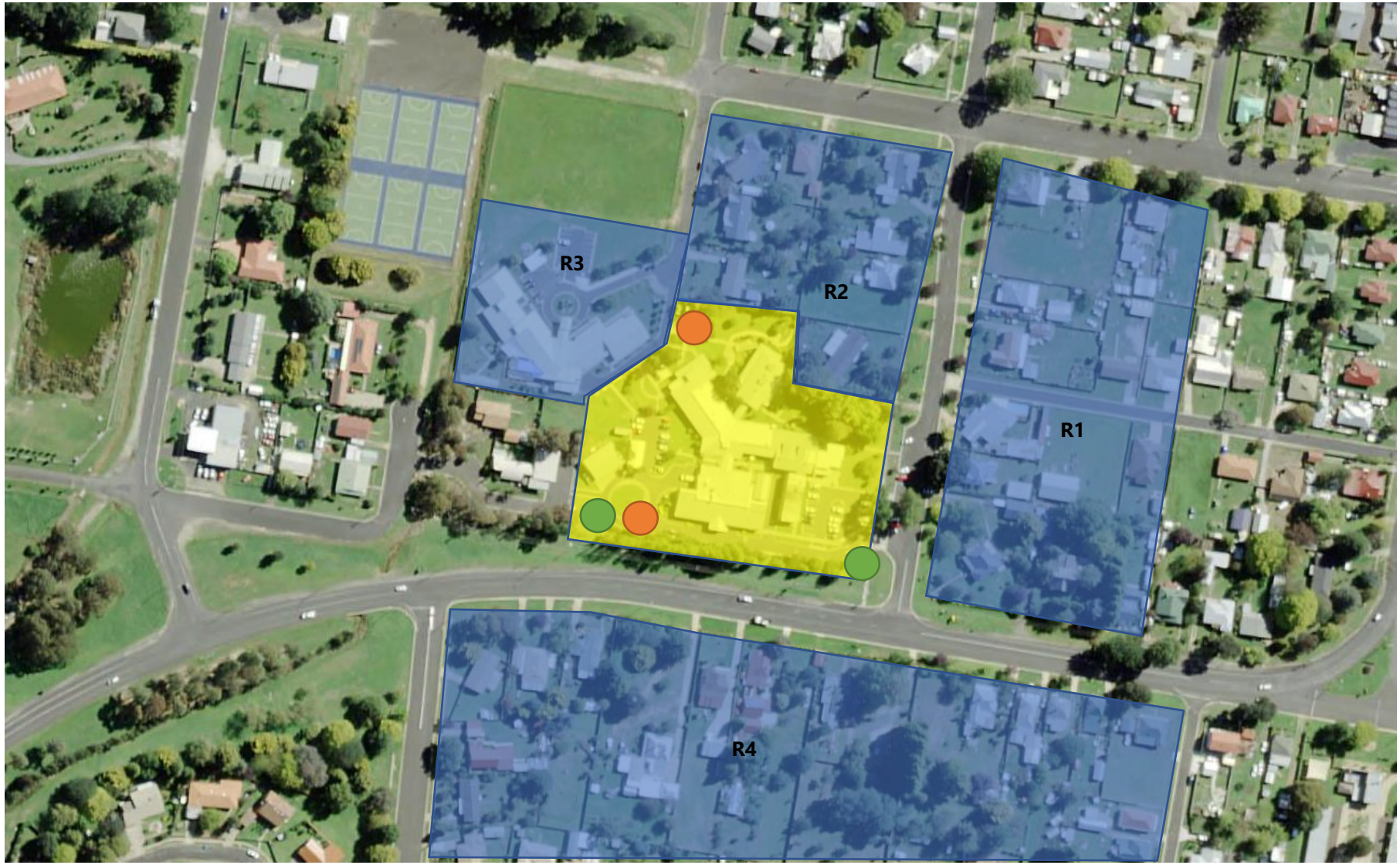


Figure 1 – Site Description and Measurement Locations

3 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-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 principal 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 environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

4 AMBIENT NOISE SURVEY

Background noise levels have been measured through long-term noise monitoring conducted by this office for the development. The results of this survey are detailed below.

4.1 MEASUREMENT EQUIPMENT

Long-term noise monitoring was undertaken with noise monitors provided Acoustic Research Laboratories Pty Ltd. The loggers were programmed to store 15-minute statistical noise levels throughout the monitoring period and was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

Attended internal background noise measurements within the existing hospital were undertaken to supplement the unattended environmental noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

4.2 MEASUREMENT LOCATIONS

Two unattended noise monitors were installed within the immediate surroundings of the hospital, with detailed monitor locations provided within Figure 1.

4.3 MEASUREMENT PERIOD

Unattended noise monitoring at both monitor locations was conducted between Tuesday 17th of January 2023 and Monday 30th of January 2023.

4.4 MEASURED EXTERNAL BACKGROUND NOISE LEVELS

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix 1 provides the results of the unattended background noise monitoring. Rain affected data was excluded from the assessment. The wind data presented has been obtained at a height of 10m.

Based on the monitoring and measurements, the Rating Background Noise Levels (lowest 10^{th} percentile noise levels during operation time period) are established for the surrounding receivers and are presented in the table below.

The following table summarises the rating background noise levels determined for the day, evening and night periods as defined in the NPI.

Table 3 – NPI Rating Background Noise Levels

Location	Rating Background Noise Level (dB(A) L_{90})		
	Day (7am – 6pm)	**Evening (6pm – 10pm)**	**Night (10pm-7am)**
Queen Street (Receivers Away from Mid Western Highway)	38	33	30* (NPI Minimum)
Mid Western Highway	41	38	35

5 EXTERNAL NOISE INTRUSION ASSESSMENT

Site investigation indicates that the major external noise source around project site is traffic movements from the Mid Western Highway (A41).

5.1 NOISE INTRUSION CRITERIA

A noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards:

- Australian and New Zealand AS/NZS 3671:1989 - *'Acoustics - Road traffic noise intrusion - Building siting and construction'*
- Australian and New Zealand AS/NZS 2107:2016 - *'Recommended design sound levels and reverberation times for building interiors'.*

5.1.1 AS/NZS 3671:1989

Australian Standard AS/NZS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'* notes the following in relation to traffic noise:

- Internal noise levels should be determined in accordance with AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors'.
- A suitable descriptor should be adopted relevant to the use of the development. As AS2107:2016 adopts the L_{eq} descriptor, Acoustic Logic shall also use this descriptor.
- AS3671 does not specifically recommend a time interval. On this basis, Acoustic Logic have adopted the interval used by the EPA Road Noise Policy for main/arterial roads, that being:
  - Day – 7am to 10pm (15 hour); and
  - Night – 10pm to 7am (9 hour).
- Acoustic Logic have applied the daytime interval to the living/dining areas and the night time interval to the bedrooms of residential spaces.

Internal noise levels have been selected in accordance with AS 2107:2016, as presented in the below section.

5.1.2 AS/NZS 2107:2016

AS2107-2016 recommends design criteria for internal spaces within various types of spaces/occupancies to ensure a healthy, comfortable and productive environment for the occupant. For the basis of this assessment, AL will use the upper range.

Table 5-1 – Recommended Design Sound Level

Space /Activity Type	Recommended Design Internal Noise Level dB(A)$L_{eq\ (Period)}$
Sleeping Areas (Night-time)	30 - 35
Living Areas	30 - 40
Common Rooms	40 - 45

5.1.3 Summary of Criteria

The governing project criteria is presented in the Table 4-2 below based on requirements above.

Table 5-2 – Summary of Internal Noise Level Criteria

Space/Activity Type	Internal Traffic Noise Criteria dB(A)$L_{eq(period)}$
Bedroom (Night Time)	35dB(A)$L_{eq(9hour)}$
Bedrooms (Daytime)	40dB(A)$L_{eq(15hour)}$

5.2 TRAFFIC NOISE SURVEY

5.2.1.1 Measured External Noise Levels

The measured external noise levels for the attended measurements are presented in the table below.

Table 5-3 – Measured Noise Levels at Attended Measurement Locations

Measurement Location	Time of day	Measured Noise Level dB(A)$L_{eq(15min)}$
Mid Western Highway (A41)	Daytime (7am – 10pm)	58
	Night Time (10pm – 7am)	52

5.3 NOISE INTRUSION ANALYSIS

Noise intrusion into the proposed development was assessed using the measured noise levels presented above.

Calculations were undertaken taking into account the orientation of windows, barrier effects *(where applicable)*, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way, the likely interior noise levels can be predicted.

5.4 COMPLYING CONSTRUCTIONS

5.4.1 Glazed Windows and Doors

The following constructions are recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. (**Mohair Seals are unacceptable**).

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

The recommended constructions are listed in Table 5-4.

Table 5-4 – Minimum Glazing Constructions

Location	Space	Facade	Minimum Glazing Construction	Acoustic Seals
RACF Uses	Ward Bedrooms	Southern Façade (Facing Mid Western Highway)	6.38mm Laminated Glazing	Yes
		All Others	Standard Glazing	Not Required

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in Table 4-5 below. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 5-5 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window	Acoustic Seals
6.38mm Laminated	31	Yes

5.4.2 External Roof & Ceiling Construction

The external roof construction has not yet been proposed, the following light weight construction will satisfy the internal noise level criteria.

Table 5-6 – External Light Weight Roof Construction

Site	Level	Space	Internal Lining	Truss System	External Lining
Blayney MPS	All Levels	All Spaces	1 x 13mm Plasterboard	Minimum of 250mm truss with 75mm thick 11kg/m^3 glasswool insulation	0.5mm Steel Sheet Metal

The above external light weight roof construction nominated in Table 5-6 above is the minimum recommended roof construction required for the development to satisfy the internal noise level requirements detailed in Section 5.4.1. If the proposed roof construction differs from the above system, it is to be reviewed by an acoustic engineer prior to installation.

In the event that any penetrations are required through the external skin, an acoustic sealant should be used to minimise all gaps.

5.4.3 External Walls

The external wall construction has not yet been proposed, the following construction will satisfy the appropriate criteria.

Table 5-7 – External Light Weight Wall Construction

Site	Building	Level	Space	Internal Lining	Truss System	External Lining
Blayney MPS	All	All	All	1 x 13mm Plasterboard	Minimum 90mm timber stud with 75mm thick 11kg/m^3 glasswool insulation to the stud cavity	9mm Fibre Cement sheet

The above external light weight wall construction nominated in Table 5-7 above is the minimum recommended external wall construction required for the development to satisfy the internal noise level requirements detailed in Section 5.4.1. If the proposed wall construction differs from the above system, it is to be reviewed by an acoustic engineer prior to installation.

In the event that any penetrations are required through the external skin, an acoustic sealant should be used to minimise all gaps.

5.4.4 Ventilation and Air Conditioning

As referenced in Section 5.1.2, the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' specifies the following controls regarding natural ventilation:

- With respect to natural ventilation of a dwelling the allowable internal noise goal is permitted to be 10 dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45 dB(A), and 50 dB(A) in living rooms). Where noise levels would exceed this, the NSW Planning guideline recommends that an alternative source of ventilation be considered to achieve the ventilation requirements of the BCA with windows closed.
- Noting this, based on the measured noise levels all façades of the proposed RACF uses may achieve required internal noise levels with windows/doors open to 5% of the floor area

Any supplementary ventilation system or façade opening proposed to be installed to provide ventilation to apartments should be acoustically designed to ensure that the internal noise level requirements are achieved. In the event mechanically assisted ventilation is utilised, it should be acoustically designed so that internal noise levels within apartments are appropriate, and any external noise emissions to surrounding noise sensitive receivers is within the requirements detailed in Section 6.1 of this report.

6 NOISE EMISSION ASSESSMENT

The noise emissions from the project site shall comply with the requirements of the following documents:

- NSW Environmental Protection Authority (EPA) document, "*Road Noise Policy 2011.*"
- NSW Environmental Protection Authority (EPA) document, "*Noise Policy for Industry (NPI) 2017.*"

6.1 NSW EPA NOISE POLICY FOR INDUSTRY (NPI) 2017

The EPA NPI has two criteria which both are required to be satisfied, namely Intrusiveness and amenity. The NPI sets out acceptable noise levels for various localities. The policy indicates four categories to assess the appropriate noise level at a site. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residential receivers would be assessed against the suburban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

6.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 6-1 – EPA Intrusiveness Noise Levels

Location	Period/Time	Intrusiveness Noise Level Criteria dB(A)$L_{Aeq(15min)}$
Queen Street (Receivers Away from Mid Western Highway)	Day (7am-6pm)	43
	Evening (6pm-10pm)	38
	Night (10pm-7am)	35
Mid Western Highway	Day (7am-6pm)	46
	Evening (6pm-10pm)	43
	Night (10pm-7am)	40

6.1.2 Project Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPI sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 4, the Noise Policy for Industry suggests the adoption of the 'urban' categorisation.

The NPI requires project amenity noise levels to be calculated in the following manner:

$$L_{Aeq,15min} = Recommended\ Amenity\ Noise\ Level - 5\ dB(A) + 3\ dB(A)$$

The amenity levels appropriate for the receivers surrounding the site are presented in Table 6-2.

Table 6-2 – EPA Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15\ minute)}$
Residential – Suburban	Day	55	53
	Evening	45	43
	Night	40	38
Commercial Premises	When in Use	65	63

The NSW EPA Noise Policy for Industry (2017) defines:

- Day as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.
- Evening as the period from 6pm to 10pm.
- Night as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

6.1.3 Sleep Arousal Criteria

The Noise Policy for Industry recommends the following noise limits to mitigate sleeping disturbance:

Where the subject development / premises night -time noise levels at a residential location exceed:

- *$L_{eq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{Fmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

a detailed maximum noise level even assessment should be undertaken.

Table 6-3 – Sleep Arousal Criteria for Residential Receivers

Receiver	Emergence Level
All Residential Receivers	40 dB(A)$L_{eq,\ 15min}$; 52 dB(A)L_{Fmax}

6.2 SUMMARISED NOISE EMISSION CRITERIA

The applicable noise emission criteria for the Blayney MPS redevelopment is summarised in the table below.

Table 6-4 – EPA NPI Noise Emission Criteria (Residents Surrounding Project Site)

Receiver(s)	Time Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) $L_{eq(15min)}$	Intrusiveness Criteria $L_{eq(15min)}$	NPI Criteria for Sleep Disturbance
Residents Facing Mid Western Highway	Day	38	53	**43**	N/A
	Evening	33	43	**38**	N/A
	Night	30	38	**35**	**40 dB(A)$L_{eq,\ 15min}$; 52 dB(A)L_{Fmax}**
All Other Residents	Day	41	53	**46**	N/A
	Evening	38	**43**	**43**	N/A
	Night	35	**38**	40	**40 dB(A)$L_{eq,\ 15min}$; 52 dB(A)L_{Fmax}**
C1 and C2	When in Use	N/A	**63**	N/A	N/A

Note: The project noise trigger levels are indicated by the bolded values in the table above.

7 NOISE EMISSION ANALYSIS

As part of this assessment, the following noise impacts have been assessed:

- Usage of the on-grade carpark.
- Delivery Truck movements and associated operation of the loading dock.
- Indicative mechanical plant operation.

7.1 ON-GRADE CARPARK EXPANSION & LOADING DOCK

An existing carpark is located on the western portion of the site (adjacent Osman Street). In addition, a new carpark is proposed next to this carpark accommodating approximately 21 car spaces. The carpark is located further from residents that the existing carpark, and accommodates a similar level of vehicles. When comparing the existing level of noise from the carpark, the new carpark would alter noise levels by less than 2dB(A), which represents a negligible increase.

Additionally, modifications are proposed to site access, with a new driveway proposed along the northern boundary.

A loading dock is located at the rear of the site, with access to the support and mortuary areas.

7.1.1 Recommendations for Noise Control

Current architectural layouts provide maintenance facilities and a covered fleet parking area to the northern boundary of the site. Solid walls are proposed for all structures, as well as a sheet metal roof over the fleet parking area. These constructions will provide noise separation for both vehicle entry and carparking activities on the site, and minimise noise to surrounding residents. No further upgrades to these structures are recommended for acoustics.

Routine deliveries to site should be scheduled between the hours of 7am and 10pm, to minimise the potential for sleep disturbance impacts to surrounding residents.

