

40 The Retreat, Bringelly

SSDA Noise and Vibration Impact Assessment

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1 DEVELOPMENT DESCRIPTION

This State Significant Development Application seeks consent for the detailed design and delivery (including construction and use) of a new mixed use residential development, to be developed in two (2) stages. Specifically, development consent is sought for:

STAGE 1

- Overall site clearing and preparation works, including demolition of all existing development on the Site;
- The redevelopment of the northern portion of the Site, comprising:
 - Temporary Site access to the northern portion of the Site from The Retreat;
 - Temporary bin enclosure adjacent the temporary access;
 - Excavation works and construction of a shared two (2) storey basement to a maximum depth of RL 60.60, with capacity for 311 vehicle car spaces;
 - Construction of three (3) individual mixed use buildings, comprising:
 - Maximum building heights between 30.4m and 39.8m;
 - A total Gross Floor Area (**GFA**) of 26, 204sqm, comprising 25,744 sqm of residential GFA, 248 sqm of non-residential GFA and 212 sqm of retail GFA, distributed across the three buildings;
 - 254 residential units, distributed across the three buildings.
 - Associated landscaping, communal open space and embellishment works; and
 - Delivery and augmentation of services.

STAGE 2

- The redevelopment of the southern portion of the Site, comprising:
 - Removal of the Stage 1 temporary access from The Retreat;
 - Connection and access of the Stage 1 basement to the western boundary (to become a future Collector Road);
 - Excavation works and construction of a shared three (3) storey basement to a depth of RL 56.35, with capacity for 336 vehicle car spaces;
 - Site and basement access from the western boundary (to become a future Collector Road);
 - Construction of three (3) individual mixed use buildings, comprising:
 - Maximum building heights between 23.8m and 39.9m;
 - A total Gross Floor Area (**GFA**) of 29,126 sqm, comprising 28,540 sqm of residential GFA, 212 sqm of retail GFA and 374 sqm of non-residential GFA, distributed across the three buildings;
 - 279 residential units, distributed across the three buildings.
 - Associated landscaping, communal open space and embellishment works; and
 - Delivery and augmentation of services.

A detailed description of the proposed development is detailed in Section 3.0 of the Environmental Impact Statement prepared by Ethos Urban.

2 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

In accordance with section 4.39 of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*, Secretary's Environmental Assessment Requirements (SEARs) for SSD 65729209 were issued on 18 December 2024. This report has been prepared to respond to the relevant issued SEARs, as set out in the table below.

Table 1 – SEARS Requirement

SEAR	Response / Location in Report
11 Noise and Vibration Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	Noise and Vibration Impact Assessment

3 SUMMARY OF MITIGATION MEASURES

Table 2 – Mitigation Measures

Noise and Vibration Impacts	Mitigation Measure
Traffic Noise Intrusion	Provided recommended constructions for building shell to reduce traffic noise into the development in Section 8.
Traffic Generation from the Development	Predicted noise level generated from the surrounding new roads based on the traffic report presented in Section 7.2 and the noise modelling results are shown in Appendix A.
Noise Emissions from the Development	A noise emission criterion has been established in Section 9, a detailed assessment for mechanical plants or other noise emitting equipment is to be conducted during CC stage once the equipment list has been confirmed.
Construction Noise and Vibration Impacts	Preliminary construction noise and vibration impacts based on typical equipment used during construction stages. The full assessment is presented in Section 10.

4 SITE DESCRIPTION

The project site is generally surrounded by residential receivers with large agriculture lands and low-density residential areas. The development has a Land title (Lot 272 DP 803167) with a site area of 20,907 sqm. The total ground floor area is 55,330 sqm which includes the GFA Residential of 54,284 sqm, GFA Retail of 424 sqm, GFA Non-Residential of 622 sqm and FSR (Achieved) 2.65:1 sqm. The full development summary table issued has been shown in the Figure 3 below.

Notwithstanding, the proposed development encompasses the following:

1. 1 Bed 104 60%
 2 bed 346 65%
 3 bed 81 15%
 4 bed 2 0%
 Total 533 units
2. Adaptable apartments 55
3. Car parking total 635
 Residential 482
 Retail 4
 Visitor 127
 Car share 10
 EV 10
 Car wash 2
4. Massing 7-12 storeys
5. Floor to floor heights
 Typical floor 3,150
 Roof terraces 3,300
 Retail 4,850-6,640

In addition to the above, based upon site investigation conducted, the nearest sensitive receivers around the project site have been identified as the following:

- **R1:** Single dwelling residential house on the East.
- **R2:** Single dwelling residential house on the South along The Retreat.

A site map with the measurement locations and surrounding receivers are presented in Figure 1 below.

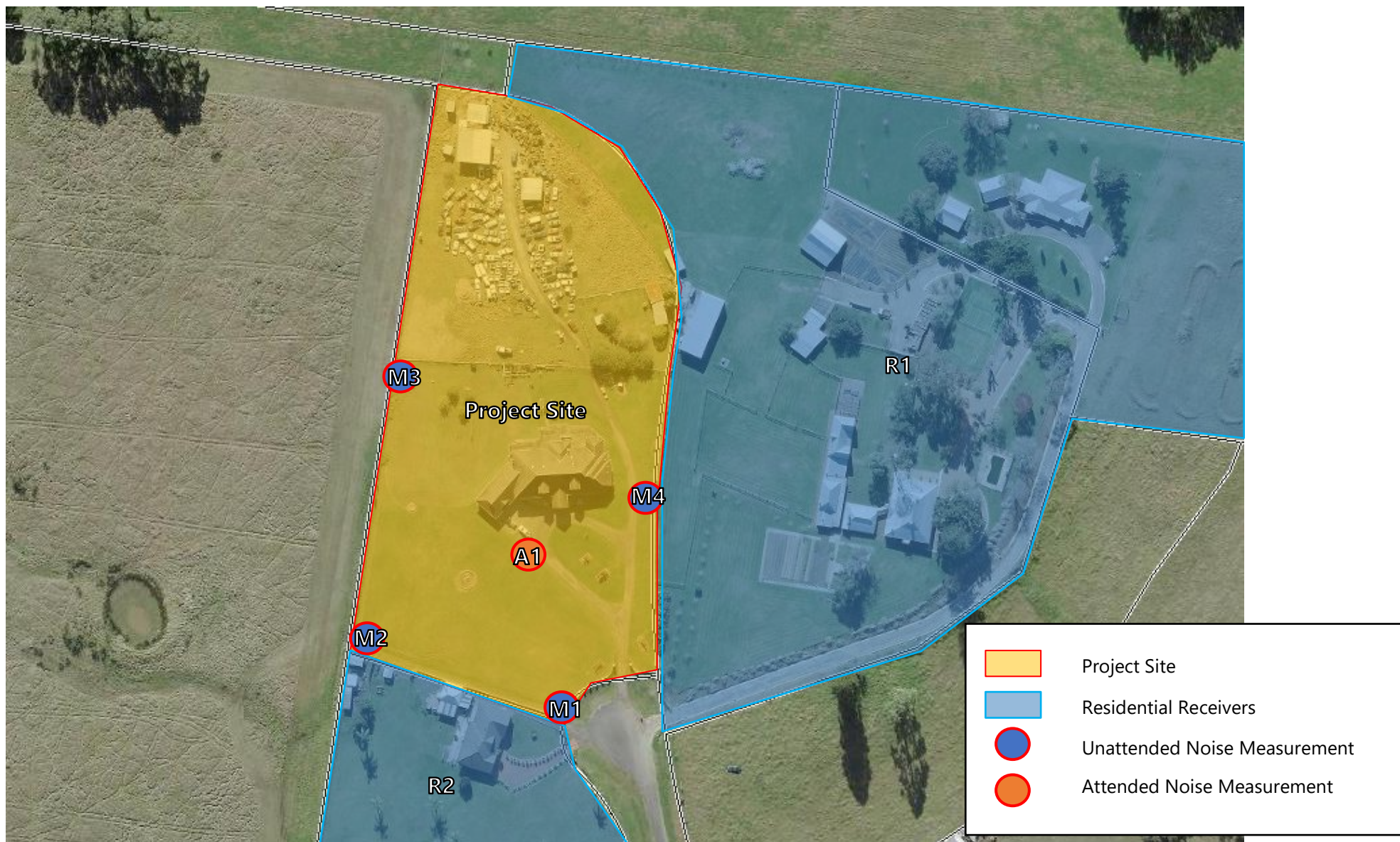
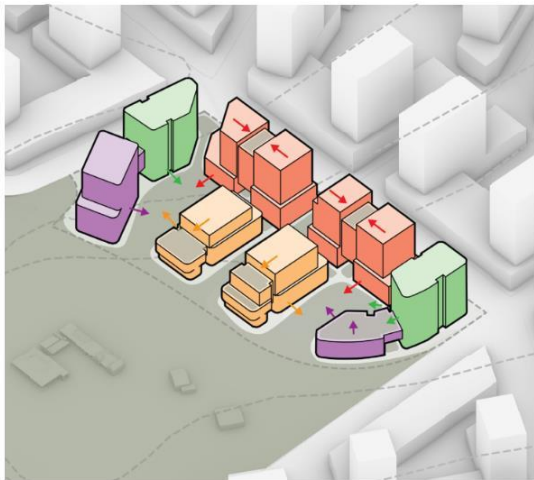


Figure 1: Aerial map of the project site and measurement locations. (sourced: SixMaps)

EVOLUTION

URBAN DESIGN - KEY PRINCIPLES



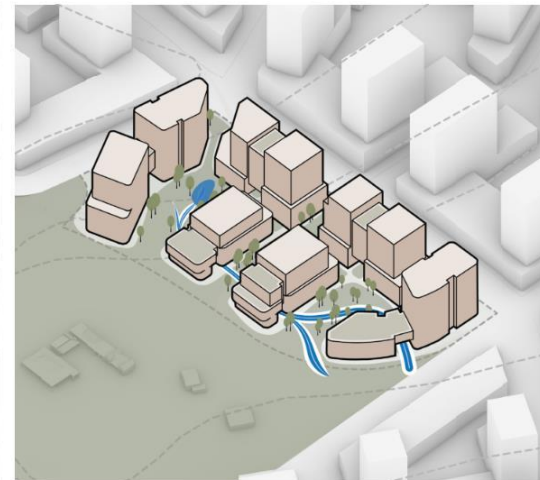
VILLAGE OF SHARED COMMUNITIES

Provide diverse typologies of buildings (shown in different colours) that respond to the immediate context, fostering smaller communities within the site by encouraging social interaction and shared spaces and amenities



MAINTAIN SIGHTLINES

Tiering of massing enables visual connection to greater context to Thompsons Creek and Cumberland Plains Woodlands



REJUVENATION OF BIOREGIONAL WOODLANDS

Reintroduce water body and local species as part of rejuvenation of native ecosystems

Figure 2: Design Excellence Report Prepared by DKO Architecture.

Development Summary

[illegible]

DISCLAIMER

This report is schematic only and subject to council and other requisite approval. Areas are not to be used for marketing purposes. This scheme has been prepared generally within the bounds of the current site dimensions however is subject to detailed discussion with council and hence may be subject to change once advice is received.

This design has been prepared without structural or services engineering inputs; hence is subject to change once advice is received.

The information contained herein is believed to be correct at time of preparation based on the information available at the time of preparation. Recipients must make their own investigations to satisfy themselves in all respects.

The design and accompanying documentation contained herein is and remains the intellectual property of 610 Architects (NSW) Pty.

[illegible]

Figure 3 :Development Summary prepared by DKO Architects

5 ABBREVIATIONS AND DEFINITIONS

The following Abbreviations and definitions are used in this noise impact assessment.

dB	Decibels - unit for the measurement of sound
dB(A)	A-weighted decibels. Unit of measurement for broadband sound with the A-frequency weighting applied to approximate human loudness perception to sounds of different pitch.
L_{eq}	Energy, time averaged sound level
L_{max}	Maximum sound pressure level, fast response
L₉₀	Sound level exceeded for 90% of the measurement period
R_w	Frequency weighted sound reduction index.
NRC	Average absorption co-efficient for the octave bands with centre frequencies of 250Hz to 2 kHz inclusive.
Day*	For noise emissions assessment - the period from 7 am to 6 pm (Monday to Saturday) and 8 am to 6 pm(Sundays and public holidays). For transportation noise - the period from 7 am to 10 pm
Evening*	Refers to the period from 6 pm to 10 pm.
Night*	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am(Sundays and public holidays). For transportation noise - the period from 10 pm to 7am
Project Trigger Level	Target receiver noise levels for a particular noise-generating facility.
Assessment Level (ABL)	Background A-weighted background noise level representative of a single period. (Calculated in accordance with NPfI unless noted otherwise)
Rating Background Level (RBL)	The overall, single-figure A-weighted background level representing each assessment period (day/evening/night) over the whole monitoring period. (Calculated in accordance with NPfI unless noted otherwise)

* Unless nominated otherwise.

6 AMBIENT NOISE SURVEY

6.1 UNATTENDED NOISE MONITORING

Unattended noise monitoring was undertaken to obtain the existing background noise levels which will help with establishing noise goals applicable to the site, thus ensuring the amenity is not adversely affected for both future residents and nearby developments.

6.1.1 Measurement Location

Four unattended noise monitors was installed within the project development. Due to the size of the development and the nature of receivers surrounding the site, it was important to understand the differences in noise levels around the boundary. Refer to Figure 1 for detailed locations of each monitor placed on site.

6.1.2 Measurement Period

The unattended noise monitoring was undertaken during between the 3rd November 2023 and 9th November 2023.

6.1.3 Summarised Background Noise Levels

Background levels have been calculated from the long term, unattended noise monitoring data. Refer to the Appendix B for the daily graphs.

The assessment and rating background levels have been determined based on the methodology in the Noise Policy for Industry Fact Sheet B. Periods affected by adverse weather conditions (as defined by NPfI Fact Sheet B) or extraneous noise are also indicated. Weather data was obtained from records provided by the Bureau of Meteorology for the weather station located at Badgerys Creek Weather Station.

The day, evening and night periods correspond to the NPfI guideline being:

- Day - period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
- Evening - the period from 6 pm to 10 pm
- Night - the remaining periods

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

Table 3 – Rating Background Noise and Traffic Noise Level Summary

Location	Time of day	Rating Background Noise Level dB(A)_{L90(Period)}
M1 – South East	Day (7am – 6pm)	31
	Evening (6pm – 10pm)	37 (31*)
	Night (10pm – 7am)	29
M2 – South West	Day (7am – 6pm)	30
	Evening (6pm – 10pm)	34 (30*)
	Night (10pm – 7am)	26
M3 – North West	Day (7am – 6pm)	30
	Evening (6pm – 10pm)	37 (30*)
	Night (10pm – 7am)	26
M4 – North East	Day (7am – 6pm)	30
	Evening (6pm – 10pm)	36 (30*)
	Night (10pm – 7am)	29

**Background noise levels have been corrected based on the NPfl 2017 requirements for ambient noise monitoring where the evening and night period cannot be higher than the daytime noise levels. Elevated evening levels during the monitoring period are most likely to be due to insect activity.*

6.2 ATTENDED NOISE MEASUREMENTS

Attended noise measurements were conducted by this office to supplement the unattended noise monitoring data. The attended noise measurements were conducted on 3rd November between 11:00am to 12:00pm. Measured noise levels are detailed in Table 4 below.

6.2.1 Measurement Position

Attended noise measurement were undertaken at **A1** as marked up in Figure 1 above.

6.2.2 Measurement Equipment

The measurement was 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.

6.2.3 Measured Noise Levels

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

Table 4– Measured Attended Noise Measurements

Project Site	Time of day	Measurement Location	Measured Noise Level dB(A)_{Leq(15min)}
40 The Retreat, Bringelly	3 rd November (11:00am to 12:00pm)	A1	41

7 NOISE INTRUSION ASSESSMENT

External noise intrusion into the development shall comply with the requirements of the following documents:

- Planning Secretary Secretary's Environmental Assessment Requirements (SEARs) (SSD – 65729209).
- Australian and New Zealand AS/NZS 3671:1989 'Acoustics—Road traffic noise intrusion—Building siting and construction'; and
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.

7.1 NOISE INTRUSION CRITERIA

7.1.1 SEARS Requirements

There are no specific noise criteria established from the SEARS document issued. Therefore, this assessment will utilise AS3671:1989 and AS2107:2016 standards concurrently as a design guideline for noise intrusion from external noise factors.

7.1.2 Australian and New Zealand AS/NZS 3671:1989 'Acoustics—Road traffic noise intrusion — Building siting and construction'.

Australian Standard AS 3671-1989 notes the following in relation to traffic noise:

- Internal noise levels should be determined in accordance with the relevant standard.
- Australian Standard AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors', is the industry adopted standard.
- A suitable descriptor should be adopted relevant to the use of the development. As AS2107:2016 adopts the L_{eq} descriptor, AL shall also use this descriptor.
- AS3671 does not specifically recommend a time interval. On this basis, AL 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).

Internal noise levels have been selected in accordance with AS 2107:2016.

7.1.3 Australian Standard AS/NZS 2107:2016

The Australian Standard AS/NZS 2107:2016 provides a recommendation of design sound levels and reverberation times for various types of building. For this development, it would be classified as residential suburban area. The recommended design sound levels for this development adopts the upper limit of the recommended design levels which are presented in the Table below.

Table 5 – AS/NZS 2107:2016 Recommended Design Sound Levels

Type of occupancy / activity	Design Sound Level ($L_{Aeq,t}$) range
Living Areas	30-40
Sleeping Areas (night-time)	30-35

7.1.4 Summary of Criteria

The governing criteria for the project site are presented in the Table 6 below.

Table 6 – Summary of Internal Noise Level Criteria

Space/Activity Type	Internal Traffic Noise Criteria dB(A) _{Leq(period)}
Sleeping Areas	35dB(A) _{Leq(night)}
Living Rooms	40dB(A) _{Leq(day)}

7.2 FUTURE TRAFFIC NOISE LEVELS

The current site does not have any major roadways in the vicinity, however future development includes provision for several new local and collector roadways surrounding the site – as part of the future development, noise impacts from future traffic needs to be considered. Noise modelling using SoundPlan was conducted in accordance to the traffic report prepared by TTP Transport Planning and the Transport Management Accessibility Plan Report by Western Parkland City Authority. (See Appendix A for the SoundPlan figures).

In the later document, it presents the estimated number of vehicles to be 600 vehicles travelling northbound during AM peak hours and 900 Vehicles travelling southbound during PM peak hours in 2036.

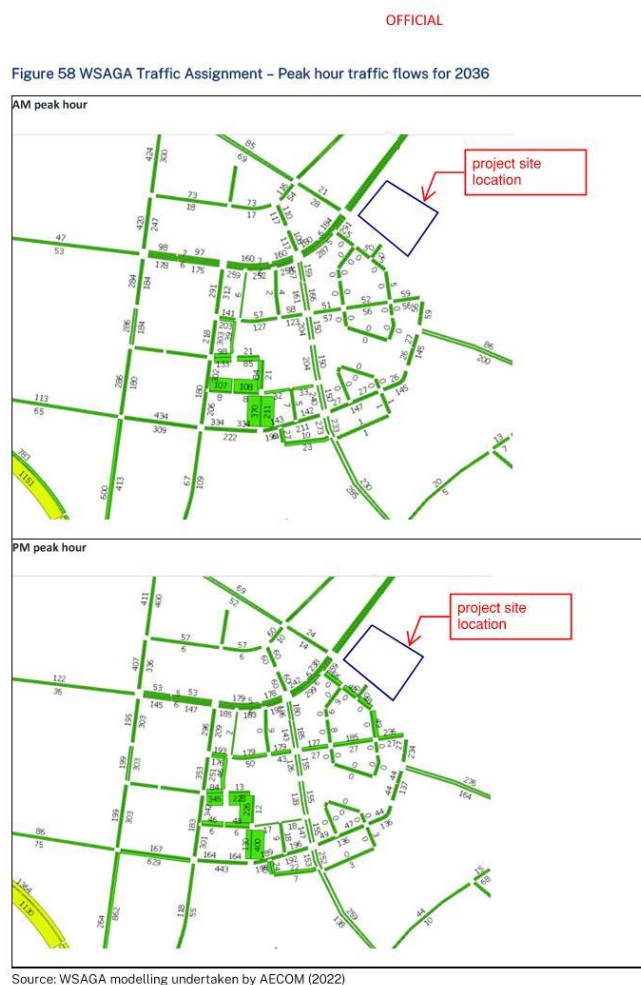


Figure 5: Peak Hour Traffic Flows for 2036 based on the Transport Management Accessibility Plan Report

Meanwhile in the traffic report prepared for the development, the preliminary traffic generation estimation are as follows:

Land Use	Size	Trip Rate		Trip Generation Estimate	
		AM Peak	PM Peak	AM Peak	PM Peak
Residential	541 Units	0.53 vehicle trips per unit	0.32 vehicle trips per unit	287	173
Retail	437m ²	2.3 vehicle trips per 100m ²	4.6 vehicle trips per 100m ²	10	20
Total				297	193

Figure 6: Estimated Traffic Volume from the Development (TTP Transport Planning).

A summary of the total number of vehicle movements during AM and PM peak hours have been presented in the table below. However, we note that,

- This is assuming that that 95% are lightweight/passenger vehicles and the remaining 5% are heavy vehicles moving in both directions per hour.
- Vehicles are moving at a speed limit of 60km/h.

An overall view of the map showing the location of roads can be seen in Figure 4 above.

Table 7 -Traffic Numbers for Each Road Surrounding the Development

Road Name	AM Peak	PM Peak
Local Street	772	590
Collectors Road	449	345
Unnamed Road (on the west)	320	216

The traffic numbers of each road is based on the numbers of vehicles predicted during peak hour for each road in 2036 and the estimated total number of vehicle movements from TTP's traffic report.

7.2.1 Traffic Noise Results

Please refer to Appendix A below for the SounPlan results as shown from Figure 7 through Figure 12.

In general, traffic generation from future transport planning will mostly affect the northern and north west buildings (i.e. Building A and B). And as the buildings progress further down south along collectors road, the traffic noise levels decreases as well.

Notwithstanding, the recommended façade constructions will be taking this into account ensuring that the internal spaces maintain an amenity level as shown in Section 7.1.4 above.

8 COMPLYING MITIGATION AND CONTROLS

The following treatment and controls are indicated for the proposed development to comply with the nominated assessment criteria. We note that road alignments, traffic routes and volumes through the precinct are still being finalised, which may alter the level of impact to the various façades of the development. As such, the below assessment is based on current available information and indicates a conservative approach.

We recommend that as road design and traffic assessments are finalised, the below assessment of traffic noise impact is reviewed for acoustic compliance. Ideally, direct measurement of noise levels along future roadways would be incorporated into this assessment, however traffic volumes at the time of construction may not allow for accurate assessment.

8.1 BUILDING ENVELOPE

The assessment indicates that the building envelope is required to be upgraded beyond what is considered to be a “standard” form of construction to comply with the internal noise criteria.