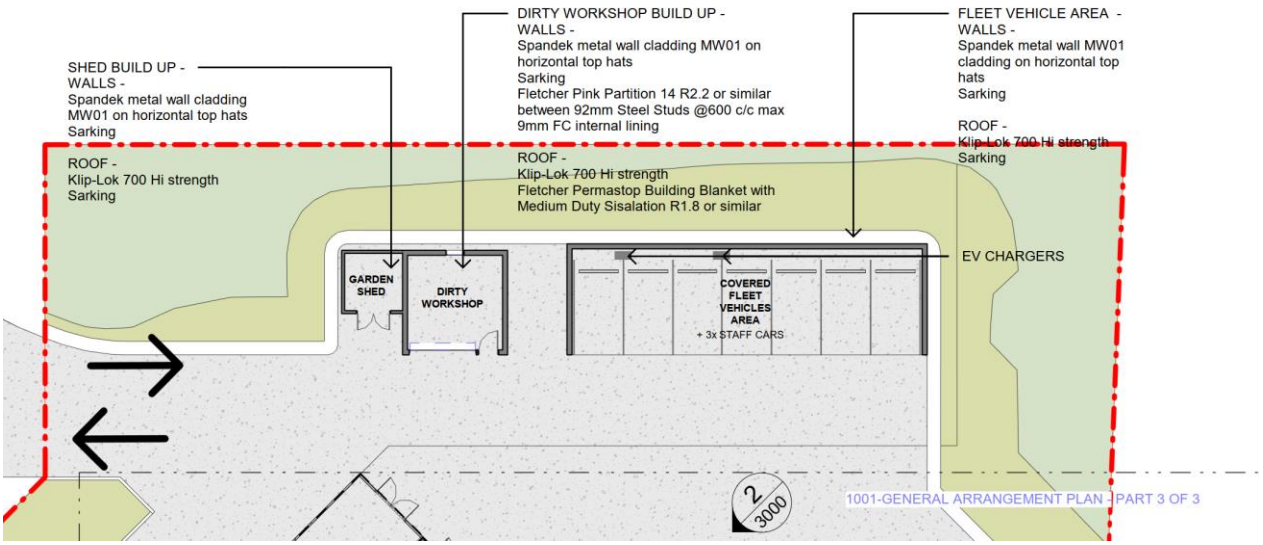


Figure 2 – Layout at Rear of Site, Queen Street Entrance

7.2 INDICATIVE MECHANICAL PLANT ITEMS

An indicative assessment of primary mechanical plant items required to be included as part of the development is presented below.

Primary plant items will include:

- Condensing units at the rear of the site (adjacent Queen Street).
- Condensing units at the south of the site, adjacent RACF uses.
- Miscellaneous ventilation fans and other ancillary equipment.

With respect to the above, we note:

- Condensing units are generally located away from residential receivers.
- The location of ventilation fans is not known in detail at this stage, however in general it is recommended that horizontal axial fans are selected (as opposed to vertical discharge fans) so that acoustic treatment may be readily applied.

Compliance with EPA acoustic criteria (as set out in Section 6.2) will be achievable, provided that detailed acoustic review of plant items is undertaken once plant is selected, and standard acoustic treatments are adopted (internally lined ductwork, silencers etc.). This is to be conducted during CC Stage.

8 ASSESSMENT OF VIBRATION

Assessment of existing levels of vibration, as well as potential future vibration impacts from construction/operational uses of the hospital site will be reviewed within this section. The assessment is based on relevant standards and guidelines relating to vibration, including:

- AS2436:2010 - "Guide to Noise Control on Construction, Maintenance and Demolition Sites."
- DIN 4150-3 (2016) – "Vibration in Buildings – Part 3."
- BS 7385 Part 2-1993 – "Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to damage levels from groundborne vibration."
- NSW EPA document – "Assessing Vibration: A technical Guideline."

8.1 EXISTING VIBRATION LEVELS

A site inspection and survey was undertaken on Tuesday 17th of January 2023 and Monday 30th of January 2023, to identify any sources of existing vibration which may impact the future hospital. With respect to this, the adjacent Mid-Western Highway was identified as the highest potential source of vibration which may impact the site. Other development immediately surrounding the hospital are generally residential (including aged care), which are not vibration generating sources.

In particular, there are no surrounding land uses which would typically generate high levels of vibration (e.g. rail lines, manufacturing facilities, industrial infrastructure or construction activities).

During the site inspection, no perceptible levels of vibration were identified, including from the Mid-Western Highway, and as such the site is not considered to be impacted by vibration.

8.2 SITE VIBRATION REQUIREMENTS

Vibration requirements during construction works and during the ongoing use of the hospital are summarised below.

8.2.1 Construction Vibration

8.2.1.1 German Standard DIN 4150-3 (1990)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

It is noted that the peak velocity is the absolute 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 5 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

	TYPE OF STRUCTURE	**PEAK PARTICLE VELOCITY (mms^{-1})**			
		At Foundation at a Frequency of		**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 a preservation order)	3	3 to 8	8 to 10	8

8.2.1.2 British Standard BS 7385 Part 2-1993

British Standard BS 7385 Part 2-1993 *Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to damage levels from groundborne vibration* presents vibration guide values to determine the effect of ground movement on structures. The values in BS7385-2 are directly reproduced in Australian Standard AS2187.2.

The guidelines are presented in the table below:

Table 6 BS 7385-2 - Guideline for Building Vibration

Line	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz – 15 Hz	15 Hz and above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structure. Residential or light commercial type buildings	15 mm/s at 4 Hz and above increasing to 20mm/s at 15 Hz	20 mm/s at 4 Hz and above increasing to 50mm/s at 40 Hz and above

Notes:
1. Values referred to are at the base of the building
2. For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm ZTP (zero to peak) should not be exceeded.

8.2.2 Future Operational Vibration

8.2.2.1 NSW EPA Assessing Vibration: A Technical Guideline

The NSW Environment Protection Authority's (EPA) publication "Assessing Vibration: A Technical Guideline" (Feb 2006), outlines vibration criteria to assess the effects on human exposure to vibration from industry, transportation and machinery. This will ensure the future amenity of both the hospital and surrounding development is not adversely impacted.

Relevant vibration categories for the development are continuous (with magnitudes varying or remaining constant with time, e.g. mechanical plant) and impulsive (such as shocks, typically short term impacts). Criteria stipulated in this publication is based on the type of vibrations generated by the source.

Table 7 – EPA Recommended Human Comfort Vibration Criteria

		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

8.3 ASSESSMENT OF FUTURE VIBRATION IMPACTS

8.3.1.1 Assessment of Vibration Impacts During Construction

Typically, excavation in rock or vibrated piling are the activities with the greatest potential for generation of vibration. Whilst a detailed construction programme has not been developed, it is unlikely that these construction processes would be required to complete proposed construction works.

Primary sources of vibration for construction elements of the project will be during the demolition phase (where excavator mounted hammering may be required) and any in ground works. Depending on the specific methodology ultimately selected by the contractor, these activities may have the potential to approach limits specified in Section 8.2.1.

In order to mitigate potential vibration impacts during the construction phase, the following is recommened:

- Implementation of lower impact work methods/technologies:
    - The primary noise generating activity at the site will be the demolition and any excavation period. As much as practicable, use of quieter methodologies methods should be adopted.
    - Works should be conducted initially using excavator with bucket or claw (lowest impact method, as opposed to hydraulic hammers and rock saws) where feasible. Use of the loudest equipment (hydraulic hammers/rock saws) is used only with other options are not available.
- Careless dropping of construction materials should be avoided..
- In the event of vibration complaint, sample measurements of typical construction activities should be undertaken to determine the source, and any potential impact. Where warranted, long term vibration monitoring may be warranted.

8.3.1.2 Assessment of Vibration Impacts for Hospital Operation

Typical hospital operational activities associated with the use of the hospital (internal uses, carpark operation etc.) present a negligible source of vibration, and would not produce perceptible vibration on any surrounding property.

Mechanical plant (particularly from larger ventilation fans and external plant items) have a potential to generate higher levels of vibration. All mechanical equipment should be appropriately vibration isolated to ensure relevant requirements are achieved. Indicatively, this would be achieved through:

- Spring isolation (25mm static deflection) of any large ventilation fans (generally greater than 450mm)
- Neoprene mount isolation (10mm static deflection) for smaller ventilation fans (generally less than 450mm)
- Rubber/waffle pad mount (3mm static deflection) for condenser units, internal fan coil units and the like.
- As part of the detailed project design, appropriate vibration isolation requirements are to be identified and incorporated into the design, as is typical.

Compliance with the NSW EPA's Assessing Vibration: A Technical Guideline is expected to be achieved through standard acoustic controls for mechanical plant and equipment.

9 CONSTRUCTION NOISE

An assessment of construction noise impacts which may be produced during the project and the potential impacts on nearby sensitive receivers has been conducted based on the requirements of the NSW EPA *Interim Construction Noise Guideline* 2009.

9.1 CONSTRUCTION NOISE MANAGEMENT LEVELS

9.1.1 NSW EPA Interim Construction Noise Guidelines (2009)

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 effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than:
    - 10dB(A)$L_{eq(15min)}$for work during standard construction hours (7am-6pm Monday to Friday and 8am to 1pm on Saturdays) and
    - 5dB(A)$L_{eq(15min)}$for work outside of standard construction hours.
- "*Highly noise affected level*". Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

A summary of noise emission goals for standard hours of construction work are presented in Table 8.

Table 8 – Construction Noise Emission Goals

Location	Rating Background Noise Level (daytime)	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Queen Street (Receivers Away from Mid Western Highway)	43	53	75
Mid Western Highway (Receivers Adjacent Highway)	46	56	75

9.2 ASSESSMENT OF CONSTRUCTION NOISE IMPACTS

With respect to construction noise, the impact on nearby development will be dependent on the activity in question and where on the site the activity is undertaken. The loudest typical construction activities will be from demolition, excavation and structural works.

Loudest plant and equipment items associated with these activities will generally have sound power levels of approximately 110-120 dB(A)$L_{eq(15min)}$. The most impacted sensitive receivers are expected to be residential development bounding the site to the north, east and west (Receivers 1, 2 & 3 identified in Figure 1). Residents to the south (across the highway) may also be impacts, however to a lesser extent given the additional distance between the site, as well as the elevated background levels from the highway.

Noise levels at the facades of these receivers is expected to be at or above the highly noise affected level for typically loud construction activities, such as excavation, piling and hammering works. In order to minimise the potential impact on residents it is recommended that construction noise management processes be implemented for the project.

Ultimately, the type and duration of specific construction processes will determine the impact on neighbouring receivers, the detail of which is not currently known. However, potential ameliorative measures which could be enacted to minimise disturbance include;

- Selection of construction equipment and processes which minimises acoustic impact. For example, internal strip out (where needed) behind a closed façade will significantly reduce noise impact to neighbouring properties during these works.
- Community interaction and notification. Notification of construction works both before and during construction will enable nearby residents to plan for acoustic impacts associated with the development;
- Where possible, machinery should be located as far as practicable from neighbouring residents (i.e. towards the southern portion of site);
- Deliveries and access to the site should be managed so that it does not unreasonably disturb neighbouring residents. Loading areas should be located away from nearby residents if possible;

10 CONCLUSION

This report presents an acoustic assessment of the potential noise & vibration impacts associated with the operation of the proposed redevelopment of Blayney Multi Purpose Service, located at 3 Osman Street, Blayney.

Noise & vibration impacts assessed within this document have been assessed with reference to the requirements of the following documents:

- Australian and New Zealand AS/NZS 3671:1989 - 'Acoustics - Road traffic noise intrusion - Building siting and construction
- Australian and New Zealand AS/NZS 2107:2016 - 'Recommended design sound levels and reverberation times for building interiors'.
- NSW Department of Planning Development near rail corridors and busy roads – Interim Guideline.
- NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPI) 2017.
- AS2436:2010 - "Guide to Noise Control on Construction, Maintenance and Demolition Sites."
- DIN 4150-3 (2016) – "Vibration in Buildings – Part 3."
- BS 7385 Part 2-1993 – "Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to damage levels from groundborne vibration."
- NSW EPA document – "Assessing Vibration: A technical Guideline."
- NSW EPA document – "Interim Construction Noise Guideline"

Based on our assessment, the proposal is able to achieve all relevant acoustic (noise & vibration) requirements of the above documents.

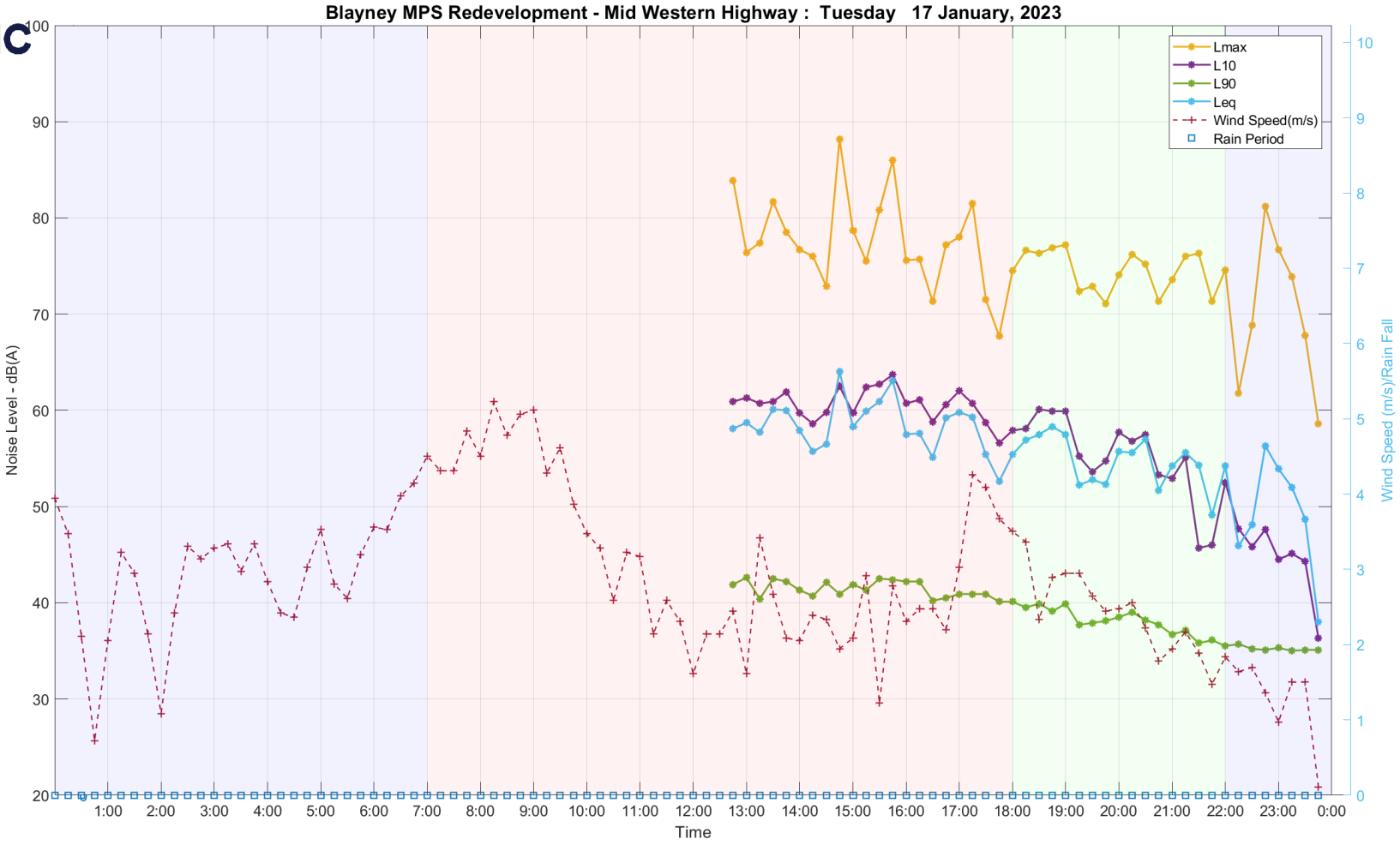
Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Alex Washer

APPENDIX ONE – UNATTENDED NOISE MONITORING DATA

LOCATION ONE - MID WESTERN HIGHWAY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Lmax
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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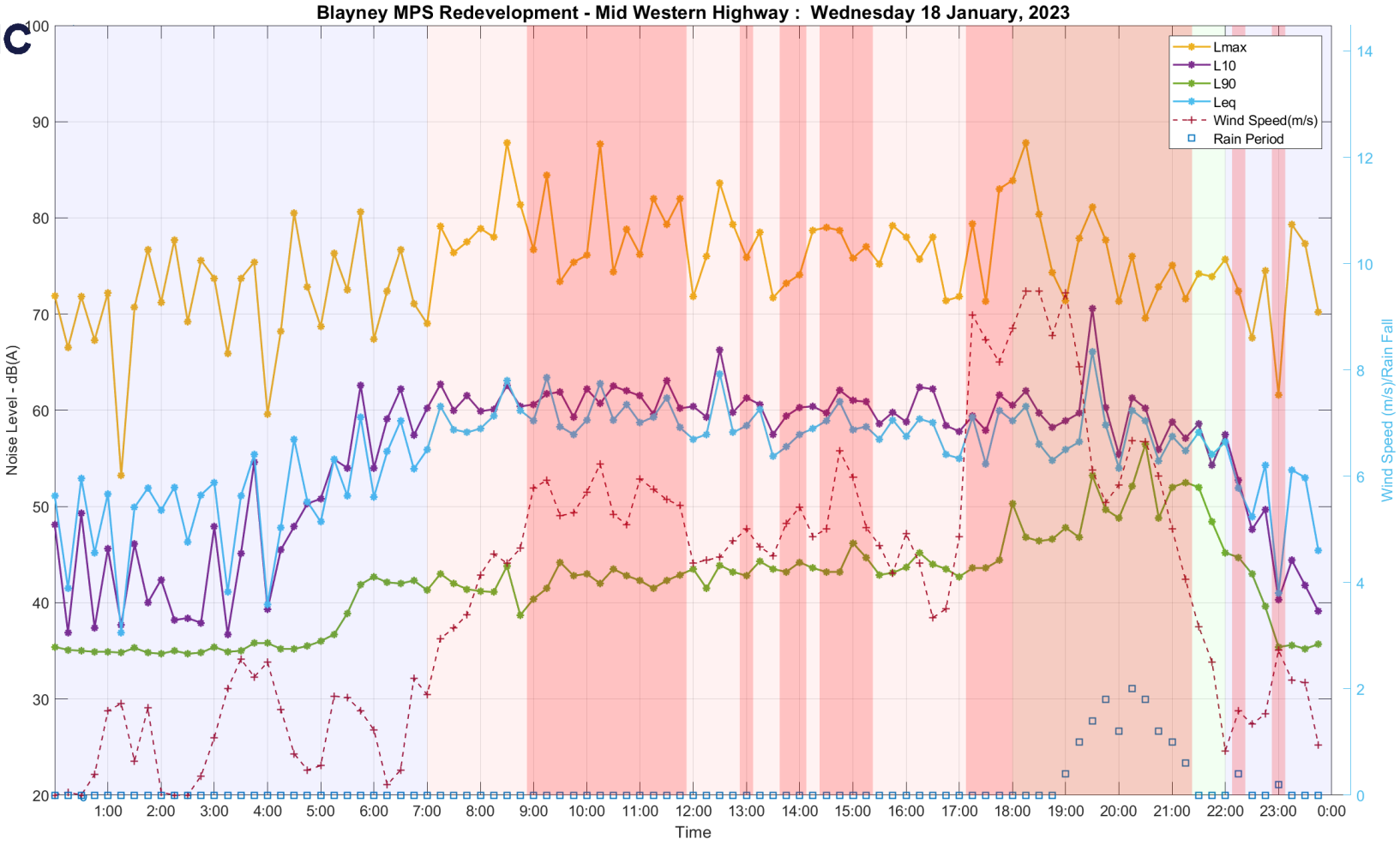
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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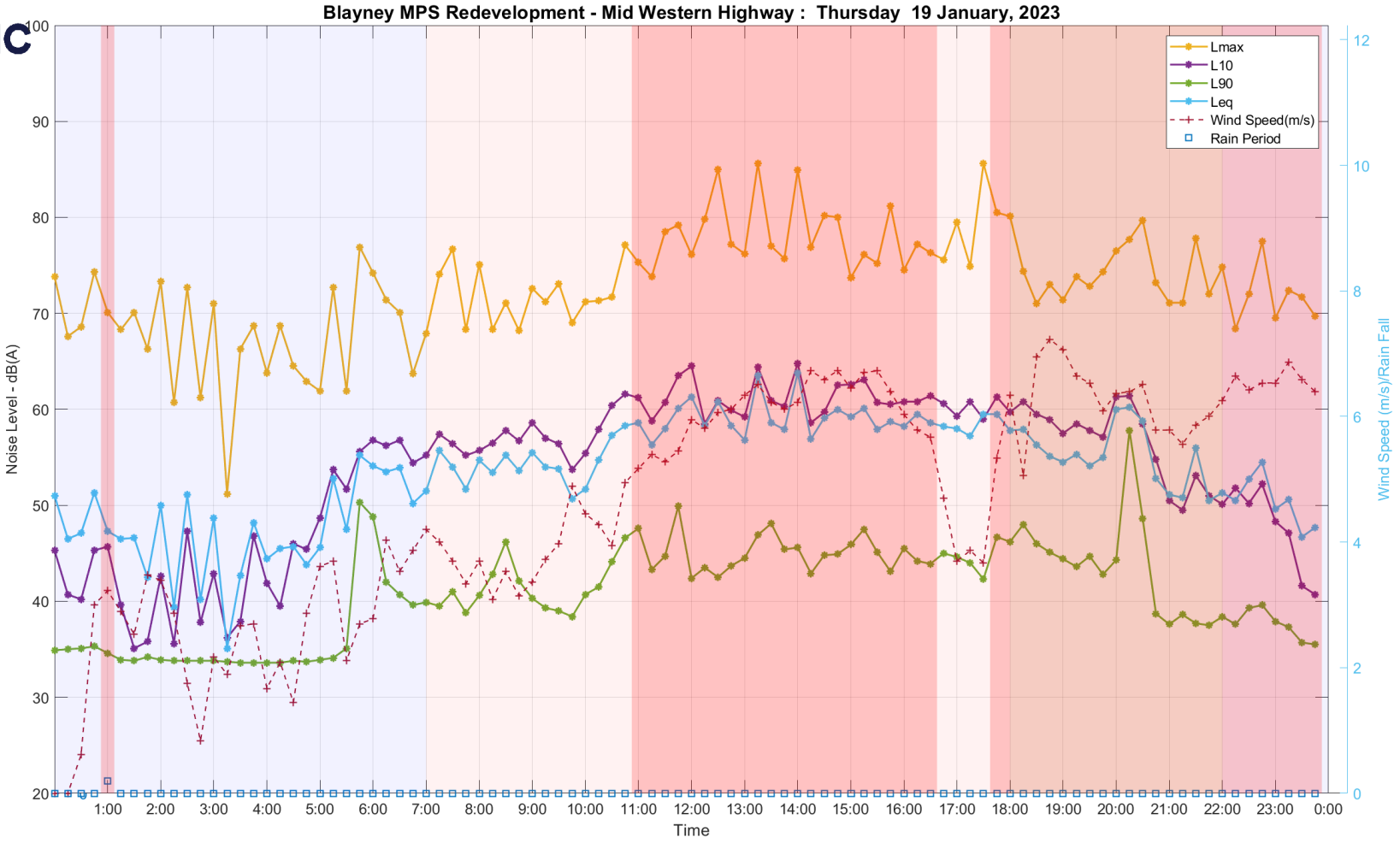
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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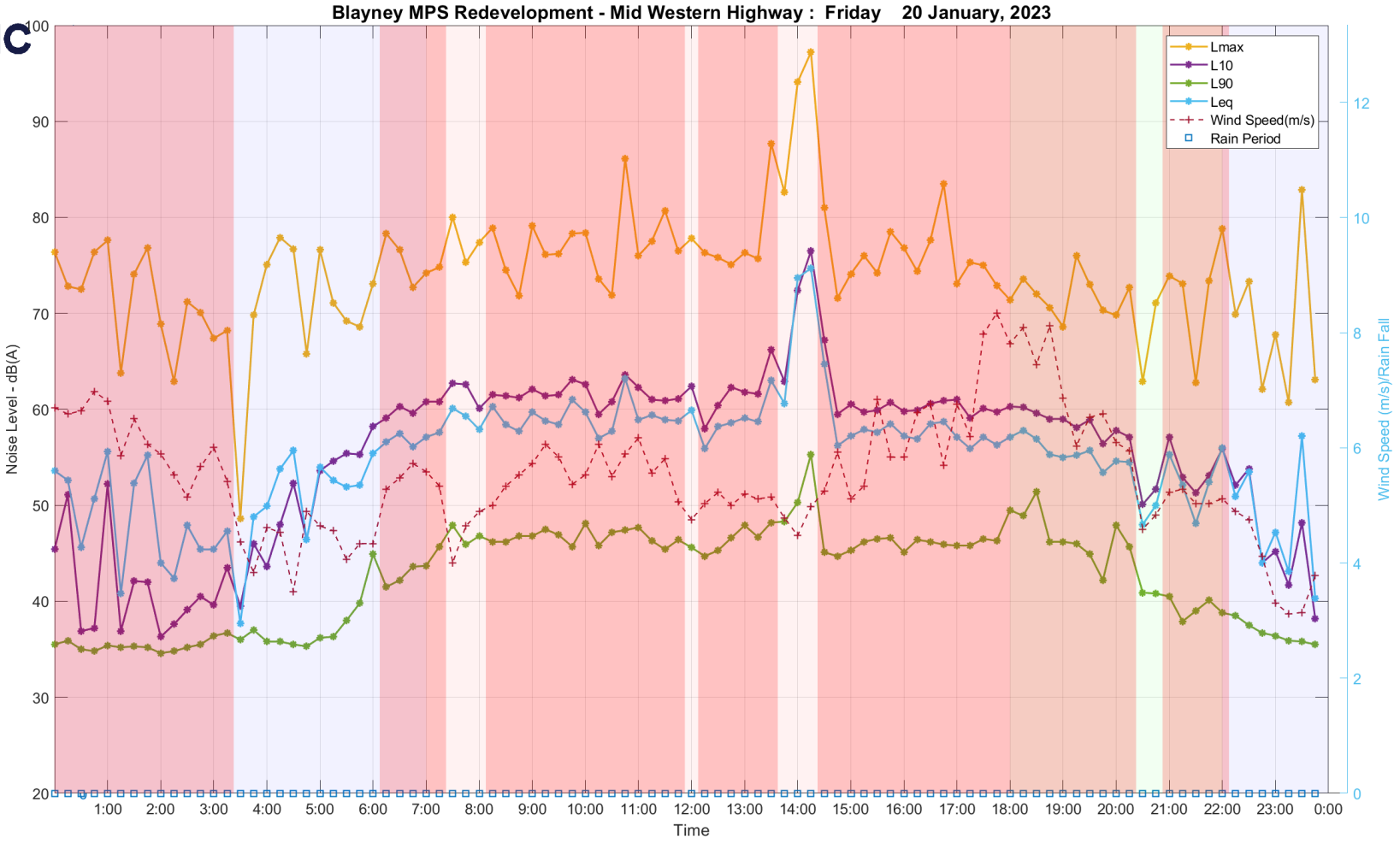
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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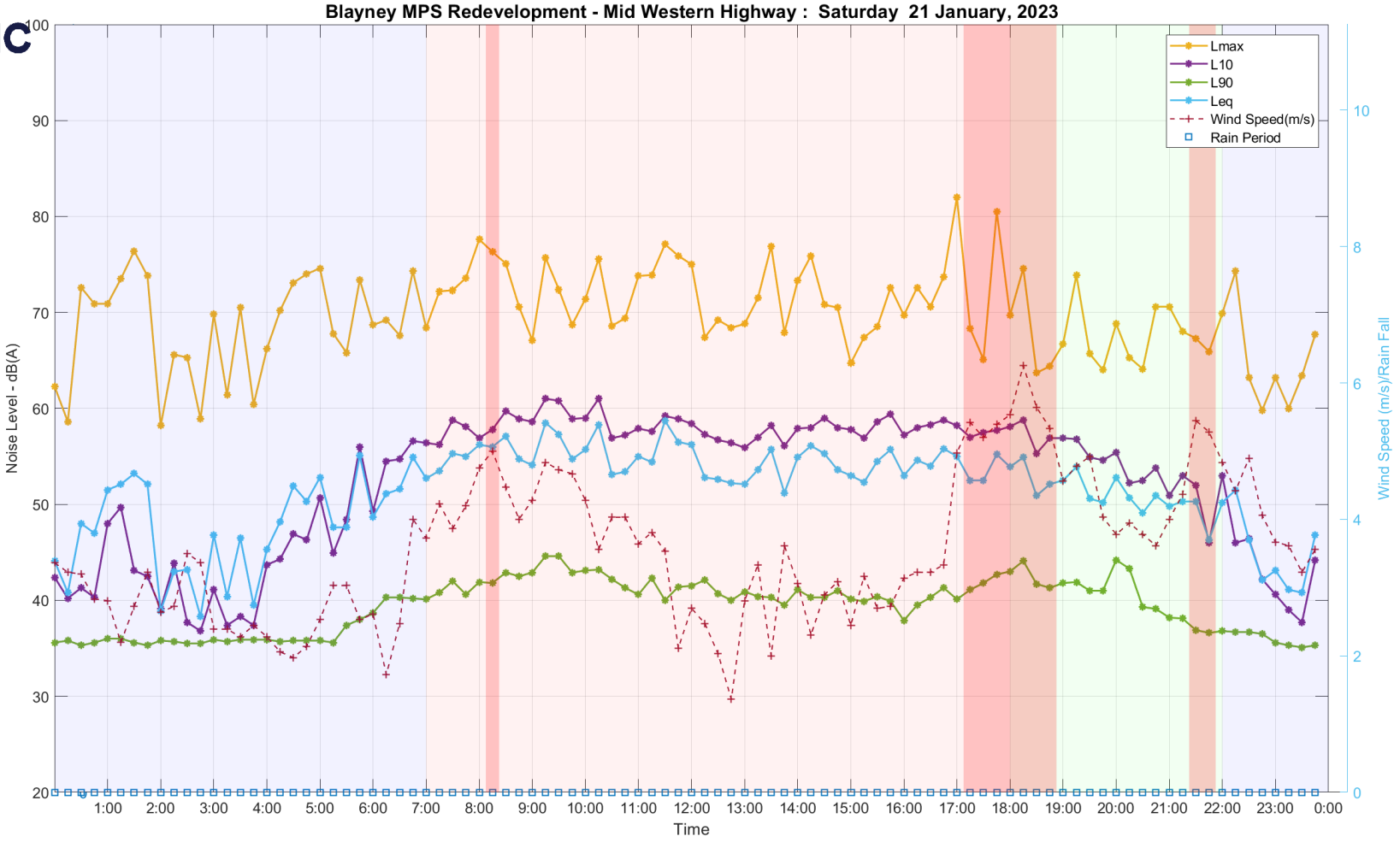