8.1.1 Glazed Windows and Doors

Acoustically rated external windows and doors are required. 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-Ion type (or equal) acoustic seals. (**Mohair Seals are unacceptable**). The suitability of alternative seal types should be determined to an appropriately qualified acoustic expert.

The complying constructions are listed below.

Table 8 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window	Acoustic Seals
12.38mm Laminated	37	Yes
10.38mm Laminated	35	
10mm Float	33	
6.38mm Laminated	31	
6mm Float	29	

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.

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 the following table. 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 9 – Minimum Glazing Constructions

Location	Facade	Space	Minimum Complying Glazing Construction	Acoustic Seals
Building A	North	Living	12.38mm Laminated	Yes
		Bedroom	10.38mm Laminated	
	East and West	Living	12.38mm Laminated	
		Bedroom	10.38mm Laminated	
	South	Living	10mm Float	
		Bedroom	6.38mm Laminated	
Building B	North	Living	10mm Float	
		Bedroom	6.38mm Laminated	
	West	Living	10mm Float	
		Bedroom	6.38mm Laminated	
	East	Living	6mm Float	
		Bedroom	6mm Float	
	South	Living	10mm Float	
		Bedroom	6.38mm Laminated	
Building C	All Facades	All Spaces	6mm Float	
Building D	All Facades	All Spaces	6mm Float	
Building E	North and West	Living	6.38mm Laminated	
		Bedroom	6.38mm Laminated	
	East and South	All spaces	6mm Float	
Building F	North and East	All spaces	6mm Float	
	West and South	Living	6.38mm Laminated	
		Bedroom	6.38mm Laminated	

8.1.2 External Wall Construction

Any external façade walls constructed from masonry system will not require further acoustic upgrading. In the event any penetrations are required through the external lining of any of the system for other building services, gaps should be filled with acoustic sealant (Selley's Pro Series Fire Block or CSR FireSeal) to ensure compliance with acoustic criteria stipulated within this report.

For external wall constructions which to be constructed from lightweight materials, the following construction is recommended.

Table 10 – External Light Weight Wall Construction

Site	Space	Internal Lining	Studwork System	External Lining
40 The Retreat Bringelly	All external facades	2 x 13mm Plasterboard	Minimum 90mm thick stud cavity with 75mm thick 14kg/m ³ glasswool insulation	9mm fibre cement sheet (equivalent to James Hardie 18mm thick FC Scyon Linea weatherboard)

8.1.3 External Roof/Ceiling Construction

Based on the architectural plans referenced, the roof construction is to be of masonry systems, therefore it will not require further acoustic upgrading.

9 NOISE EMISSION ASSESSMENT

9.1 NOISE CRITERIA

9.1.1 NSW EPA Noise Policy for Industry (NPfI) 2017

The NPfI code is used to assess mechanical services and plant noise. In Section 2.4.3 of the Noise Policy for Industry addresses the effect of changing land use. In the case of Bradfield City Centre, the further development of residential subdivisions surrounding 40 The Retreat will significantly affect the background noise levels. The following changes would be expected to impact the existing background noise levels;

When considering effects of changing use, the NSW EPA Noise Policy for Industry states the following:

When land uses in an area are undergoing significant change, for example, residential subdivision with associated development of local and regional roads, the background noise levels would be expected to change, sometimes significantly. The impact of noise from an existing industry on a proposed new residential area should be made using the recommended amenity noise level for the residential land use, not the project intrusiveness level. Where impacts exceed the amenity noise level, consideration should be given to how these impacts can be avoided or mitigated, such as modifying the location of the proposed residential development, placing screening land uses in-between the proposed residences and existing industry, or ensuring residences are built in a manner that provides acceptable indoor noise amenity.

Considering the above, noise emission requirements as detailed in the Noise Policy for Industry will be determined with reference to the amenity noise levels.

9.1.1.1 Project Amenity Noise Level Criteria

The intent of the amenity noise level is to limit the absolute noise level to that is consistent with the prevailing land use.

The EPA's NPI sets out acceptable noise levels for various localities based on land zoning. The recommended noise amenity area for the residential subdivision proposed surrounding the site would be 'suburban residential'.

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

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

The amenity levels appropriate for the receivers surrounding the project site are presented in the table below.

Table 11 – EPA NPI Project Amenity Noise Levels

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

9.1.2 Sleep Arousal Assessment

In addition to the above, the NSW EPA *NPfI* provides an assessment procedure for assessing any potential sleep arousal impacts for when any noise is generated between 10:00pm and 7:00am (i.e. night period). Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the *NPfI*, to assess potential sleep arousal impacts a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the *NPfI* states the following:
Where the subject development/premises night-time noise levels at a residential location exceed:
 - $L_{Aeq,15min}$ 40dB(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 greater,*a detailed maximum noise level event assessment should be undertaken.*
- Step 2 - If there are noise events that could exceed the average/maximum criteria detailed in the tables above, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA *NPfI*, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

For the research on sleep disturbance to date it can be concluded that:

- Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.
- One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.

9.2 MECHANICAL PLANT NOISE

The detailed plant selection plant selections have not been determined at this stage. Thus, a detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers, and enclosures.

Noise emissions from all mechanical services to the closest residential receiver should comply with the requirements of Section 6.1.1.

9.3 NOISE FROM COMMERCIAL SPACES

The proposed retail tenancies within Building B and E will be subjected to a separate acoustic assessment as the noise generation for the use will likely be associated to the number of patrons speaking and the use of background noise music.

- It is expected that compliance with relevant noise emission objectives is to be reviewed based on a separate planning approval as part of a fit-out development application subject to the specific operations of each individual commercial tenancy once operators have been determined. Tenancies are capable of achieving noise emission objectives provided the appropriate acoustic treatments and management controls are implemented for each specific application.
- If tenancies were to become licensed for the service of alcohol, this use would be subject to a separate planning application which would be accompanied by a noise impact assessment of the proposed use typical for Liquor and Gaming NSW. Acoustic treatments and management controls could be applied to these tenancies use to achieve the relevant noise emission requirements from internal activities (such as upgraded glazing); however, the use of external areas (if any) would be likely management of patron numbers/hours of use to achieve compliance.

10 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT PRELIMINARY ADVICE

A preliminary construction noise and vibration advice is provided in the following section, a detailed assessment is typically conducted once the proposed construction activities and equipment has been finalised. This assessment will present the relevant the noise management levels, and vibration criteria based on industry standards as follows:

- NSW EPA 'Interim Construction Noise Guideline' (ICNG)
- Australian Standard AS2436:2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites"
- DIN4150, 'Vibration in Buildings (2016-12)
- EPA "Assessing Vibration: A Technical guideline".

10.1 EPA INTERIM CONSTRUCTION NOISE GUIDELINE

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

- Determination of noise generation goals (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest receivers. As the surrounding receivers are Industrial, the following management levels applies.

Table 12– Summarised Noise Management Levels

Receivers	Noise Management Level – dB(A)$L_{eq}(15min)$ RBL + 10	Highly Noise Affected level dB(A)$L_{eq}(15min)$
Residential	45*	75

*Note – EPA minimum noise level for daytime period, plus 10dB(A)

If noise levels exceeded the management levels identified in the table above, reasonable and feasible noise management techniques will be reviewed.

10.2 VIBRATION CRITERIA

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 criteria 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.

10.2.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (2016-12) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (2016-12) are presented in Table 3.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle v-ocities 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 13– DIN 4150-3 (2016-12) 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

The surrounding industrial receivers would be classified under **Type 2** structure above.

10.2.2 Assessing Amenity

The NSW EPA document “Assessing Vibration: A Technical Guideline” provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity.

Relevant criteria are presented below.

Table 14– EPA Recommended Vibration Criteria

		RMS acceleration Z-axis (m/s ²)		RMS velocity Y-axis (m/s ²)		Peak velocity X-axis (m/s ²)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.010	0.020	0.0071	0.014	0.0071	0.014
	Night-time	0.007	0.014	0.005	0.010	0.005	0.010
Impulsive Vibration							
Residences	Daytime	0.30	0.60	0.21	0.42	0.21	0.42
	Night-time	0.10	0.20	0.071	0.14	0.071	0.14

10.3 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

For this project, the most significant sources of noise or vibration generated during construction will be 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 15 - Sound Power Levels of the Typical Equipment

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

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

- Table A1 of 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).

10.4 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 16 – Predicted Noise Generation to Residential Receivers South of Site

Activity	Predicted Level dB(A) $L_{eq}(15min)$ (External)	Comment
Concrete Pump	76-90	Exceeds Highly Noise Affected Level (HNAL)
Trucks	66-80	Exceeds NAML, Exceeds HNAL when close to site boundaries
Bobcat	71-85	Generally exceeds HNAL
Crane/hoist (electric)	51-65	Exceeds NAML, below HNAML at all times.
Powered Hand Tools (Externally)	61-75	Exceeds NAML, below HNAML at all times.

10.5 DISCUSSION – NOISE

Without mitigation noise at the sensitive receivers around the site will exceed the highly noise affected level. In general, there won't be significant demolition as the current site is mostly consists of agricultural lands. Ground works are expected to establish the basement levels. During structural works, concrete pumps are anticipated to generate the highest noise impact.

10.6 DISCUSSION - VIBRATION

Given the distance from nearby receivers, vibration impacts to all receivers are expected to be minimised or within the recommended levels.

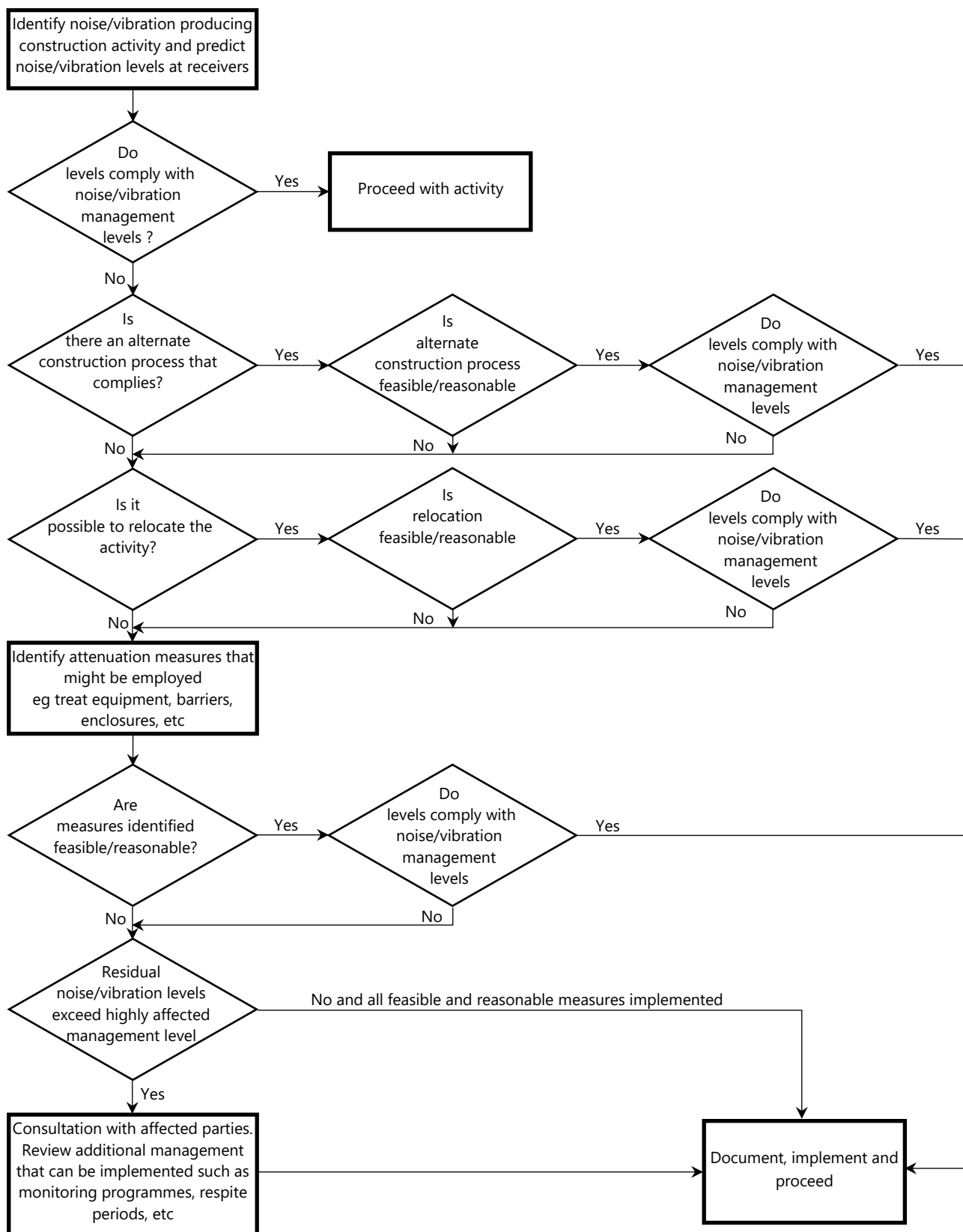
10.7 RECOMMENDATIONS

In light of the above, the following recommendations are made:

- 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.
- Quiet work methods/technologies:
 - Materials handling/vehicles:
 - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of neighbours.
 - Avoid careless dropping of construction materials into empty trucks.
 - Trucks, trailers and concrete trucks (if feasible) should turn off their engines during idling to reduce noise impacts (unless truck ignition needs to remain on during concrete pumping).
- Complaints handling - In the event of complaint, the procedures outlined in Sections 10.8 and 10.9 should be adopted.
- 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 noise complaint.

10.7.1 Assessment Methodology and Mitigation Methods

The flow chart that follows illustrates the process to be followed to minimise the impact associated with these activities.



10.8 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.

10.8.1 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.

10.8.2 Acoustic Barriers

Given the position of adjacent development, it is unlikely that noise screens will provide significant acoustic benefit for commercial or residential 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.

Barriers can also be placed between the source and the receiver.

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 effected. 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.

10.8.3 Material Handling

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

10.8.4 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.

10.8.5 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.

10.8.6 Combination of Methods

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

10.9 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.

11 CONCLUSION

Acoustic Logic have undertaken noise and vibration impact assessment In accordance with section 4.39 of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*, Secretary's Environmental Assessment Requirements (SEARs) for SSD 65729209 issued on 18 December 2024. AL have utilised the following documents and regulations in the noise assessment of the development:

- Planning Secretary Secretary's Environmental Assessment Requirements (SEARs) (SSD – 65729209).
- Traffic Report prepared by TTP Transport Planning.
- Transport Management Accessibility Plan Report by Western Parkland City Authority.
- NSW Department of Environment and Heritage, Environmental Protection Authority document – '*Noise Policy for Industry (NPfl) 2017*'.
- Australian and New Zealand AS/NZS 3671:1989 'Acoustics—Road traffic noise intrusion—Building siting and construction'; and
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.
- NSW EPA 'Interim Construction Noise Guideline' (ICNG)
- Australian Standard AS2436:2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites"
- DIN4150, 'Vibration in Buildings (2016-12)
- EPA "Assessing Vibration: A Technical guideline".

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,



Acoustic Logic Pty Ltd
Samantha Wong

APPENDIX A: SOUNDPLAN NOISE MODELLING RESULTS

A.1: SoundPlan Modelling – Traffic Noise Generation for Future Roads

Noise levels have been predicted at the receiver locations using SoundPlan™ 8.0 modelling software implementing the ISO 9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation standard.

Noise enhancing meteorological effects have been adopted as recommended by the NPfI, noting that the ISO 9613 modelling approach assumes that all receivers are 'downwind' (i.e., that noise enhancing wind and temperature conditions are in effect at all times).

Ground absorption was conservatively calculated with a ground factor of 0 for all areas except for localised lawns and greenery with a ground factor of 0.6 as recommended in *Engineering Noise Control* (Bies & Hanson).

In line with Factsheet C of the NPfI, penalties for annoying noise characteristics should be applied at the receiver, where applicable. Based on the predicted noise levels, no penalty should be applied (either for tonality, intermittency, or otherwise).

Figure 7 through Figure 12 present the results of the SoundPlan Noise modelling, and they are summarised in the table below.



Figure 7: Traffic Noise Generation for Overall Site.

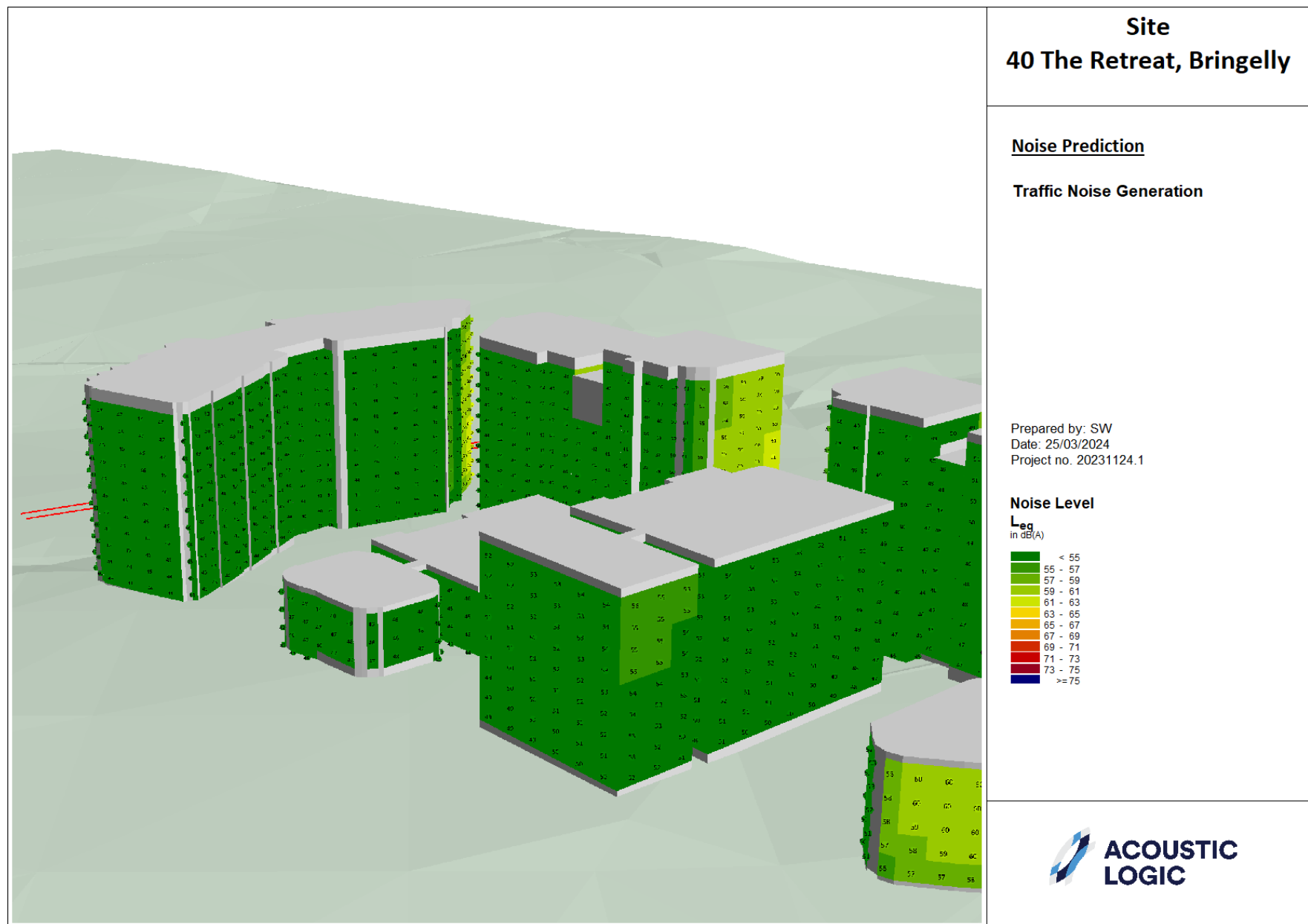


Figure 8: Traffic Noise Generation on the East.

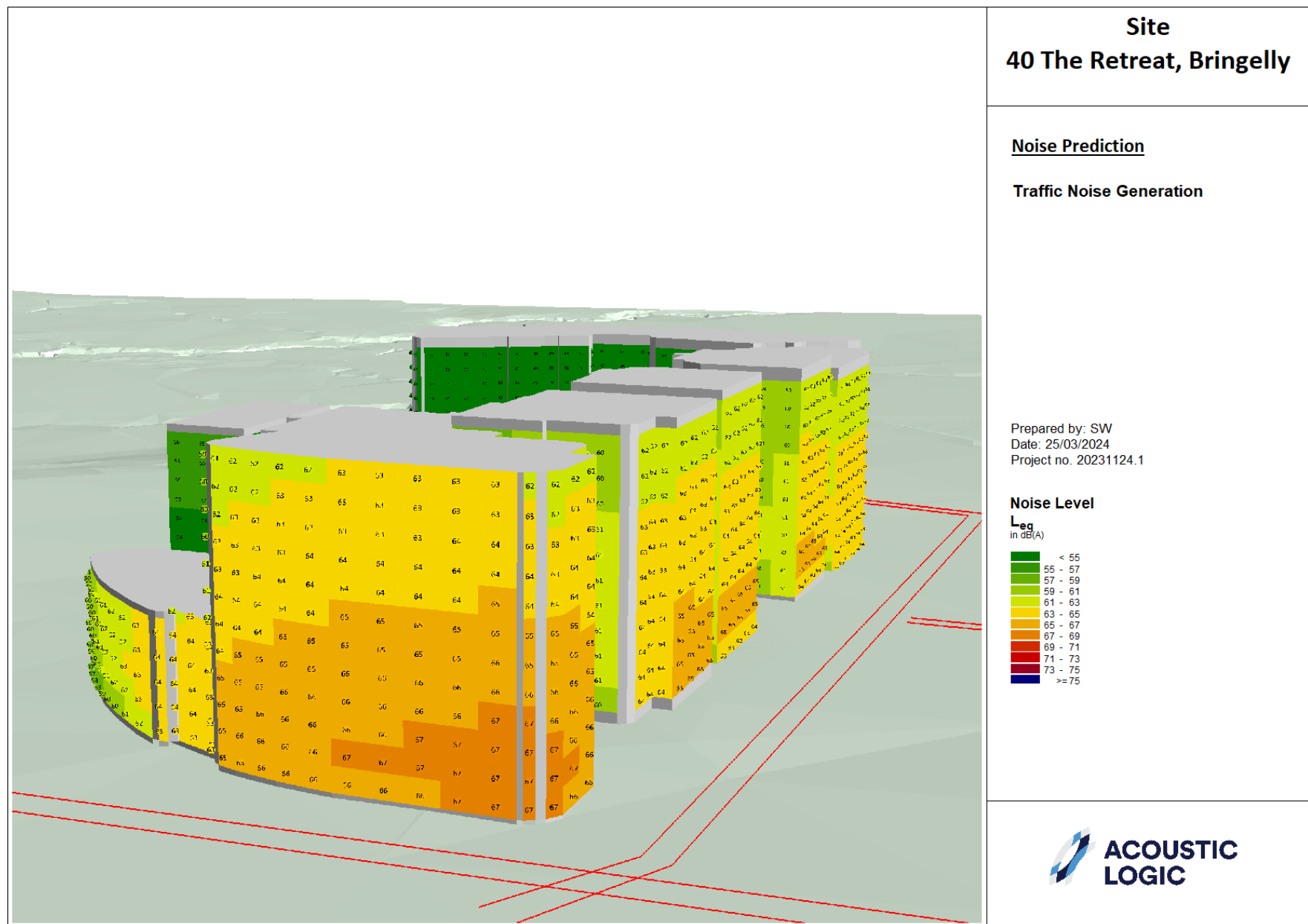


Figure 9: Traffic Noise Generation on the North and West.