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Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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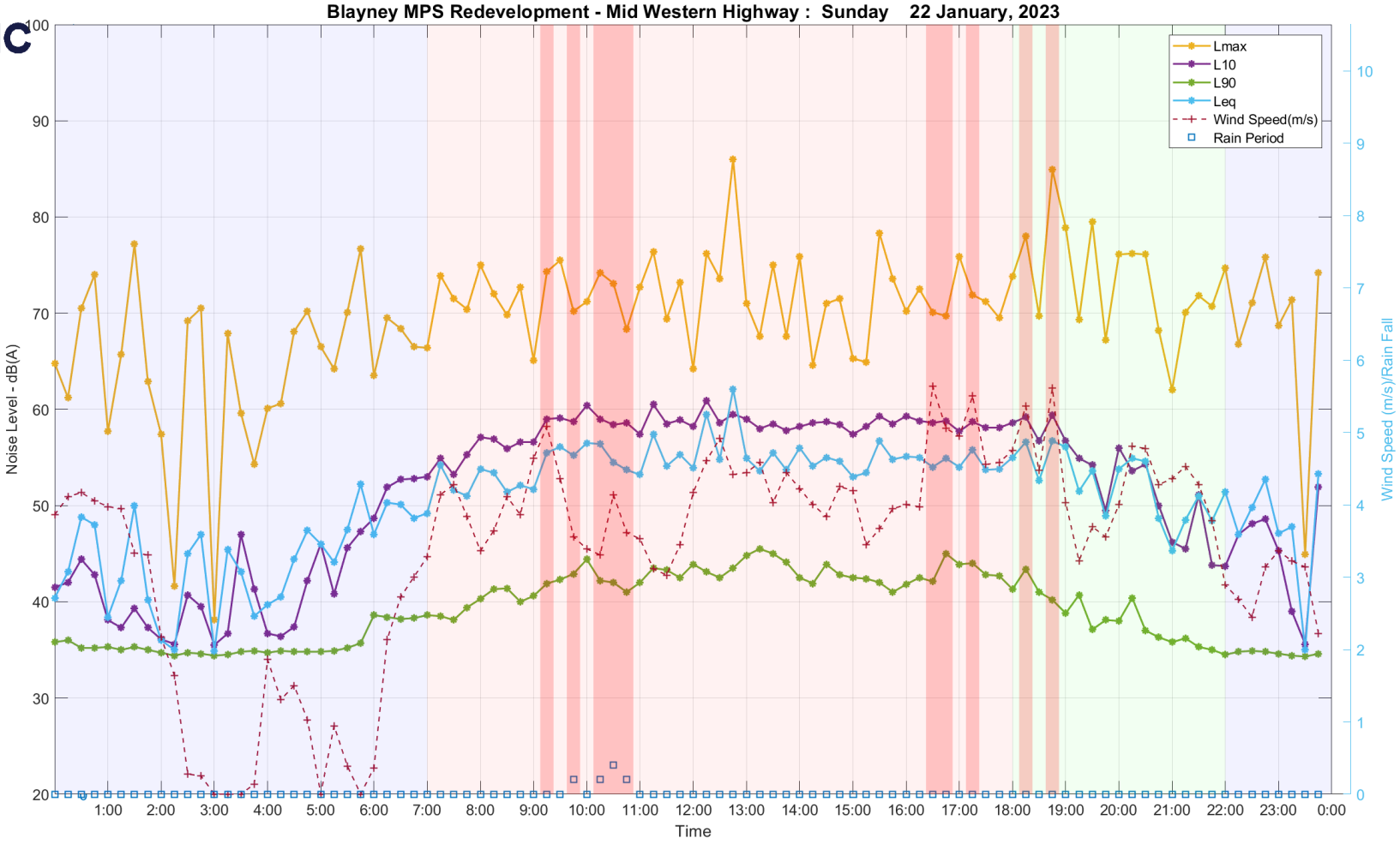
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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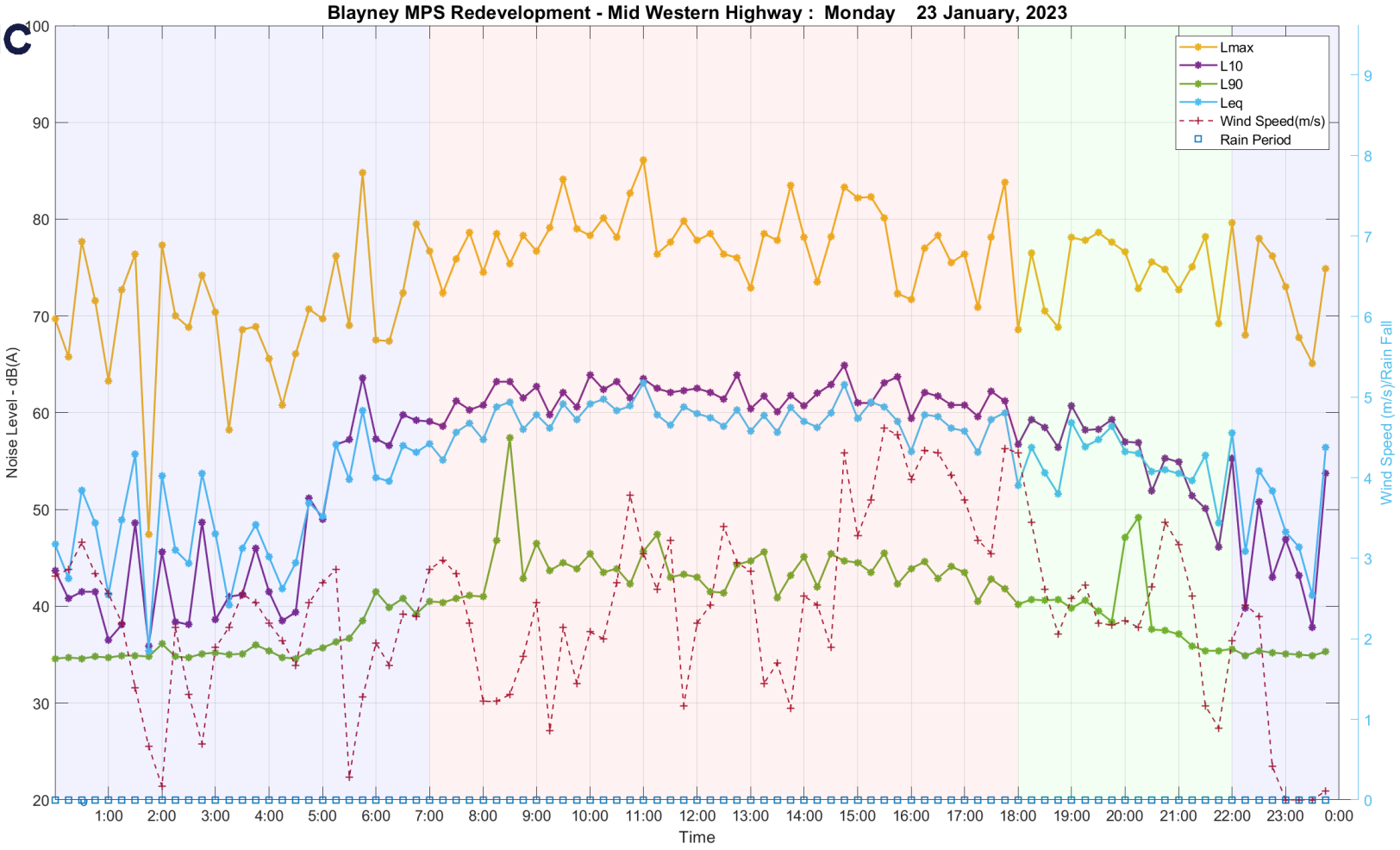
Blayney MPS Redevelopment - Mid Western Highway : Monday 23 January, 2023
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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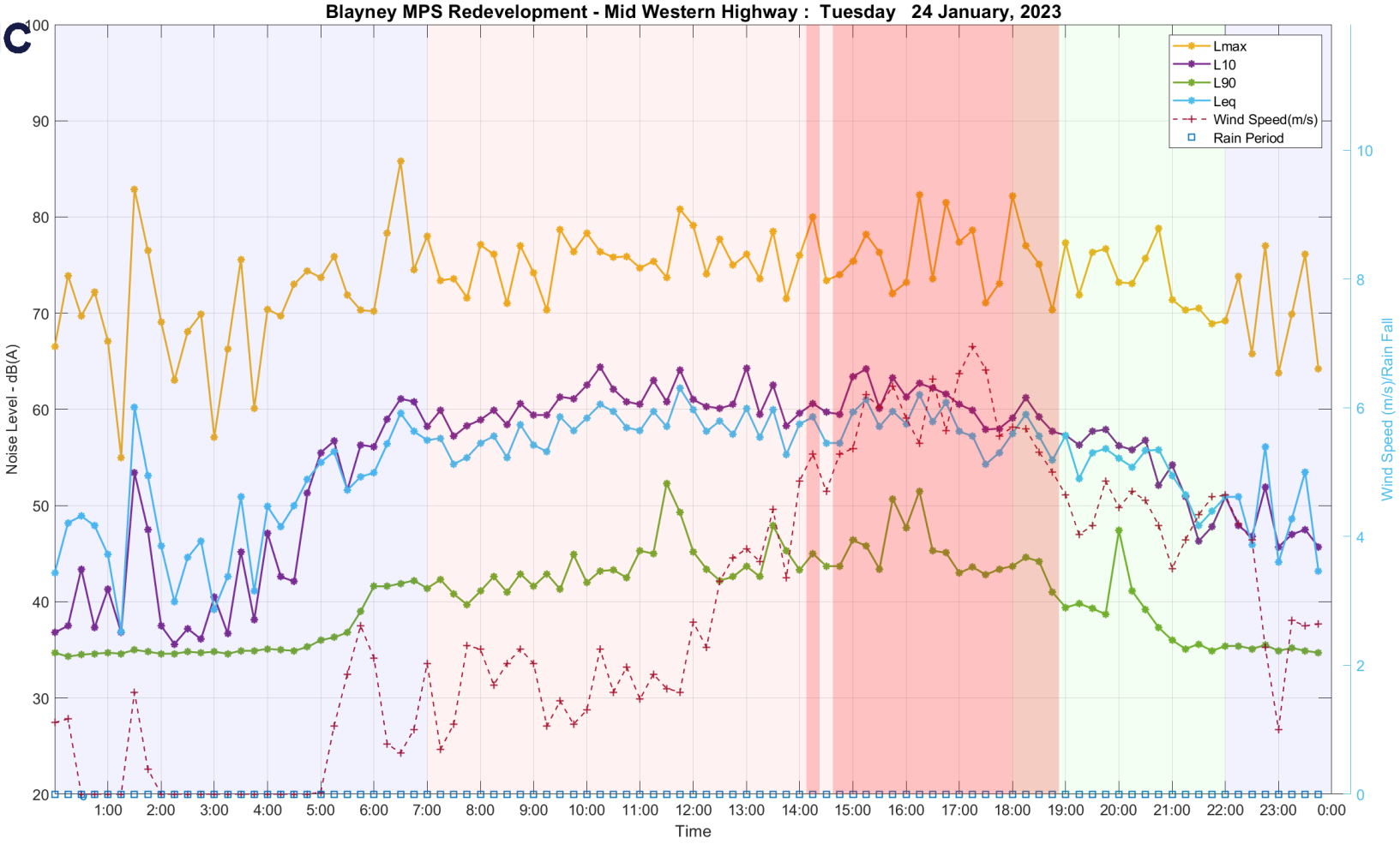
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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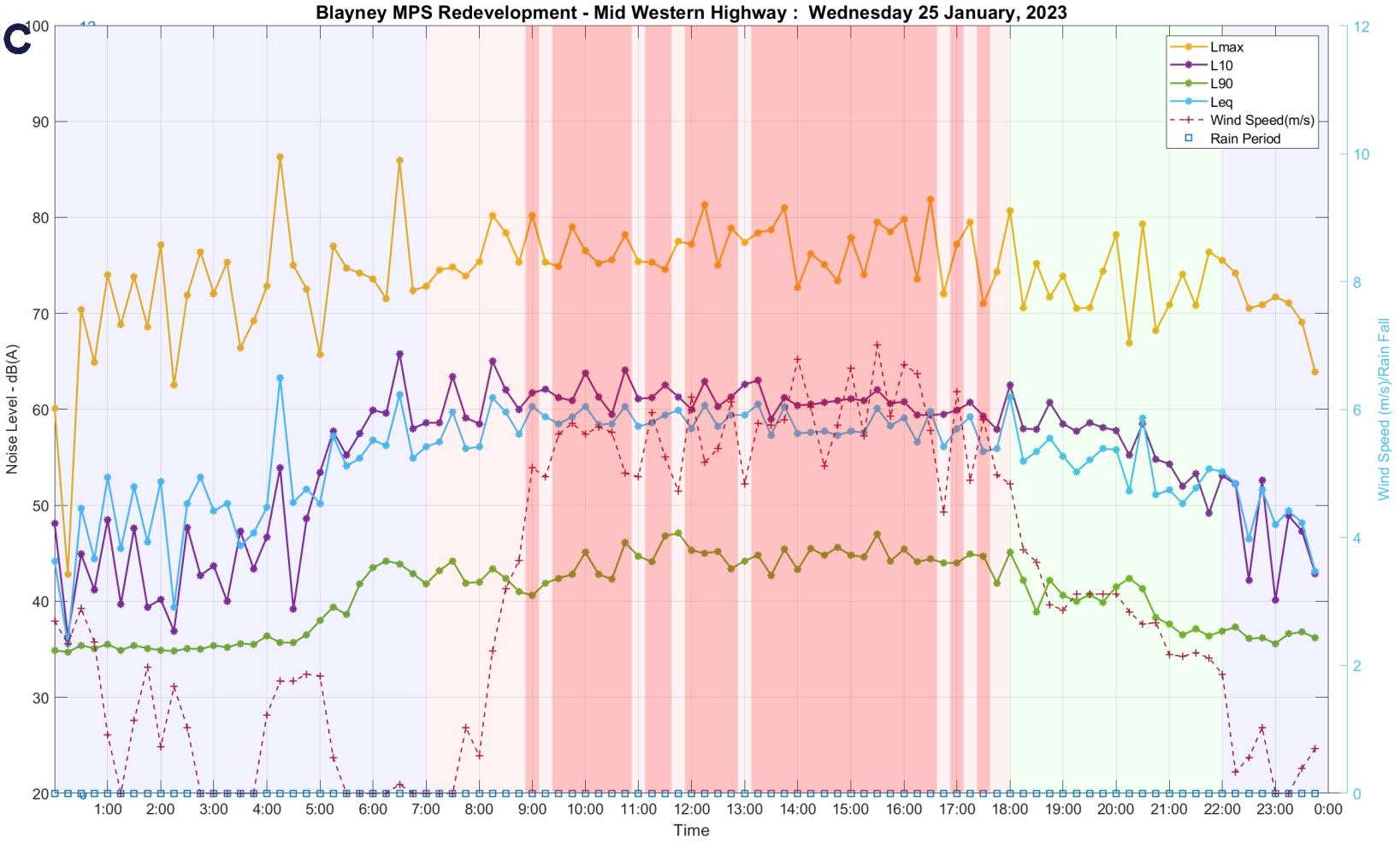
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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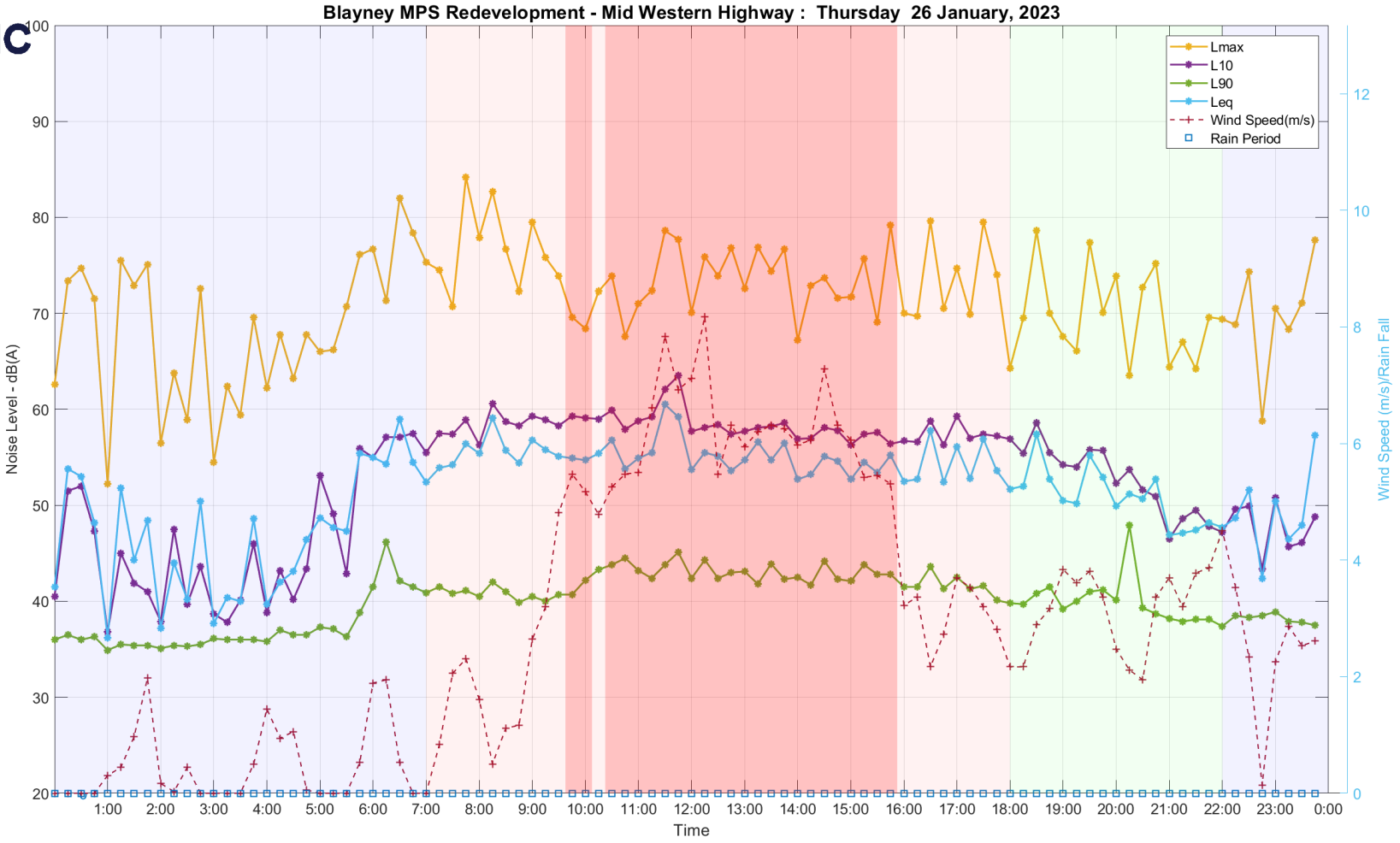
Blayney MPS Redevelopment - Mid Western Highway : Thursday 26 January, 2023
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Noise Level - dB(A)
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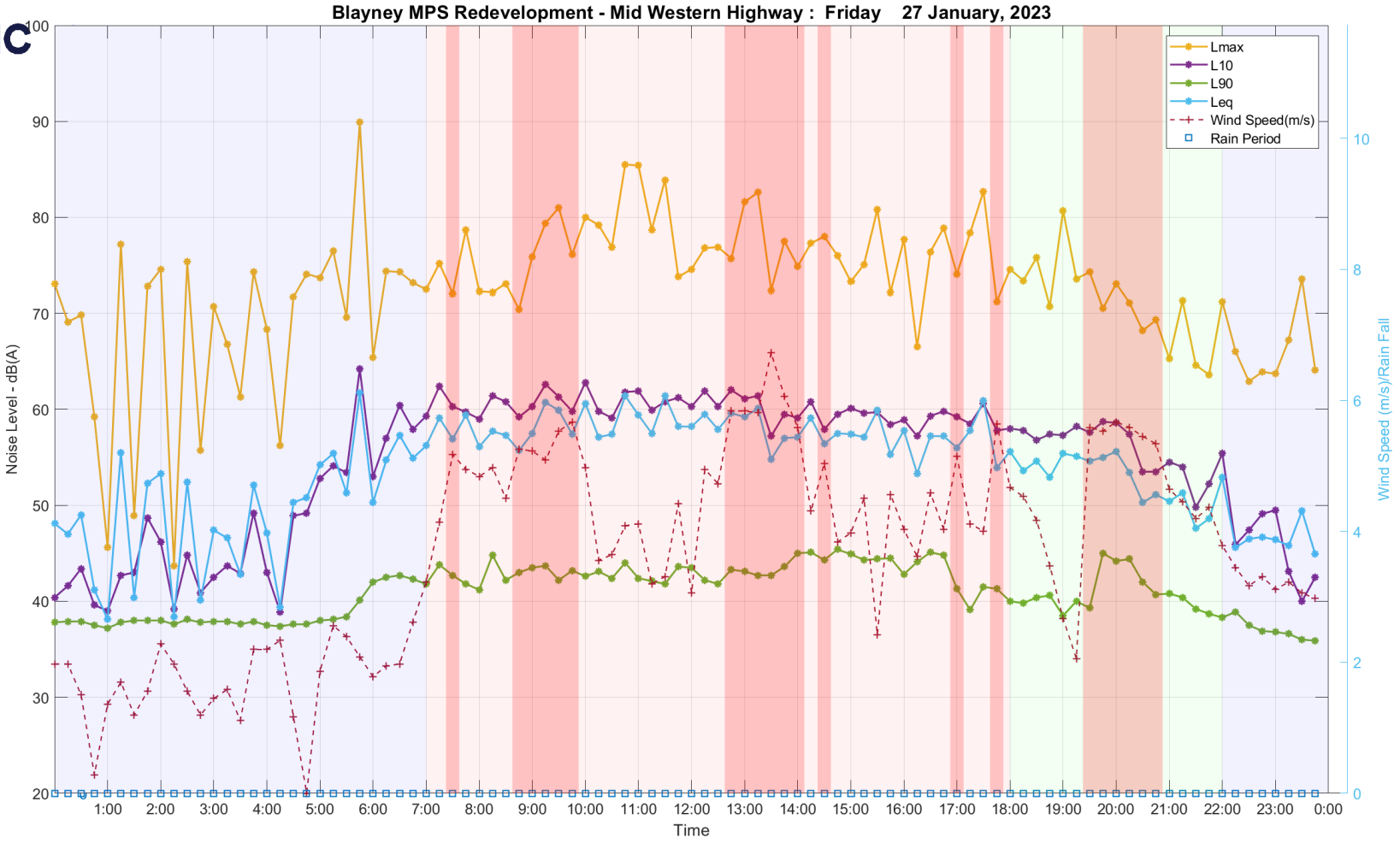
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Noise Level - dB(A)
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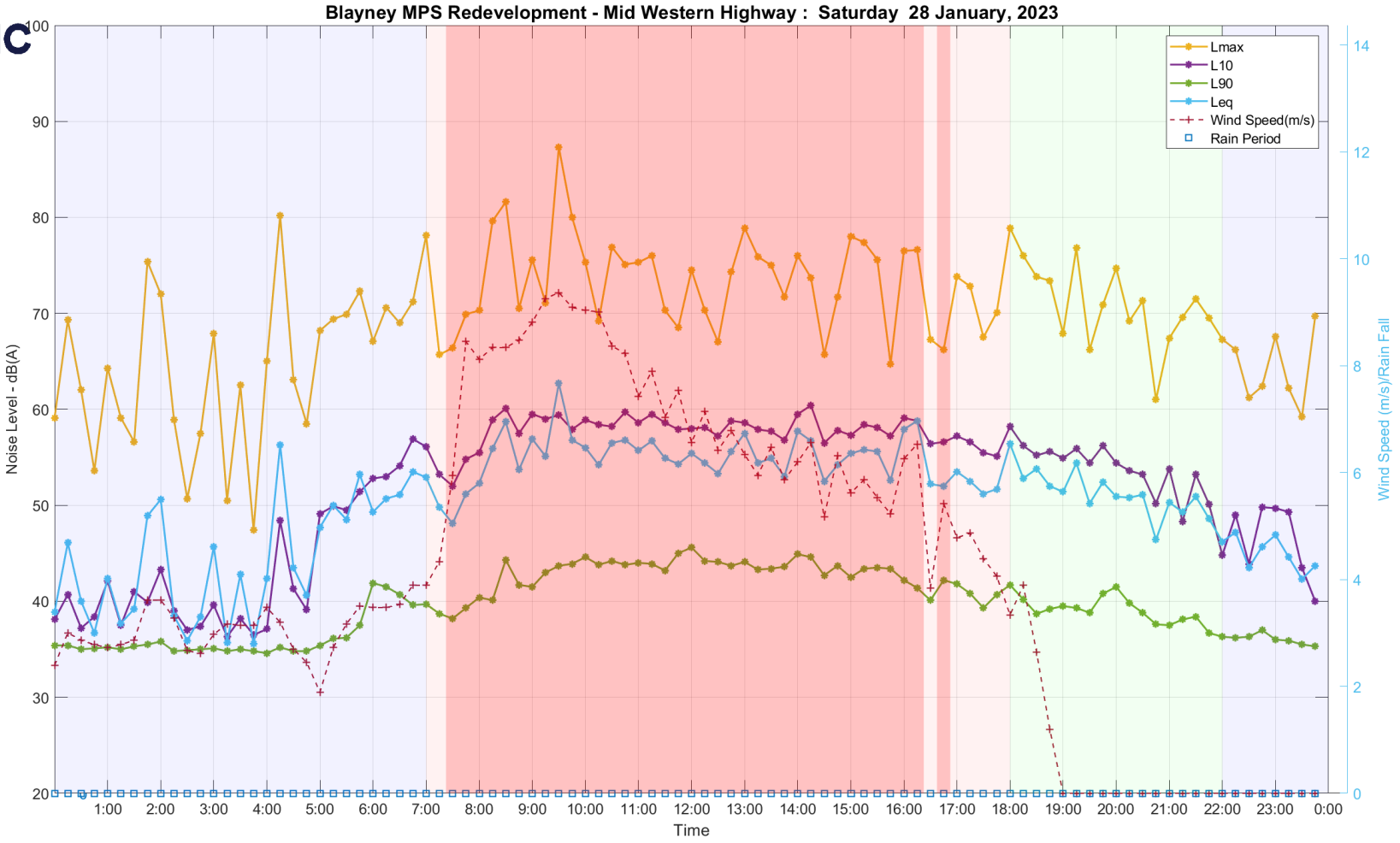
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Noise Level - dB(A)
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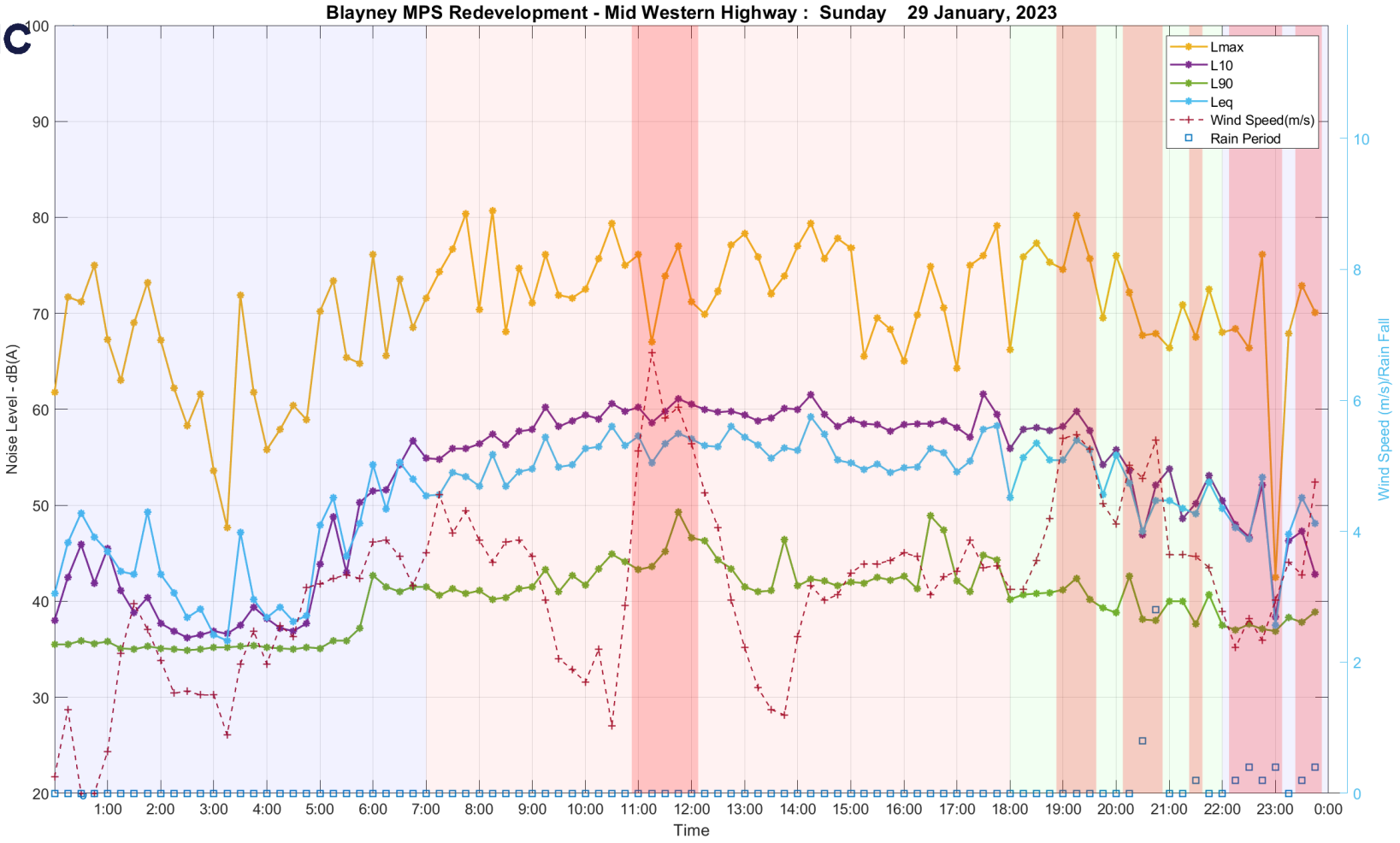
Blayney MPS Redevelopment - Mid Western Highway : Sunday 29 January, 2023
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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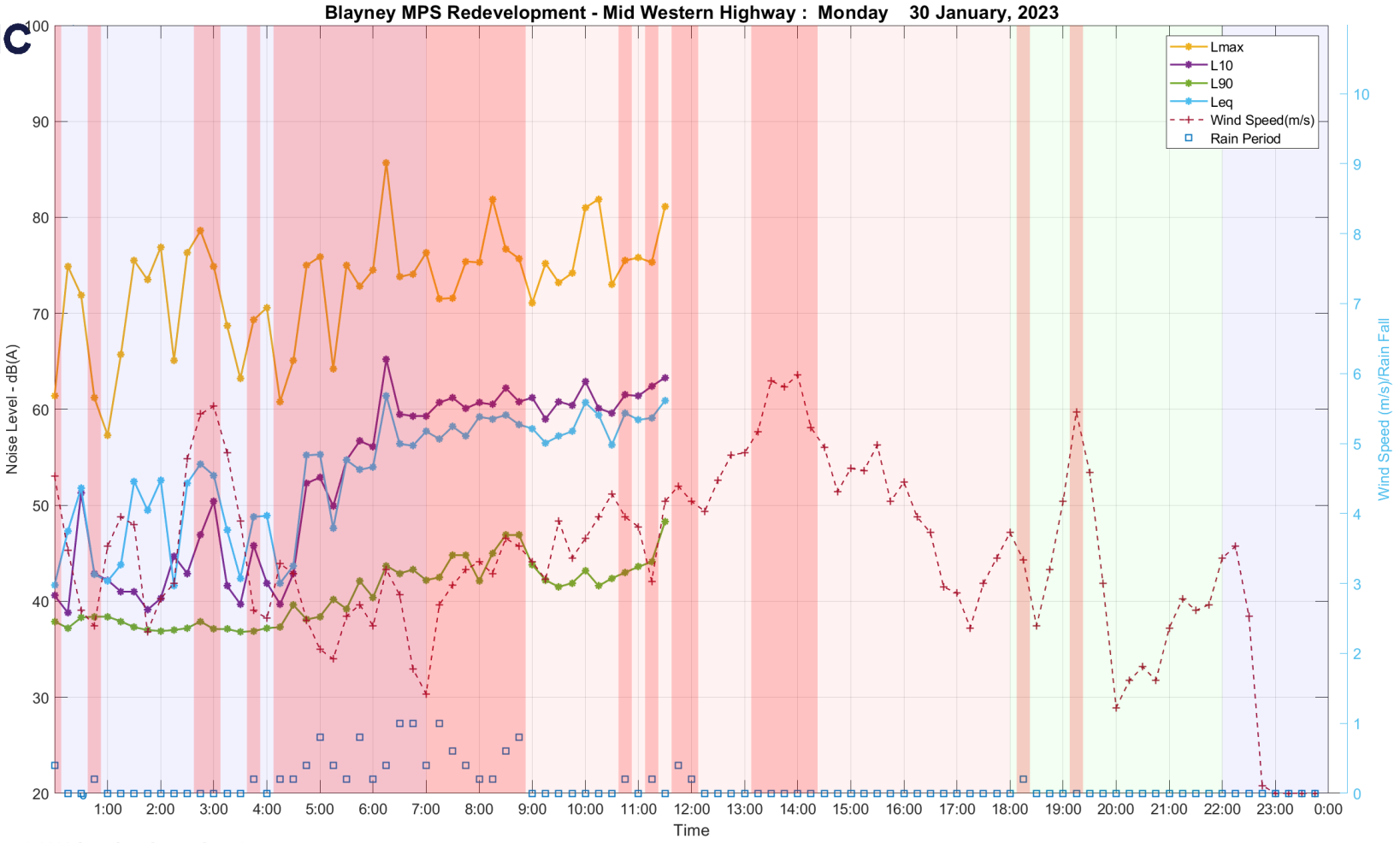
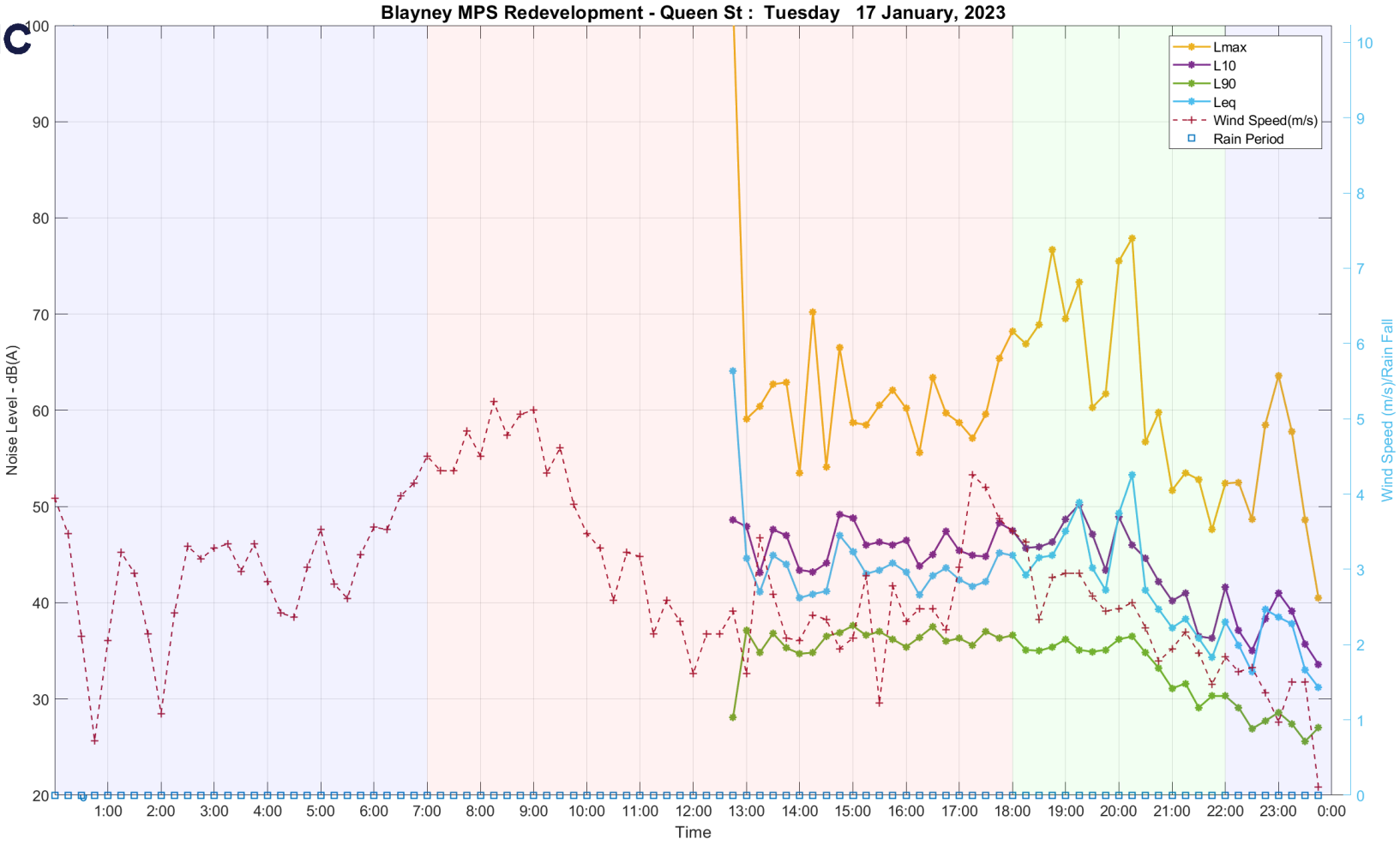