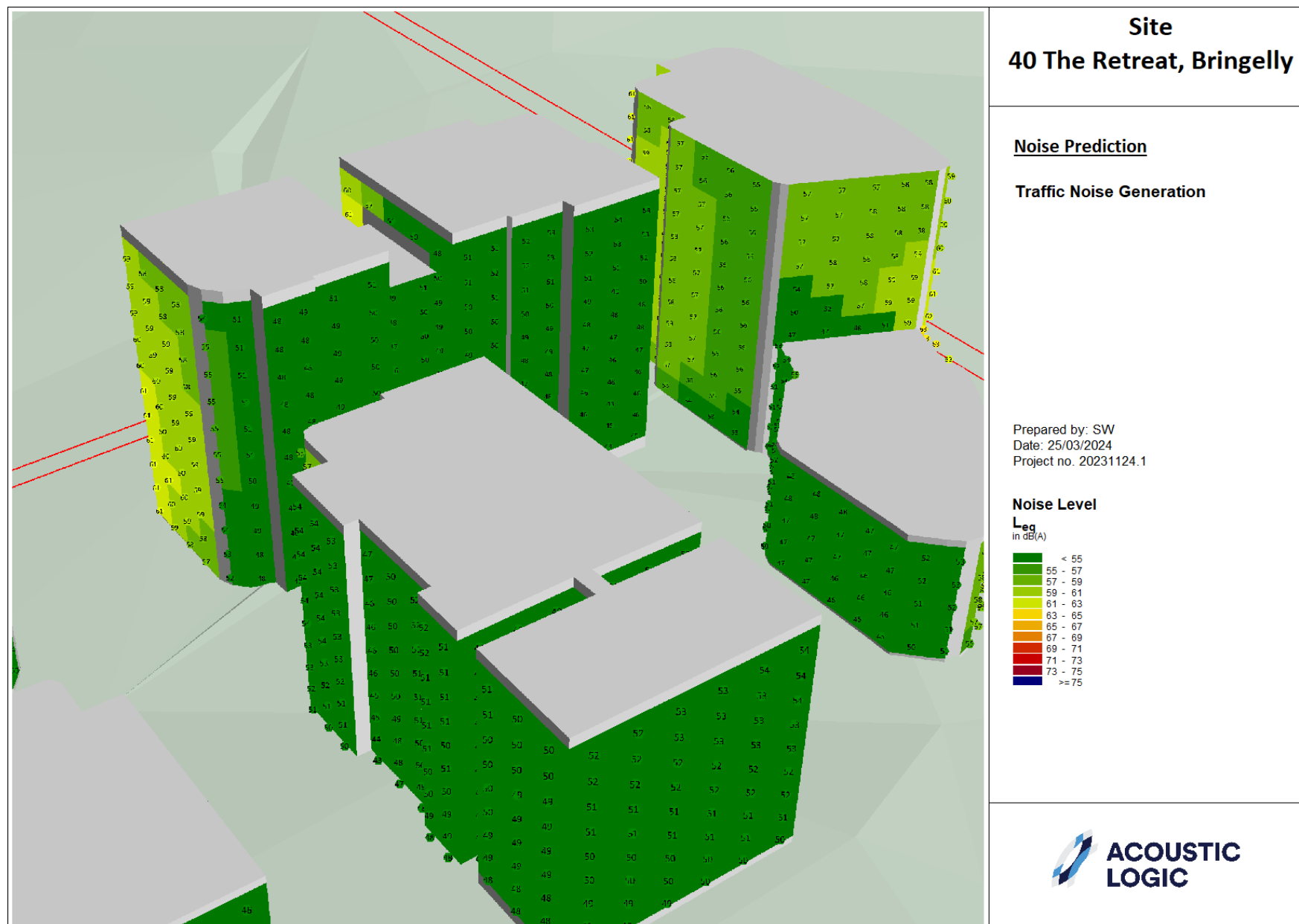


Figure 10: Traffic Noise Generation on the North and East Buildings.

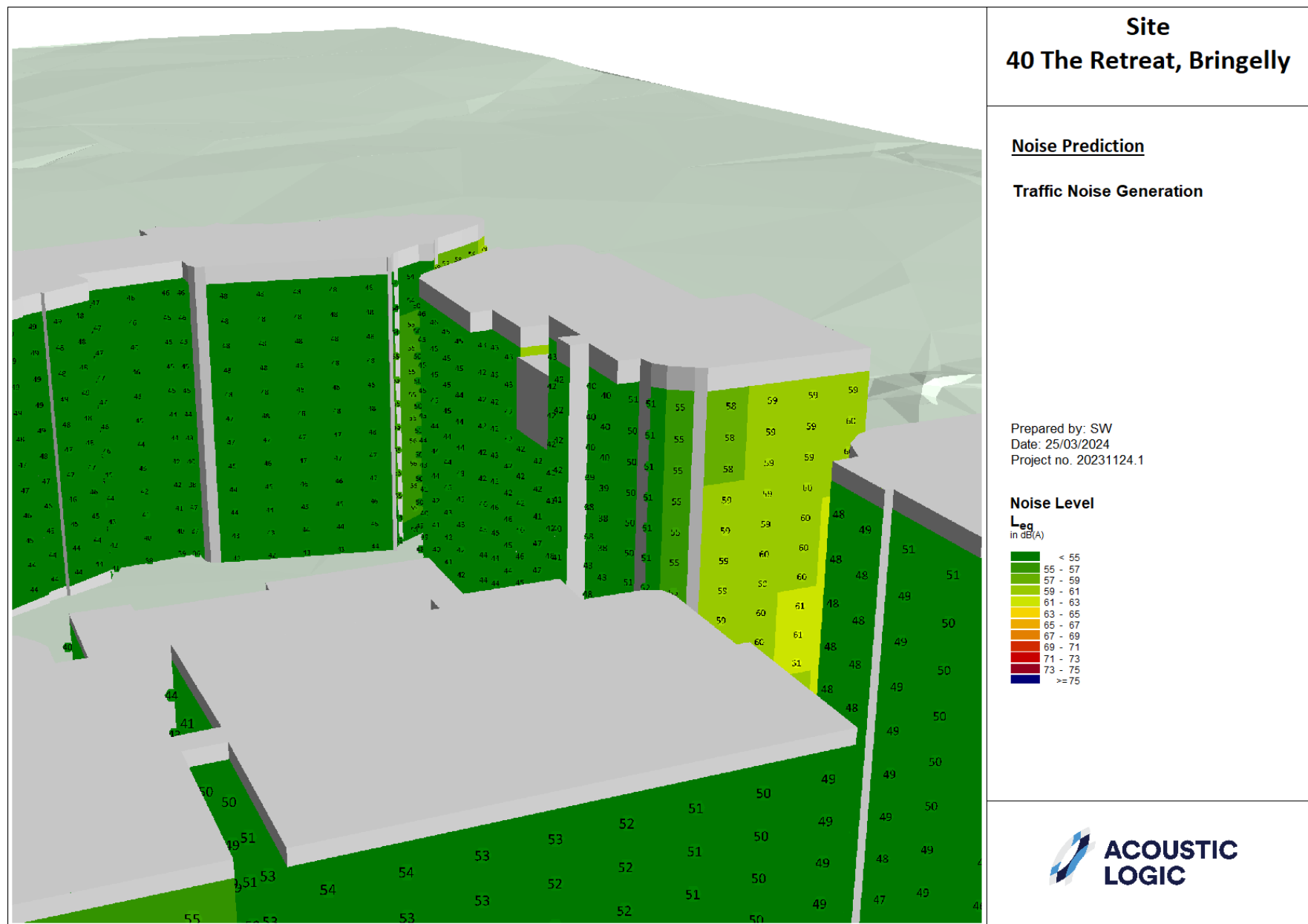


Figure 11: Traffic Noise Generation for South and East Buildings.