Wind Speed is corrected using factor 1.0000 based on logger location

LOCATION TWO – QUEEN STREET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Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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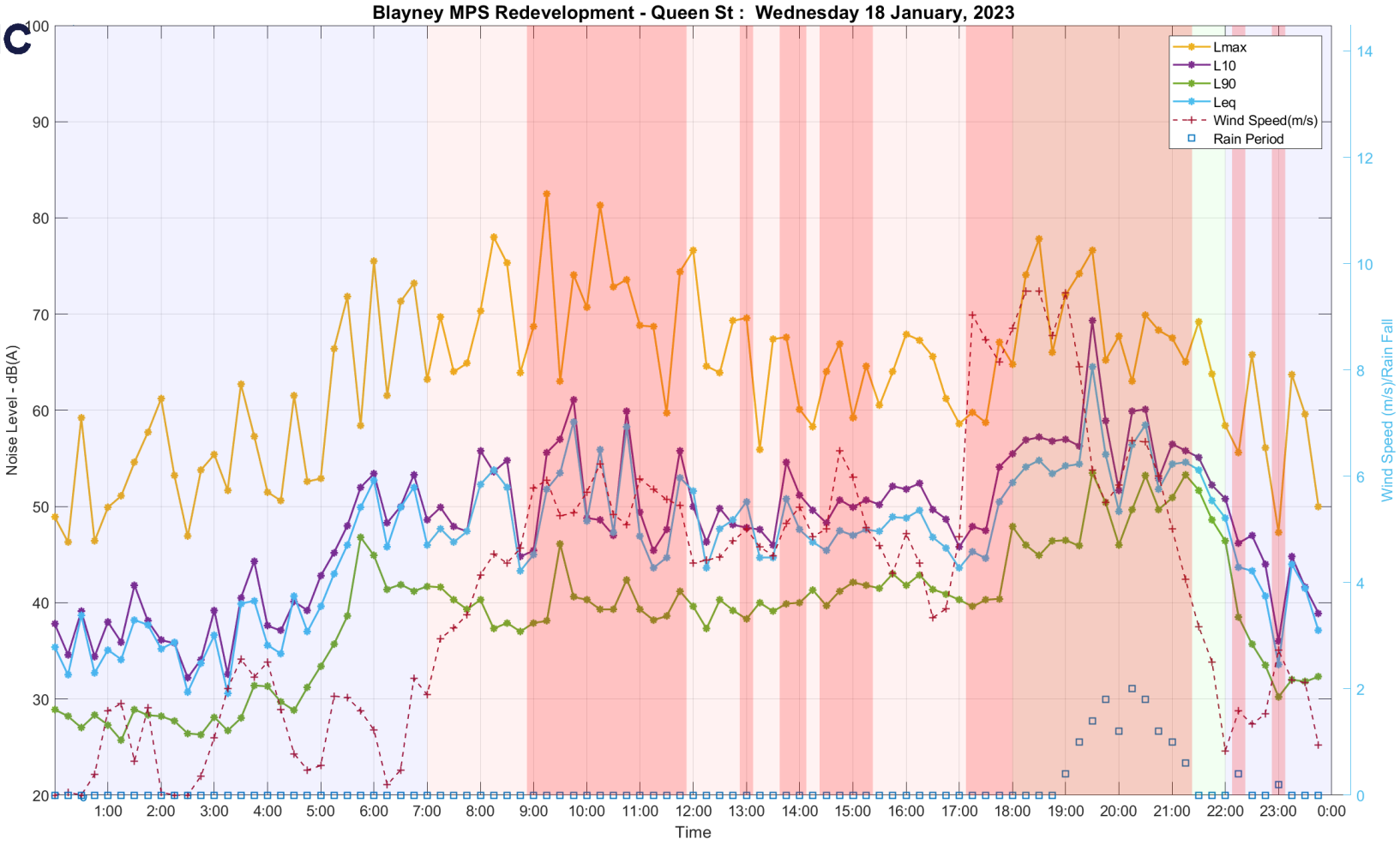
Blayney MPS Redevelopment - Queen St : Wednesday 18 January, 2023
Lmax
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Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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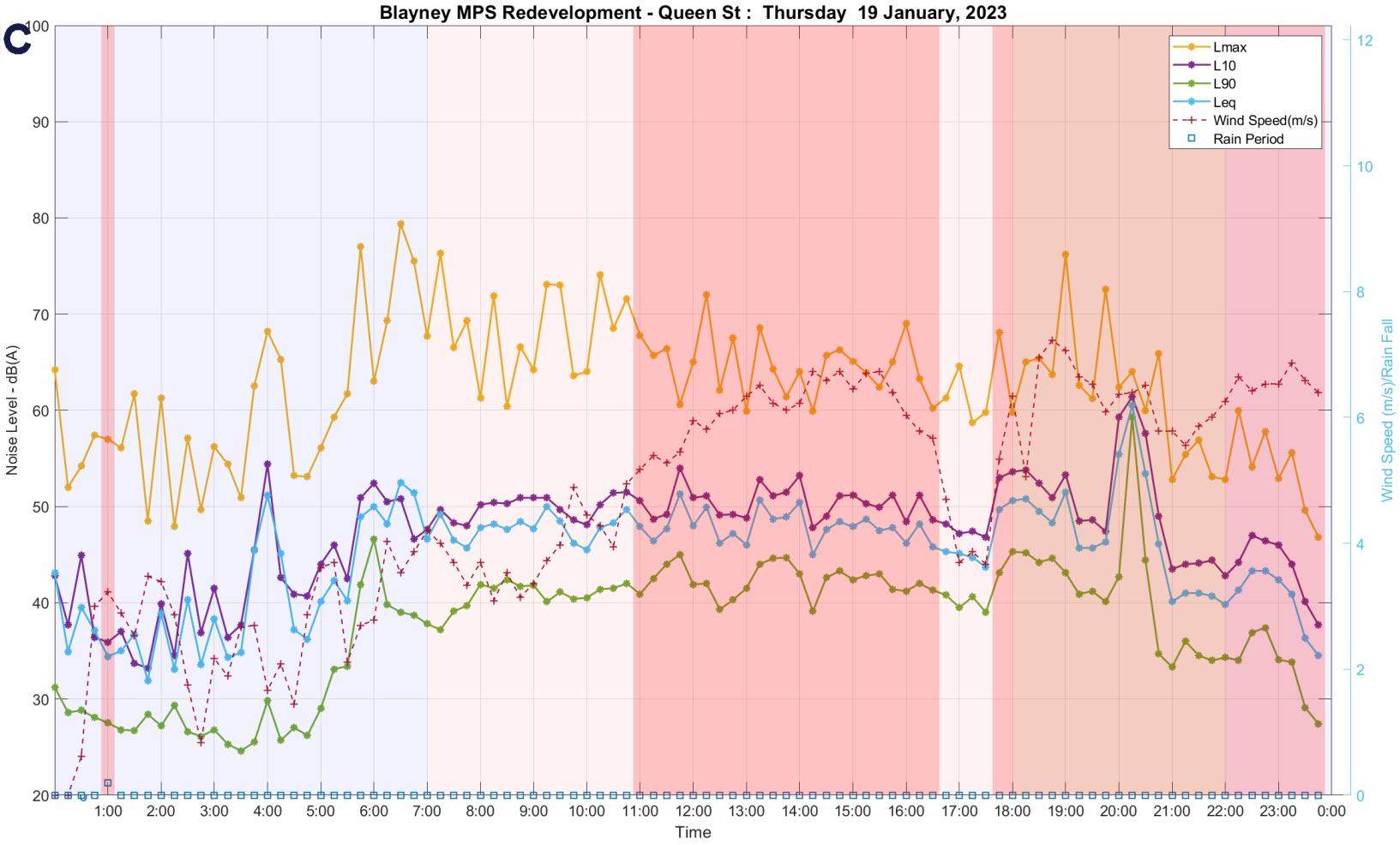
Blayney MPS Redevelopment - Queen St : Thursday 19 January, 2023
Lmax
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L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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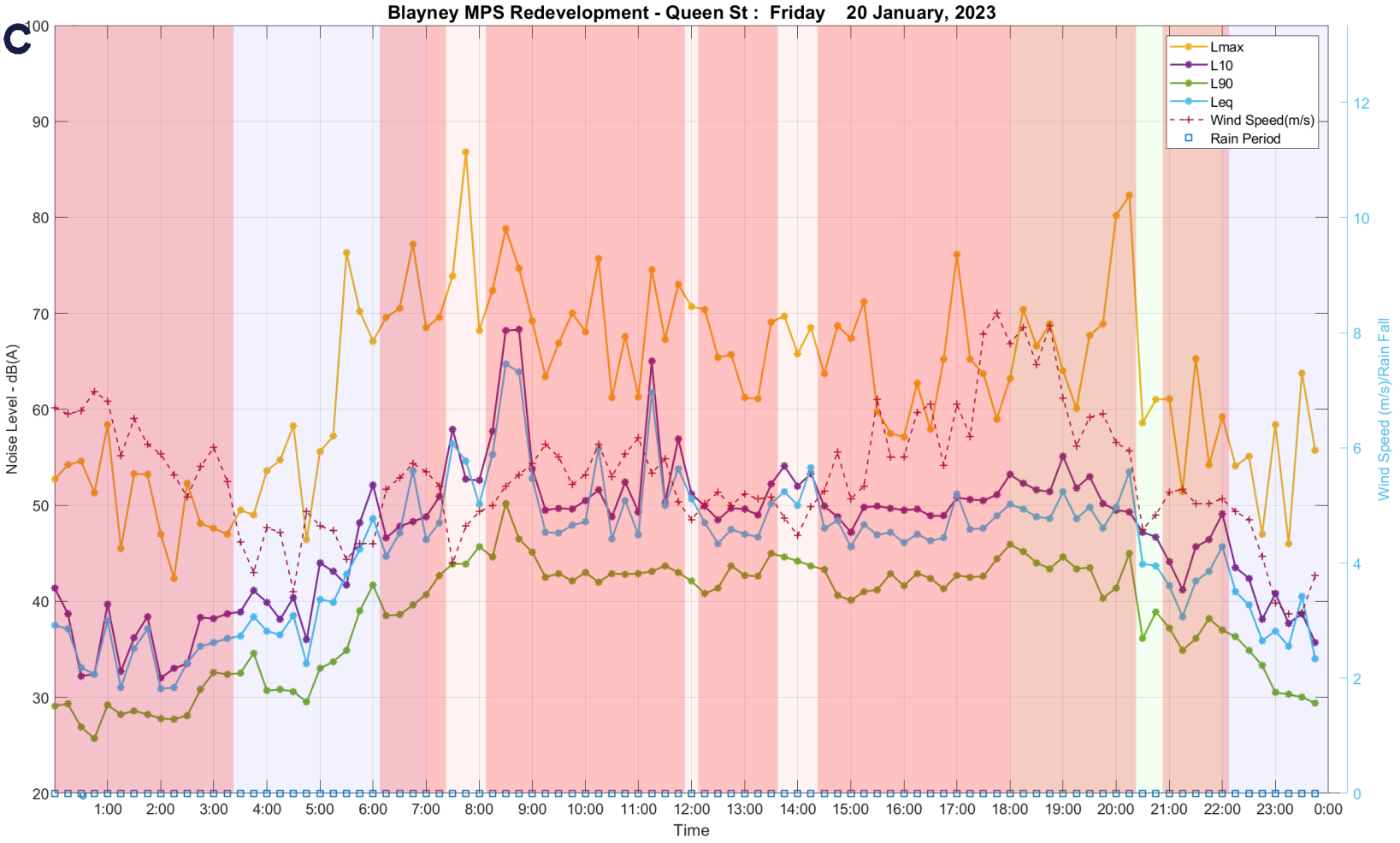
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Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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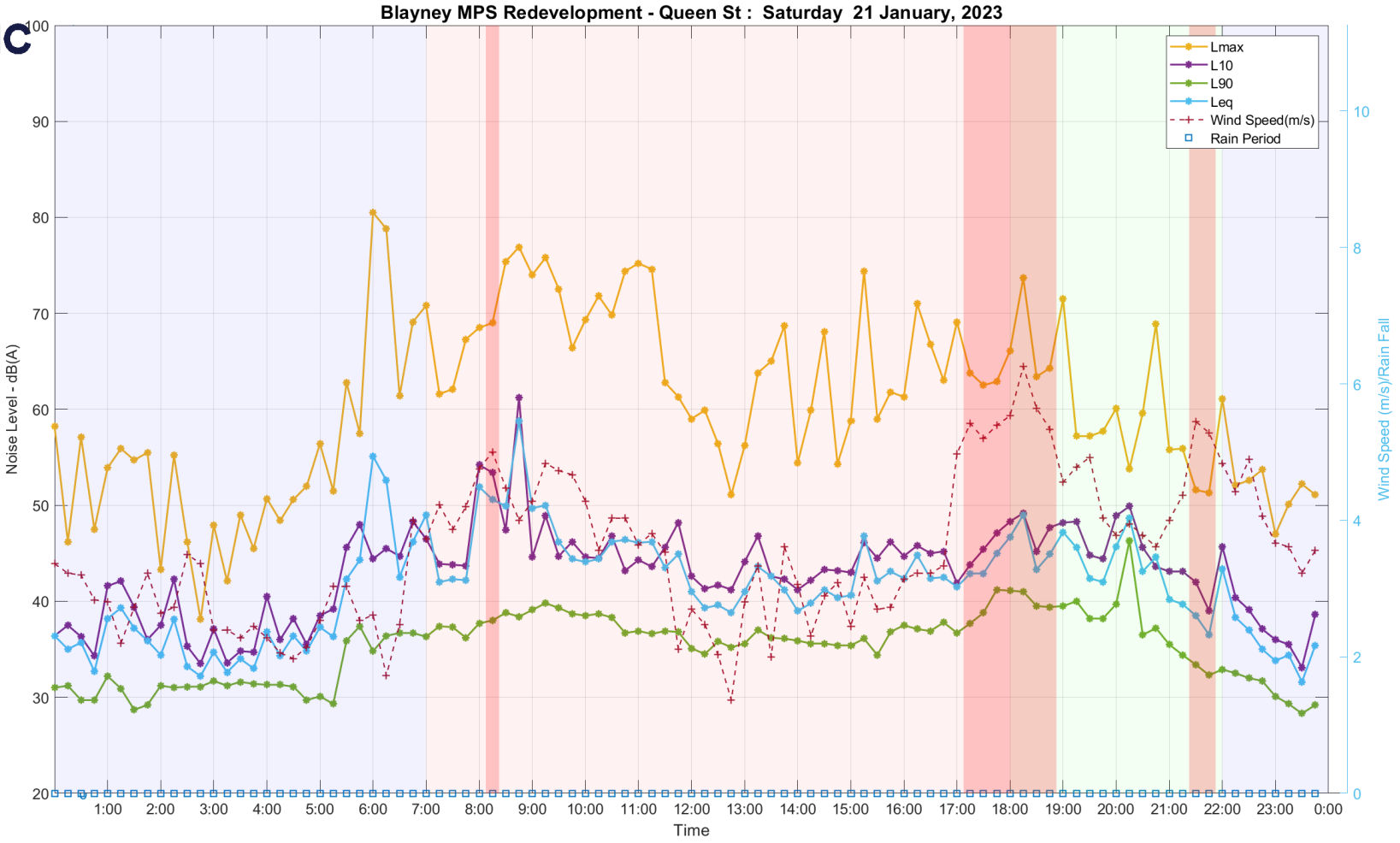
Blayney MPS Redevelopment - Queen St : Saturday 21 January, 2023
Lmax
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Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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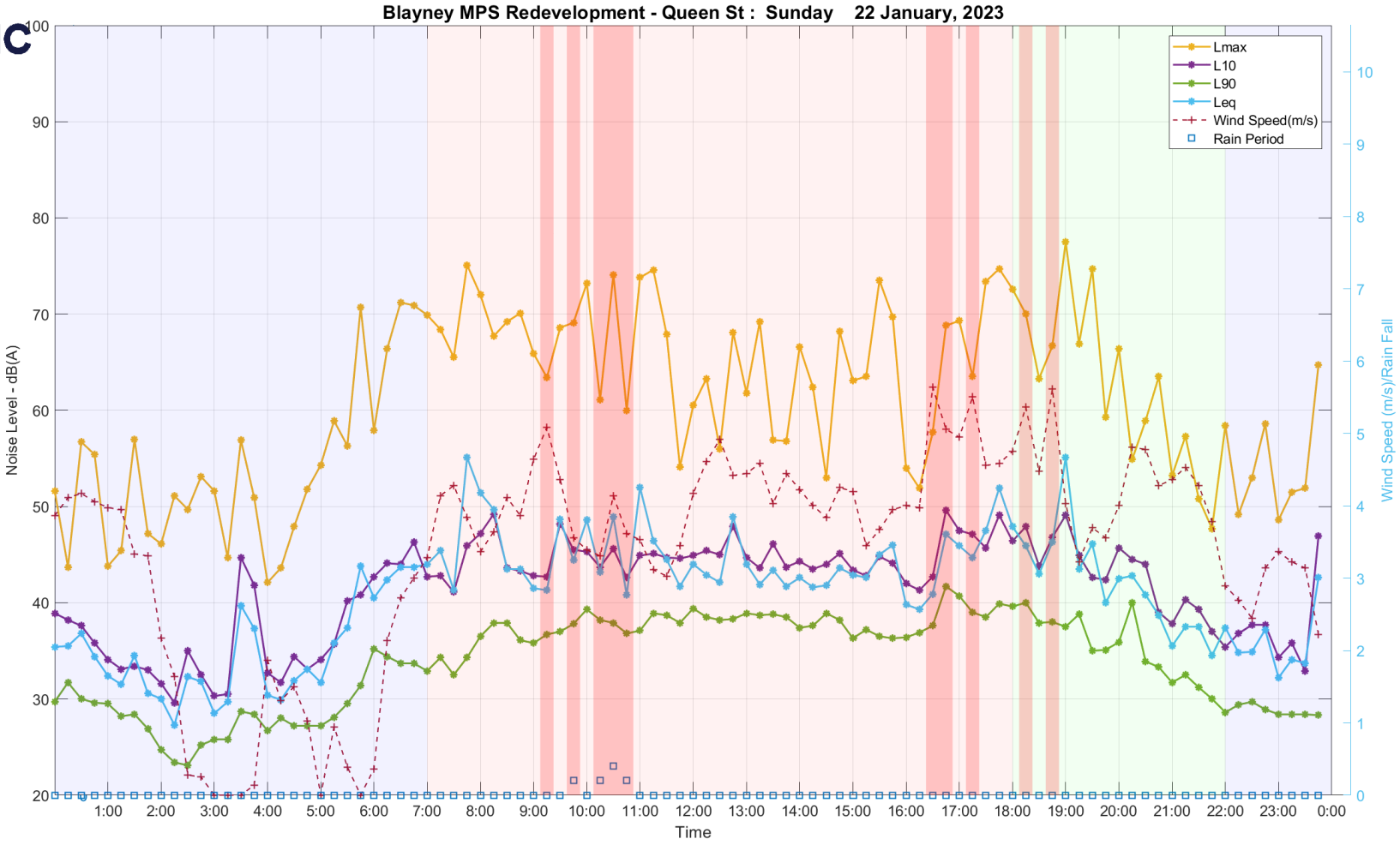
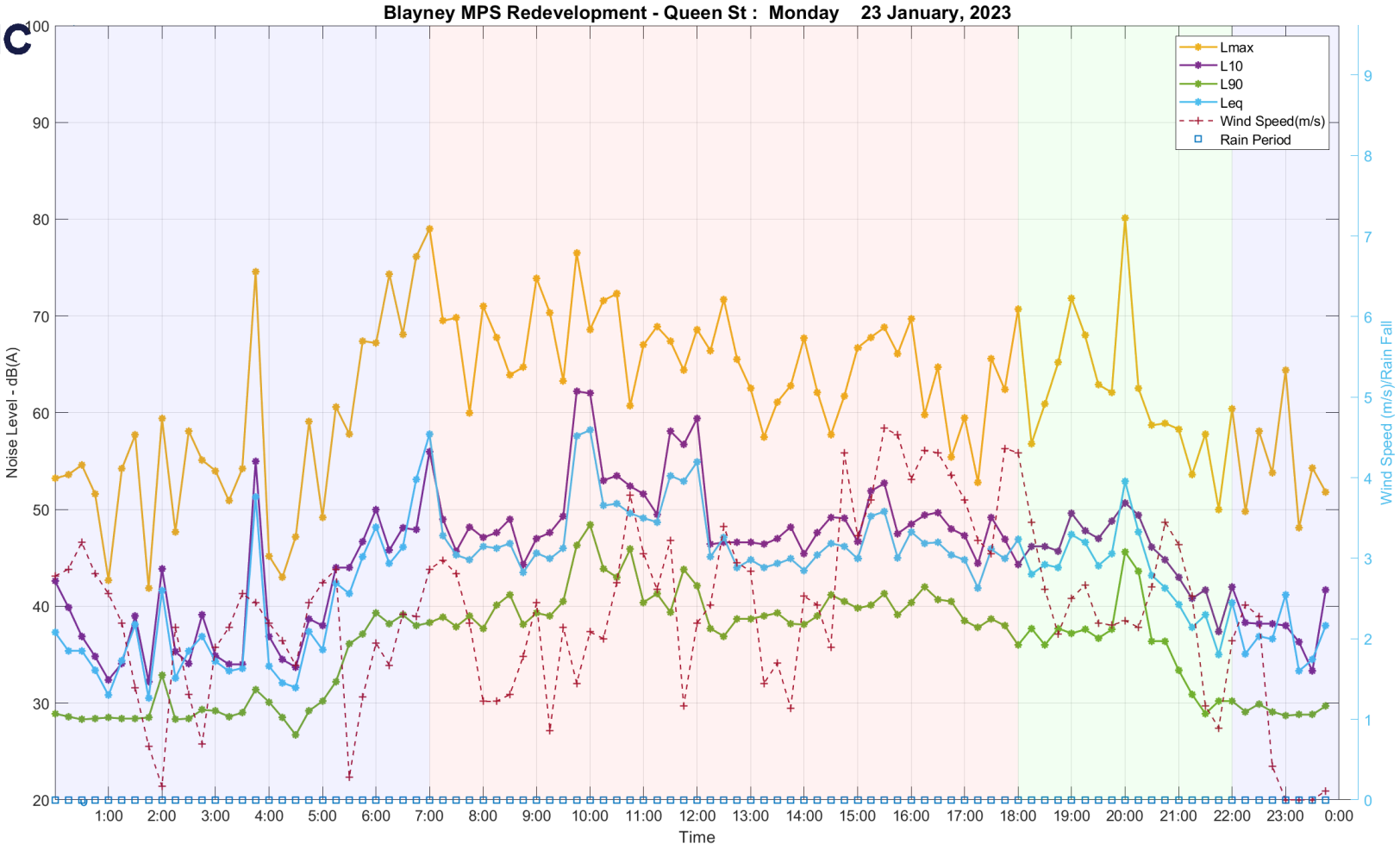
18:00
19:00
20:00
21:00
22:00
23:00
0:00


Blayney MPS Redevelopment - Queen St : Sunday 22 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
0
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


Blayney MPS Redevelopment - Queen St : Monday 23 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
9
8
7
6
5
4
3
2
1
0
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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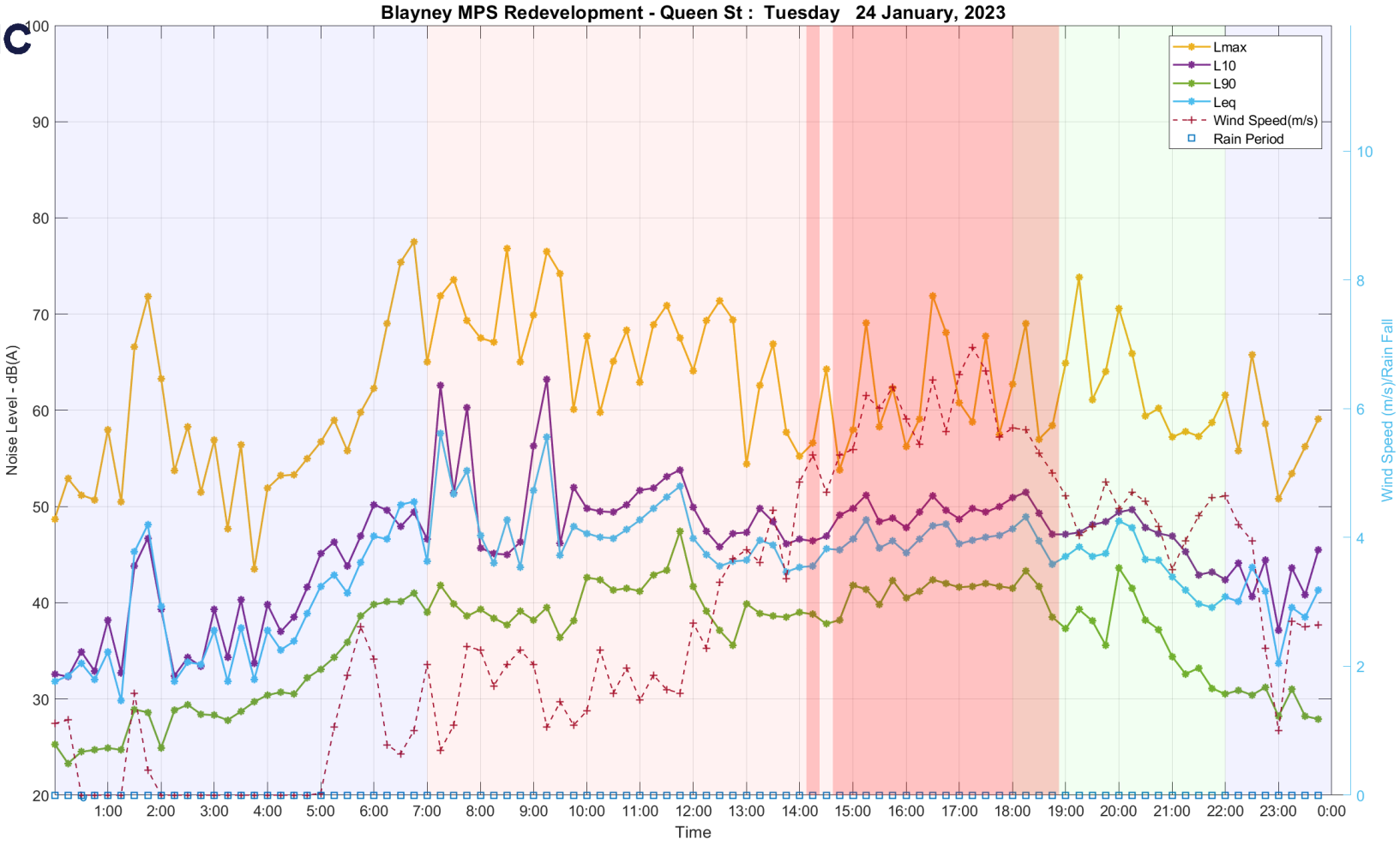
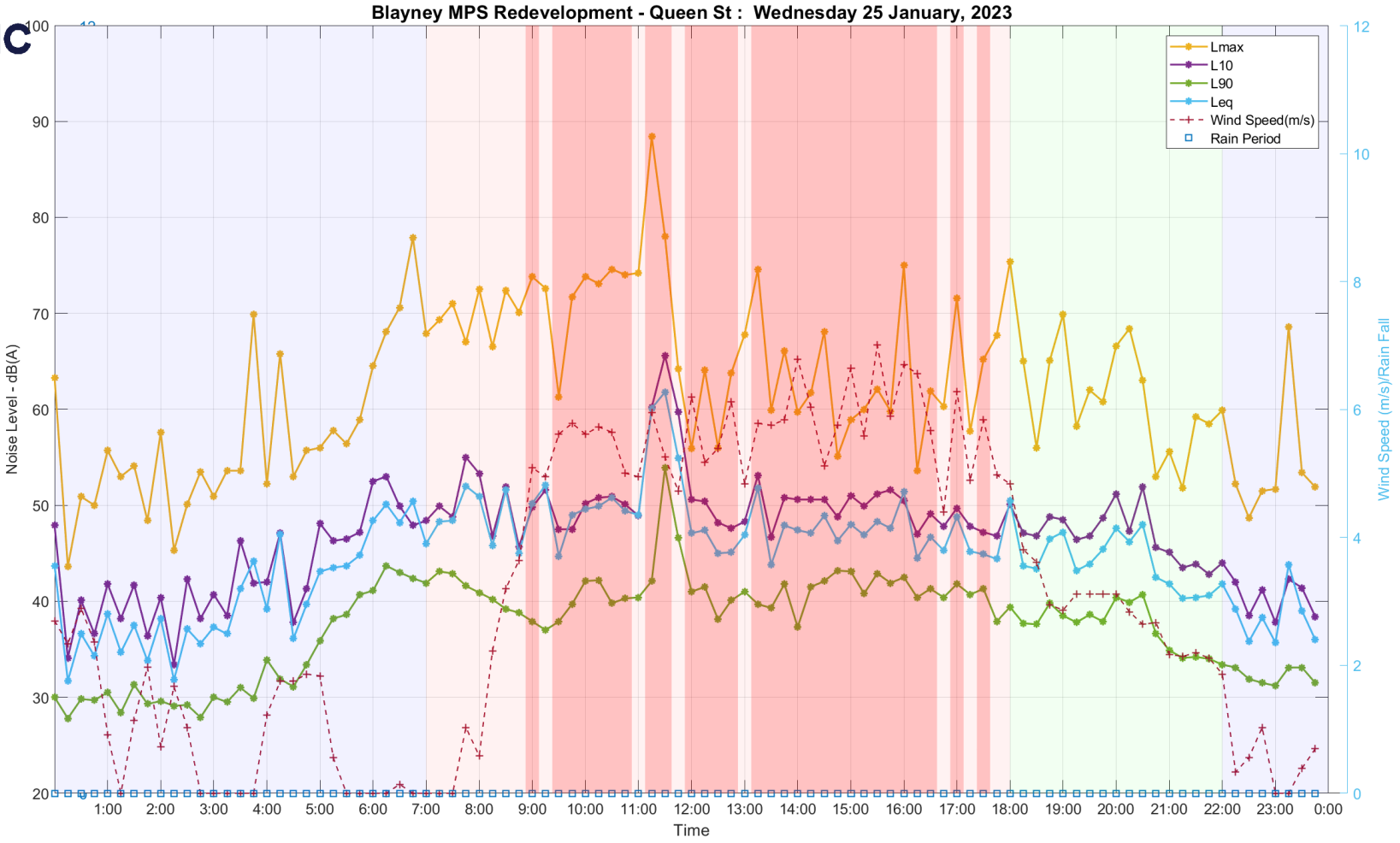
19:00
20:00
21:00
22:00
23:00
0:00


Blayney MPS Redevelopment - Queen St : Tuesday 24 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
10
8
6
4
2
0
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


Blayney MPS Redevelopment - Queen St : Wednesday 25 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
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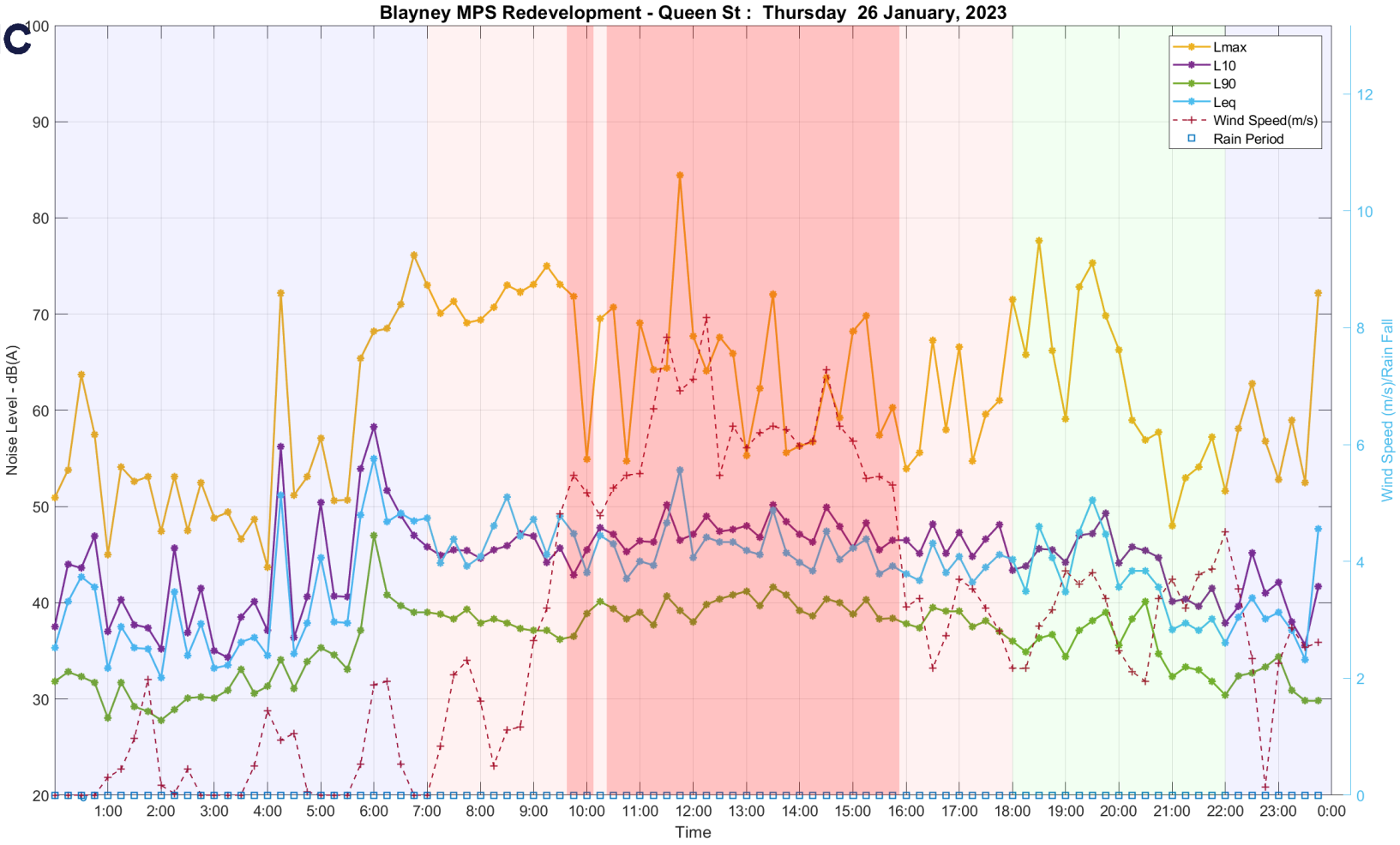
23:00
0:00