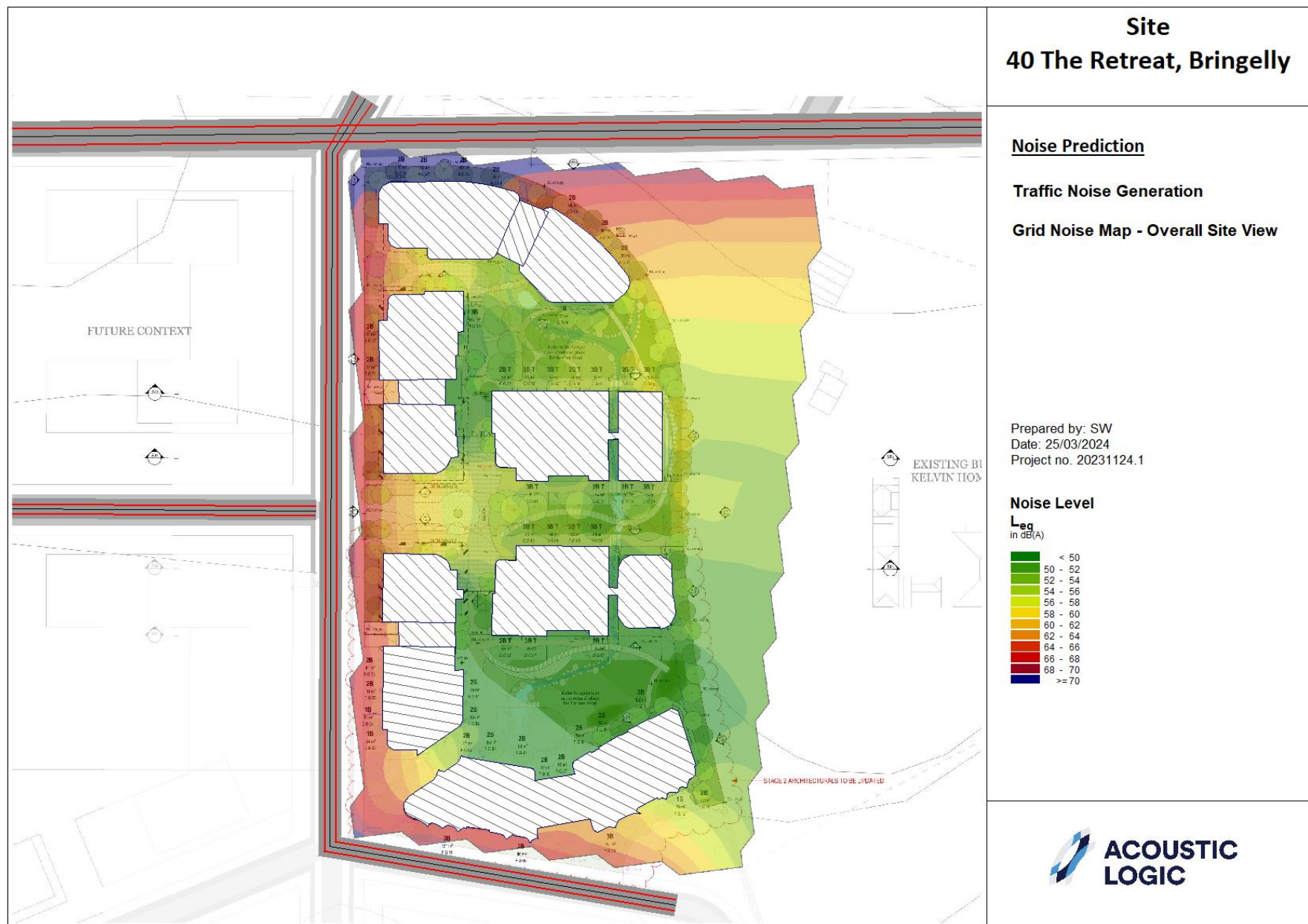
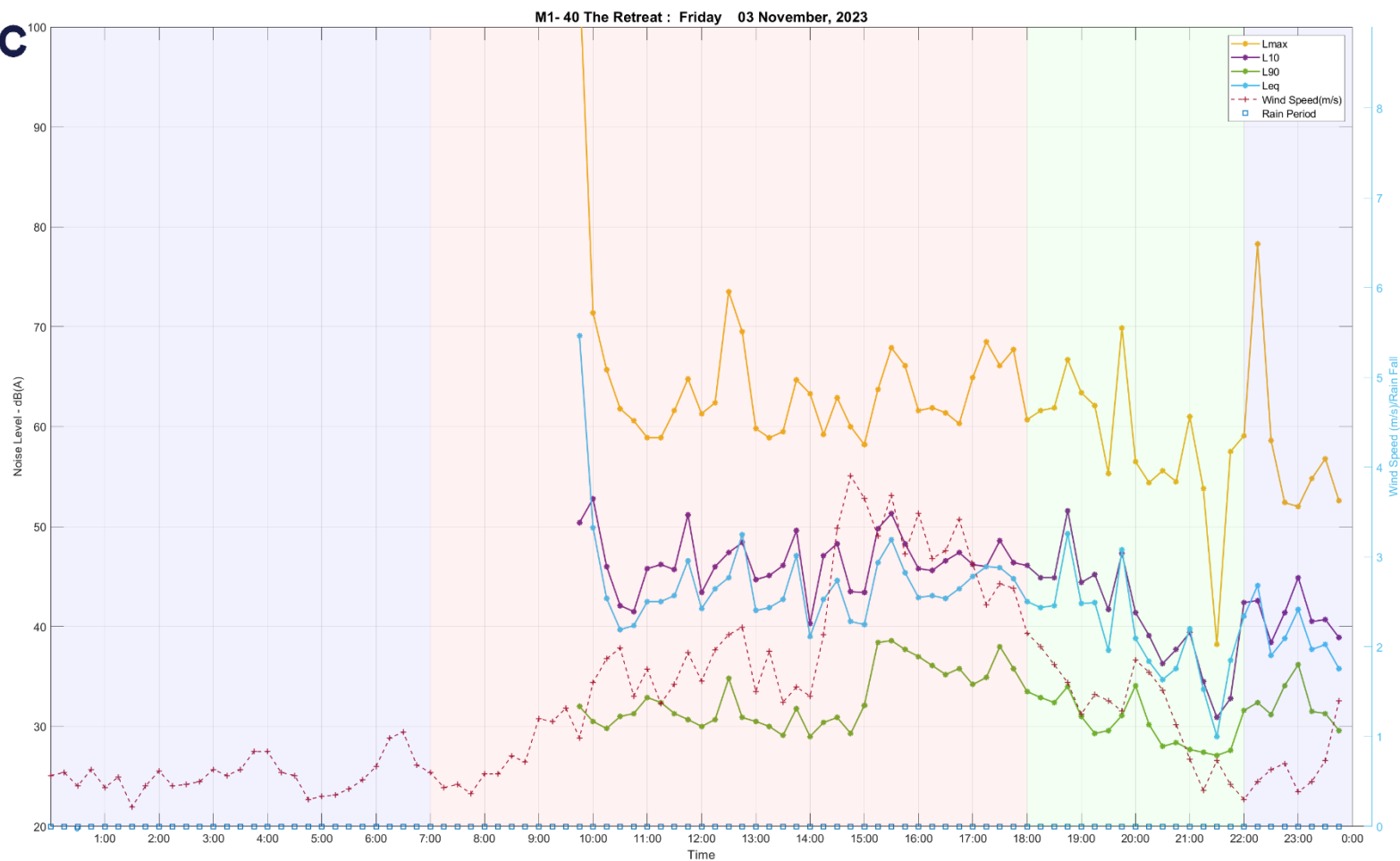
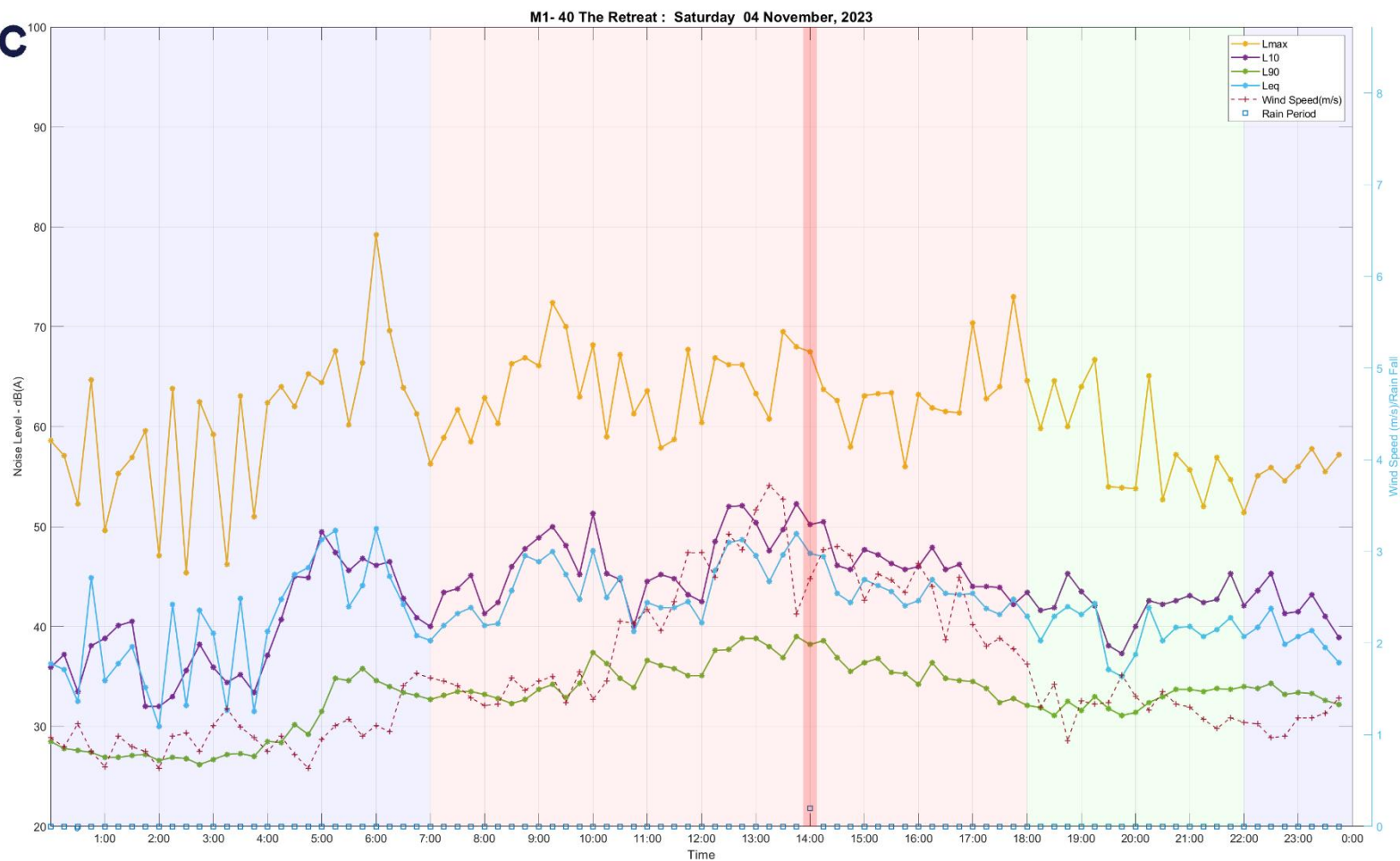
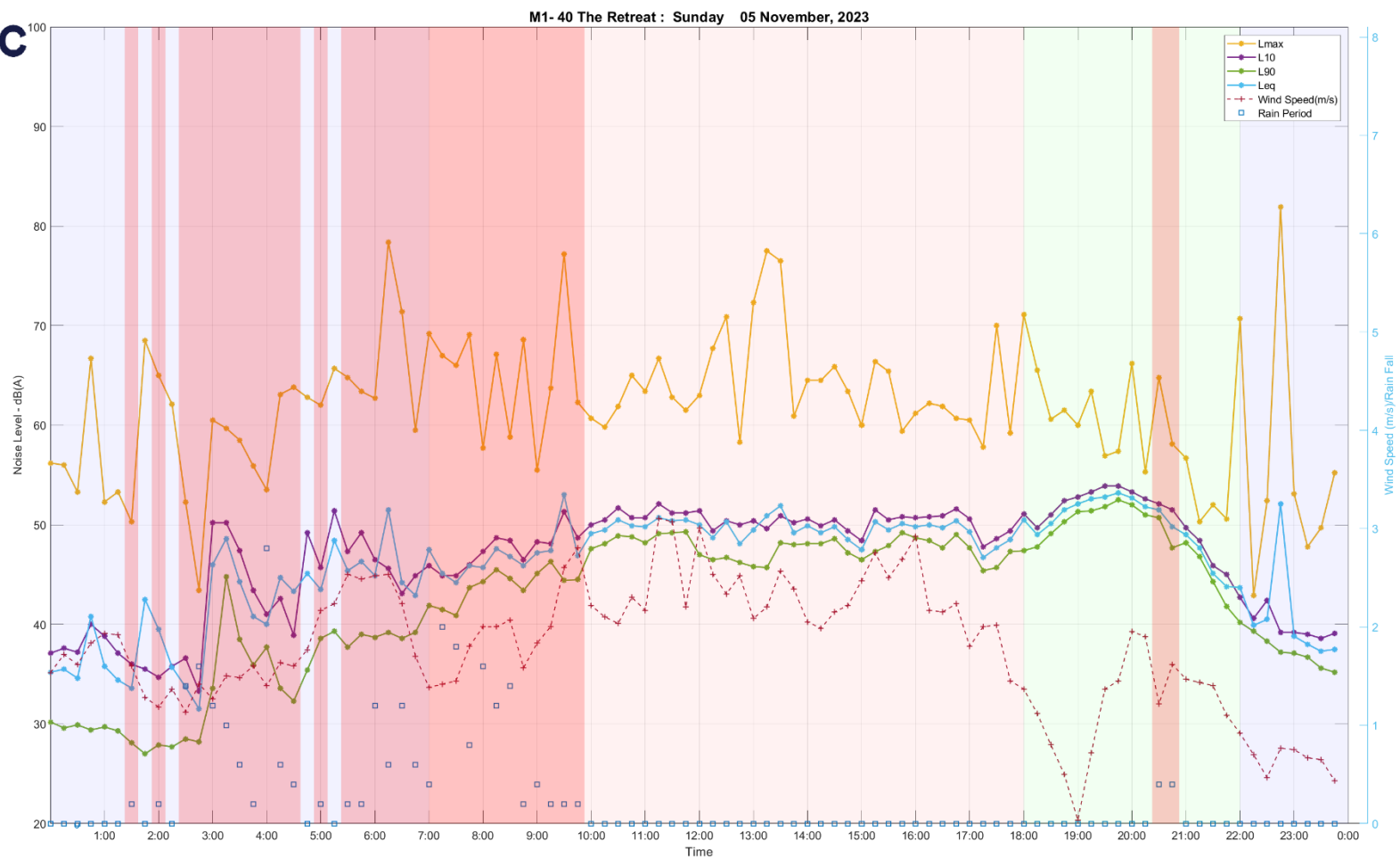