Blayney MPS Redevelopment - Queen St : Thursday 26 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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11:00
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23:00
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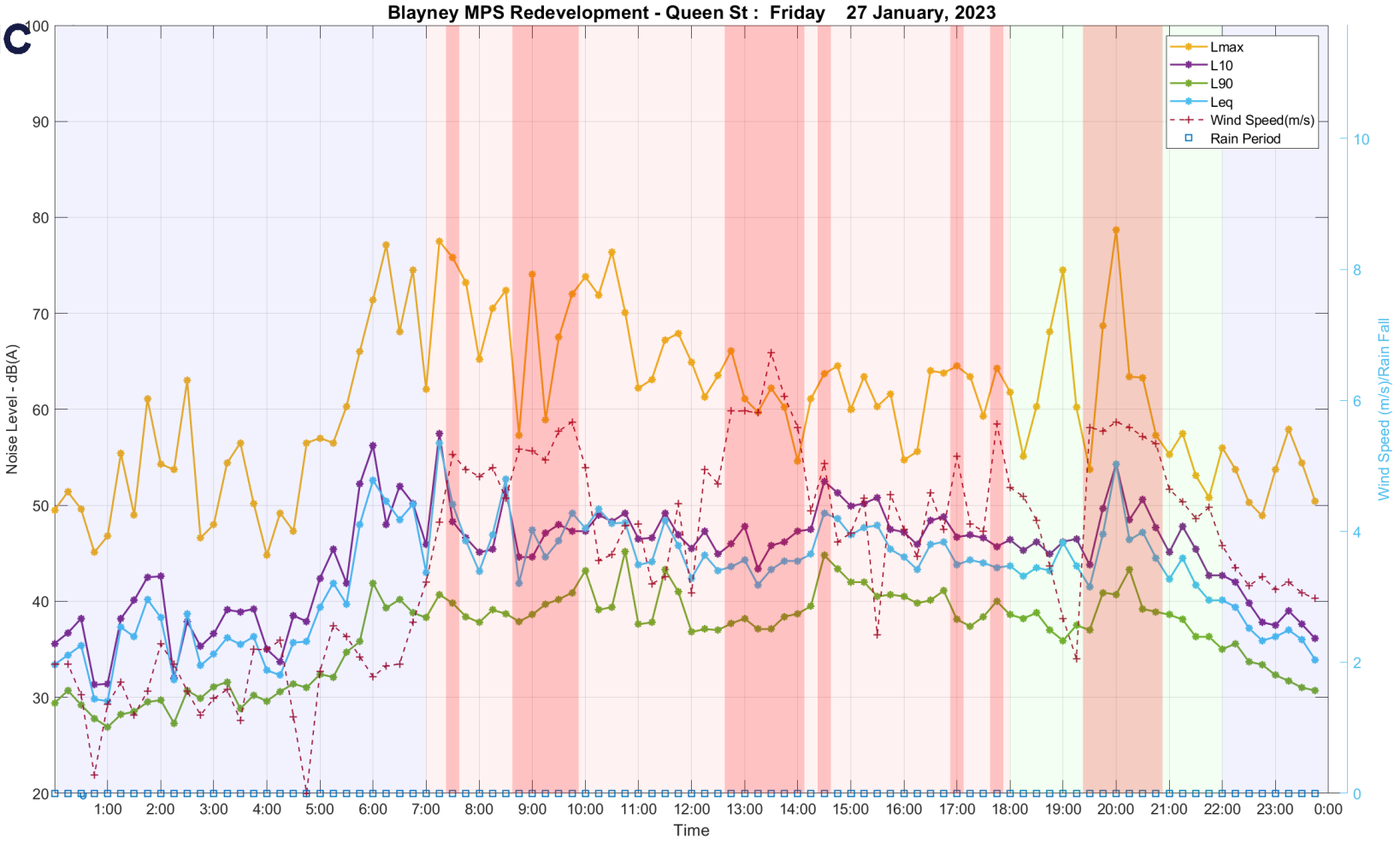
Blayney MPS Redevelopment - Queen St : Friday 27 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
10
8
6
4
2
0
1:00
2:00
3:00
4:00
5:00
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8:00
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11:00
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23:00
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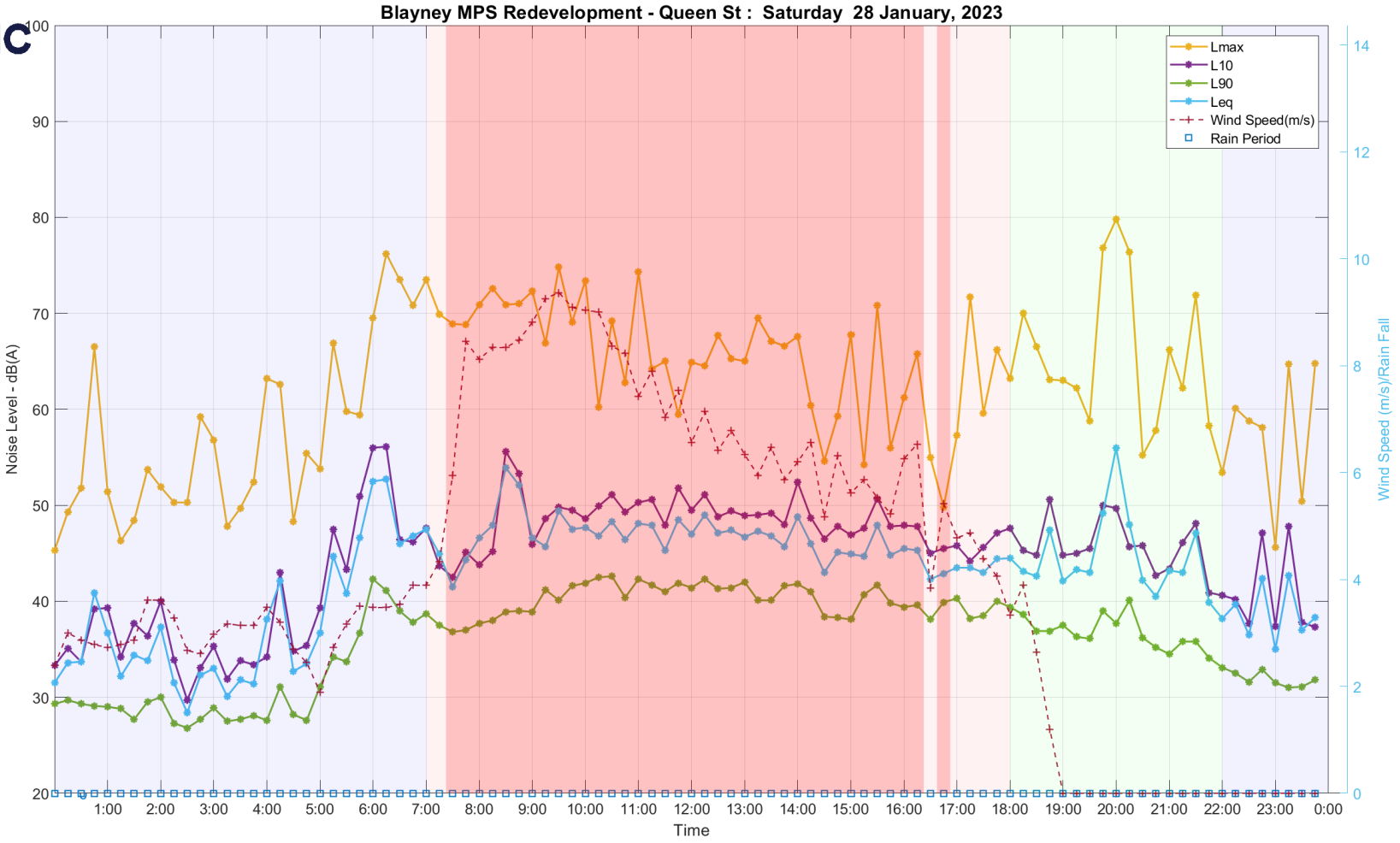
Blayney MPS Redevelopment - Queen St : Saturday 28 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
14
12
10
8
6
4
2
0
1:00
2:00
3:00
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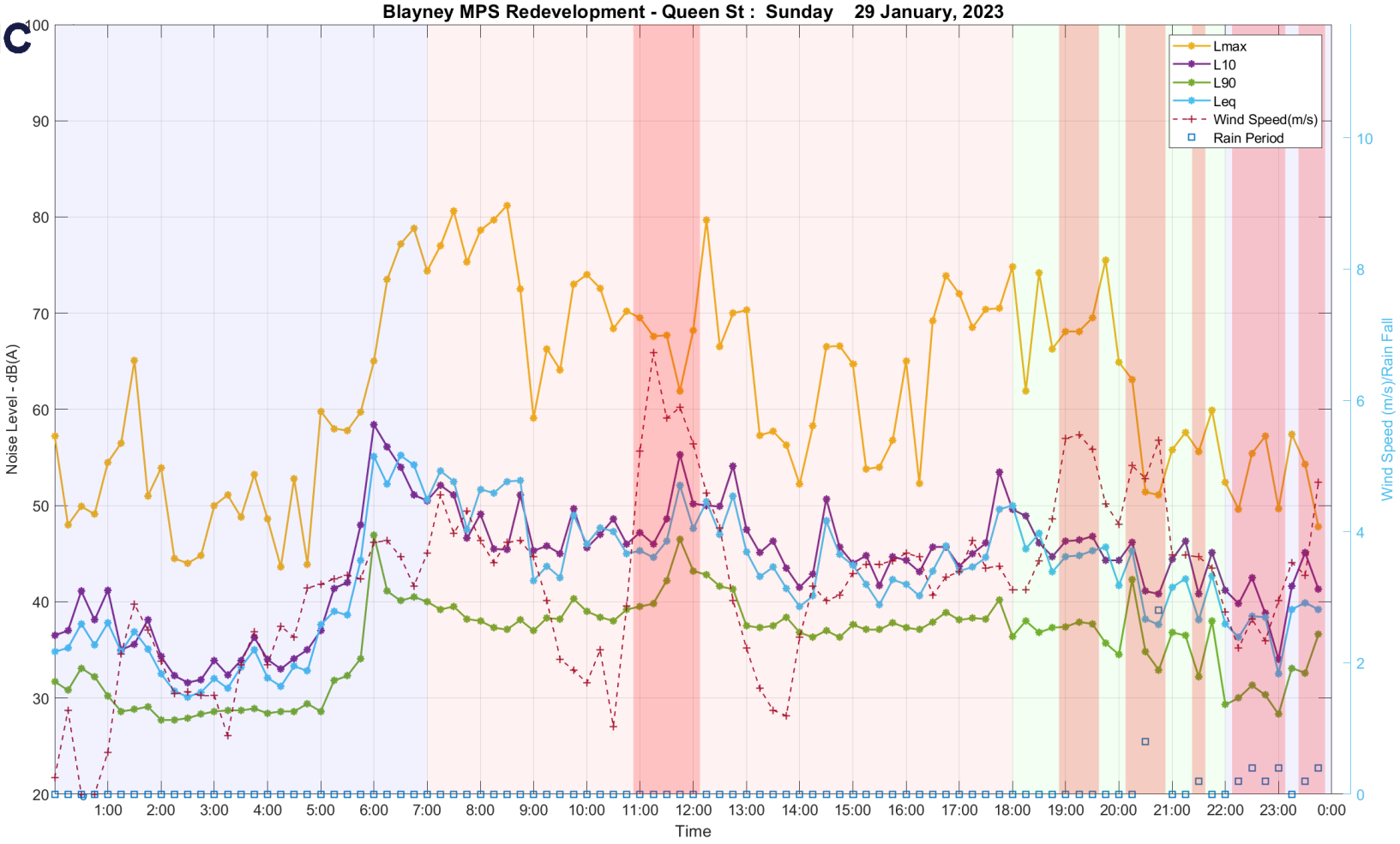
Blayney MPS Redevelopment - Queen St : Sunday 29 January, 2023
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
100
90
80
70
60
50
40
30
20
10
8
6
4
2
0
1:00
2:00
3:00
4:00
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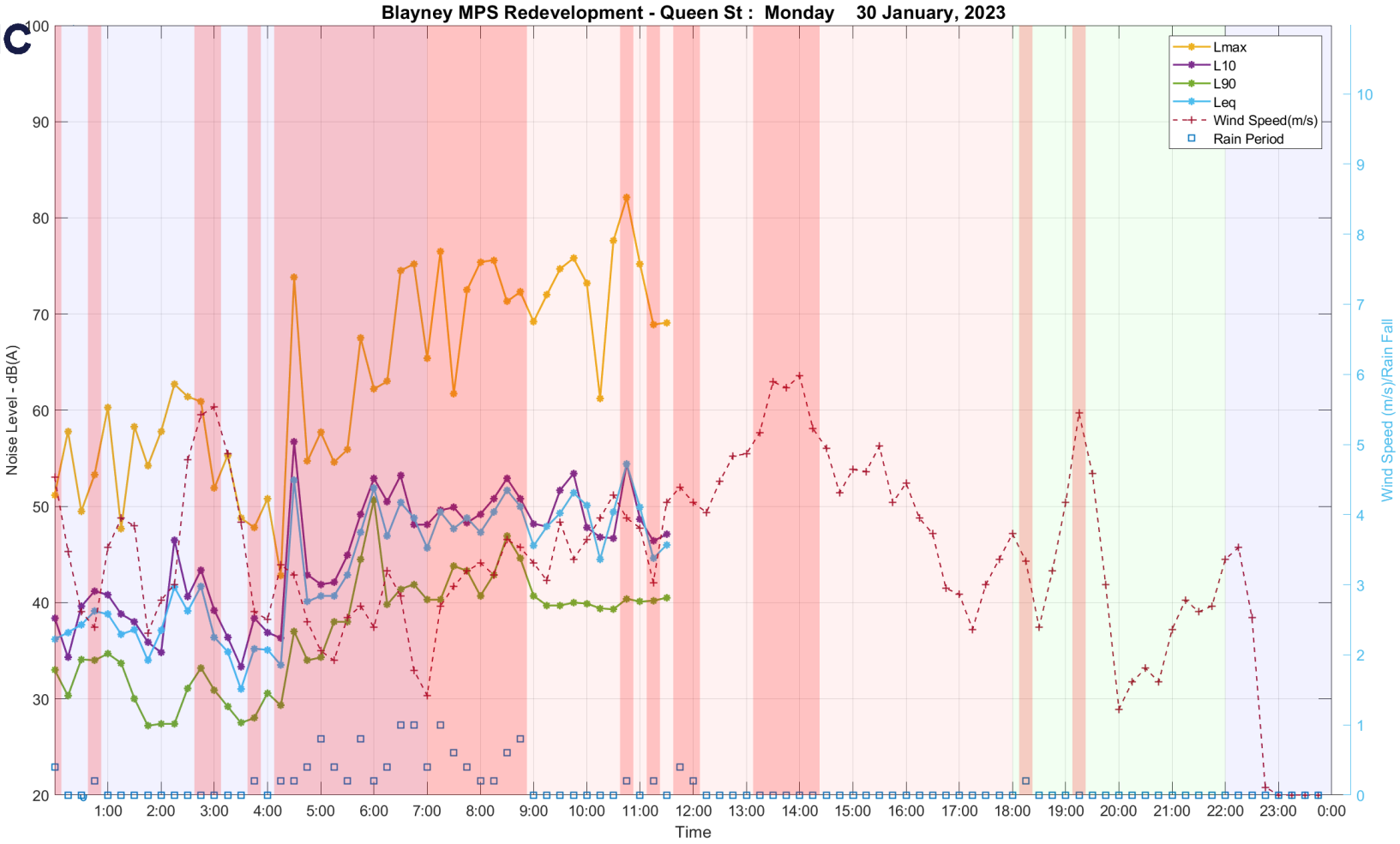

Wind Speed is corrected using factor 1.0000 based on logger location