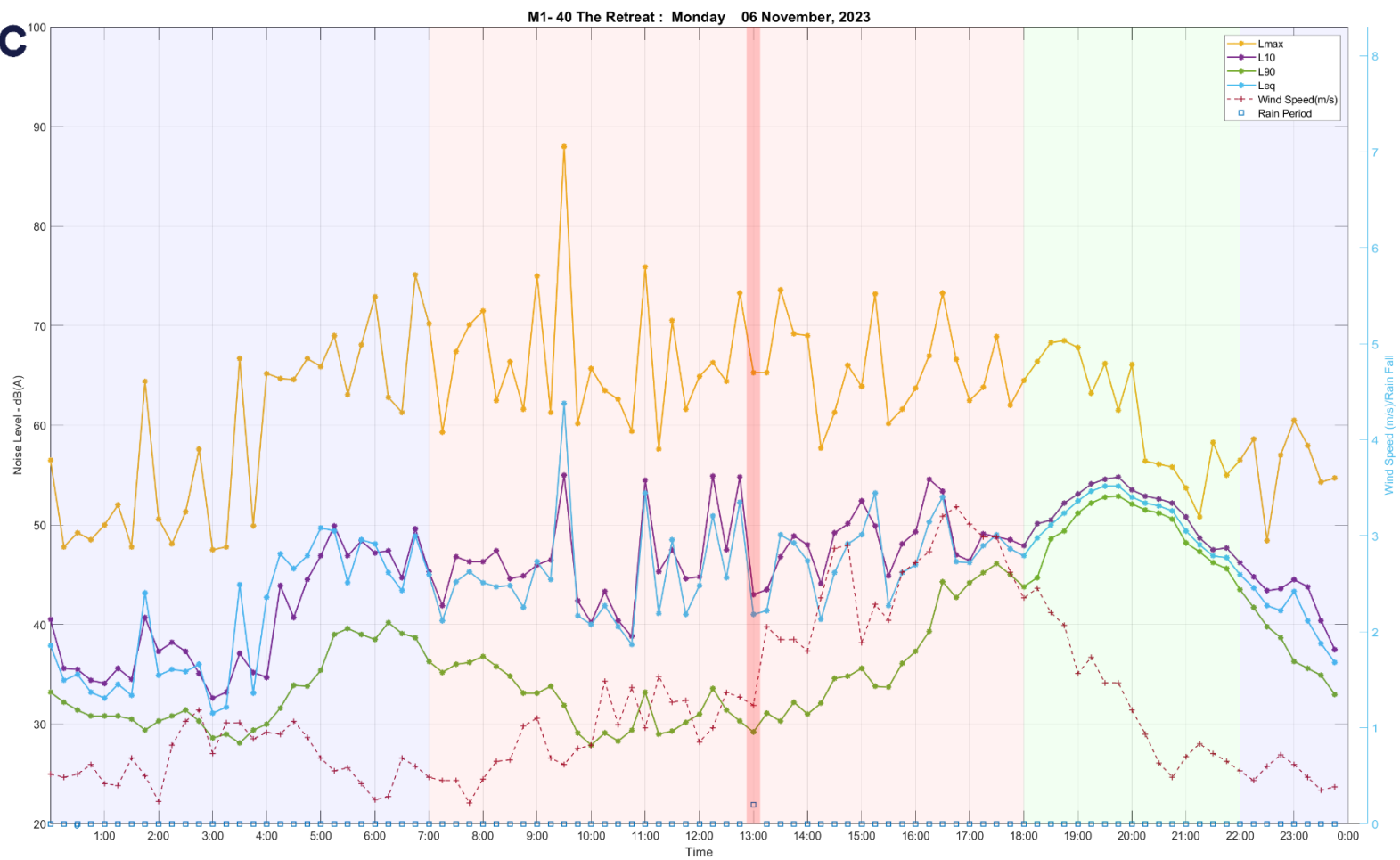
Figure 12: Grid Noise Map for the Overall Site.

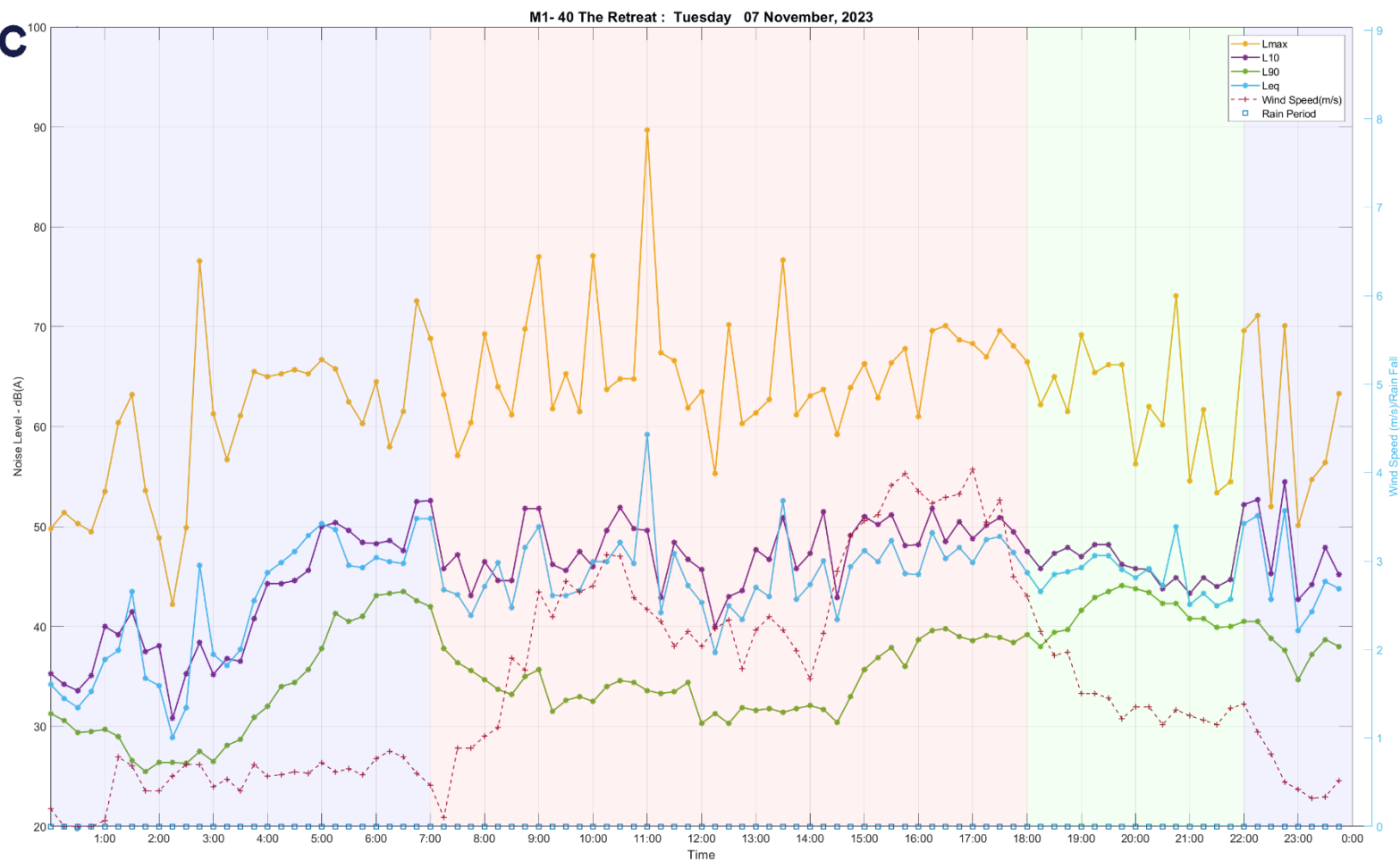
APPENDIX B: UNATTENDED NOISE MONITORING RESULTS (M1 – M4)

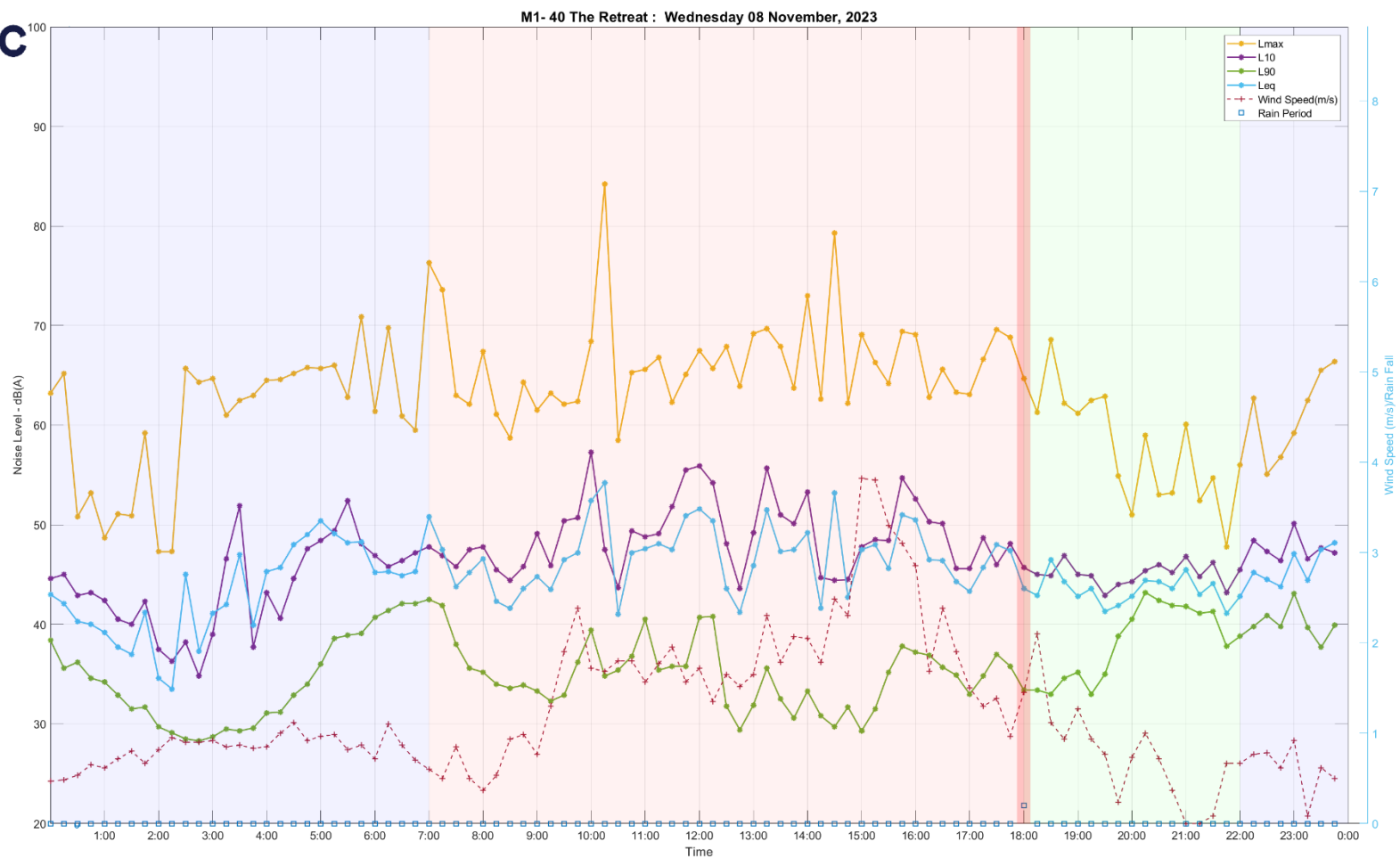


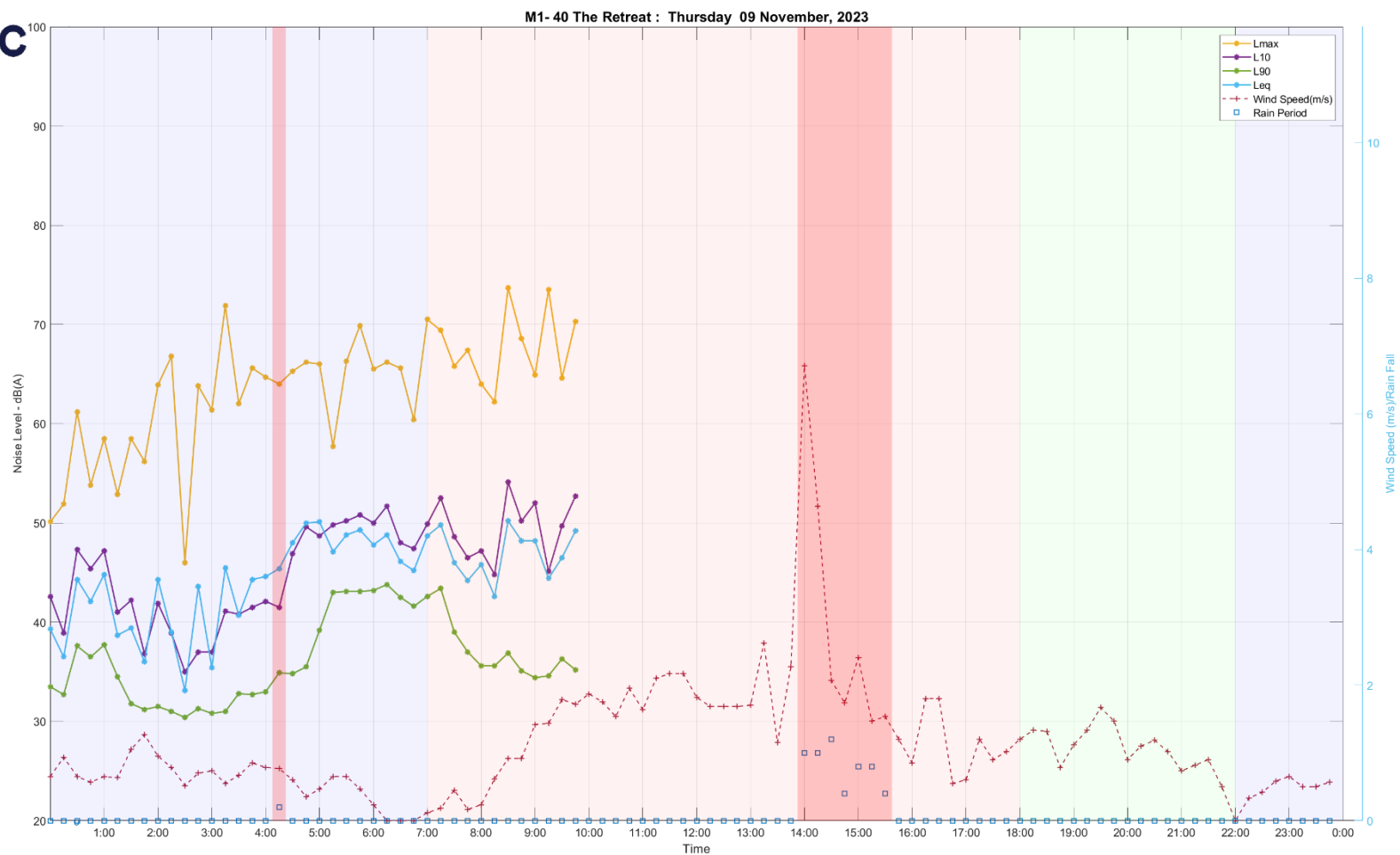




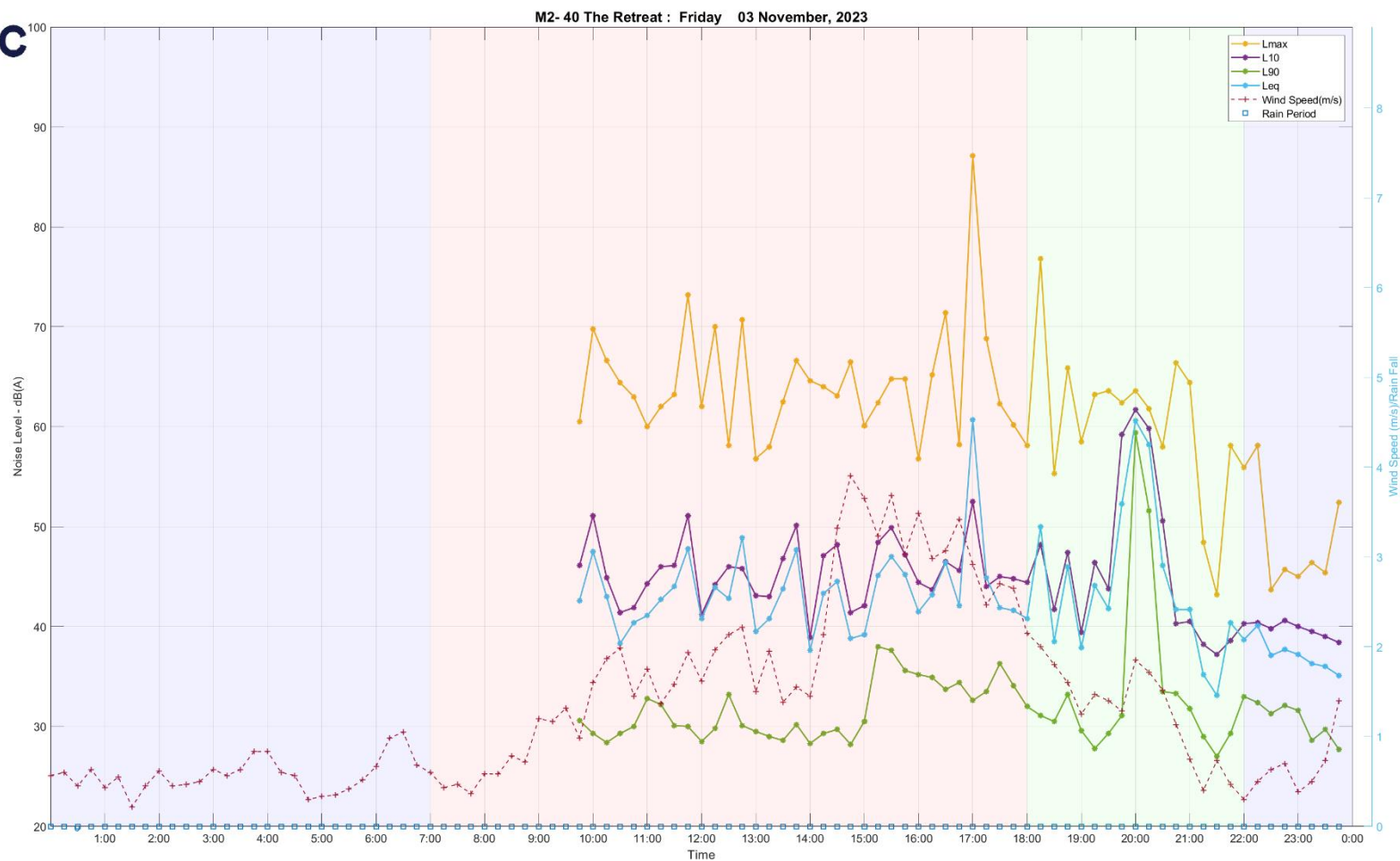


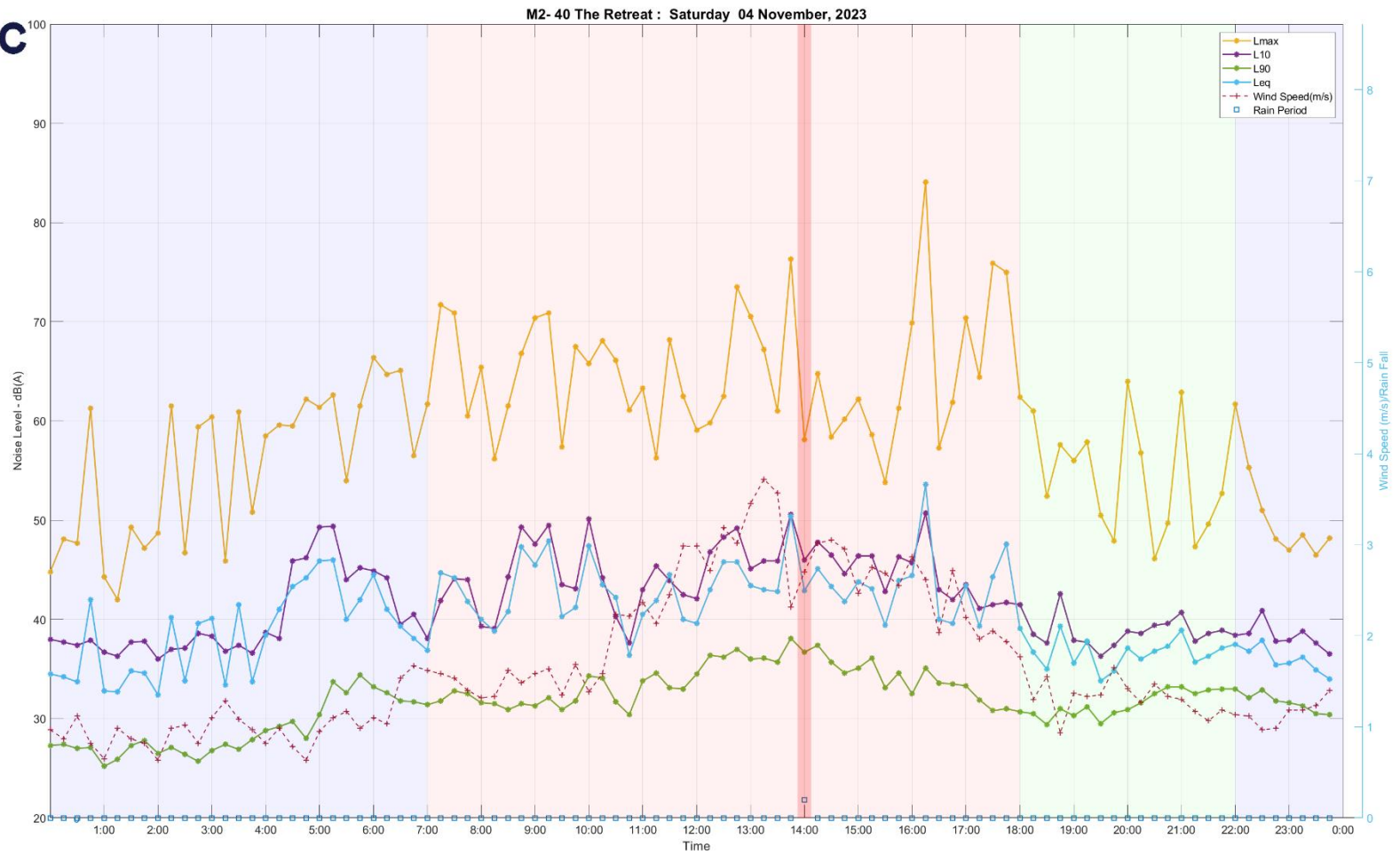


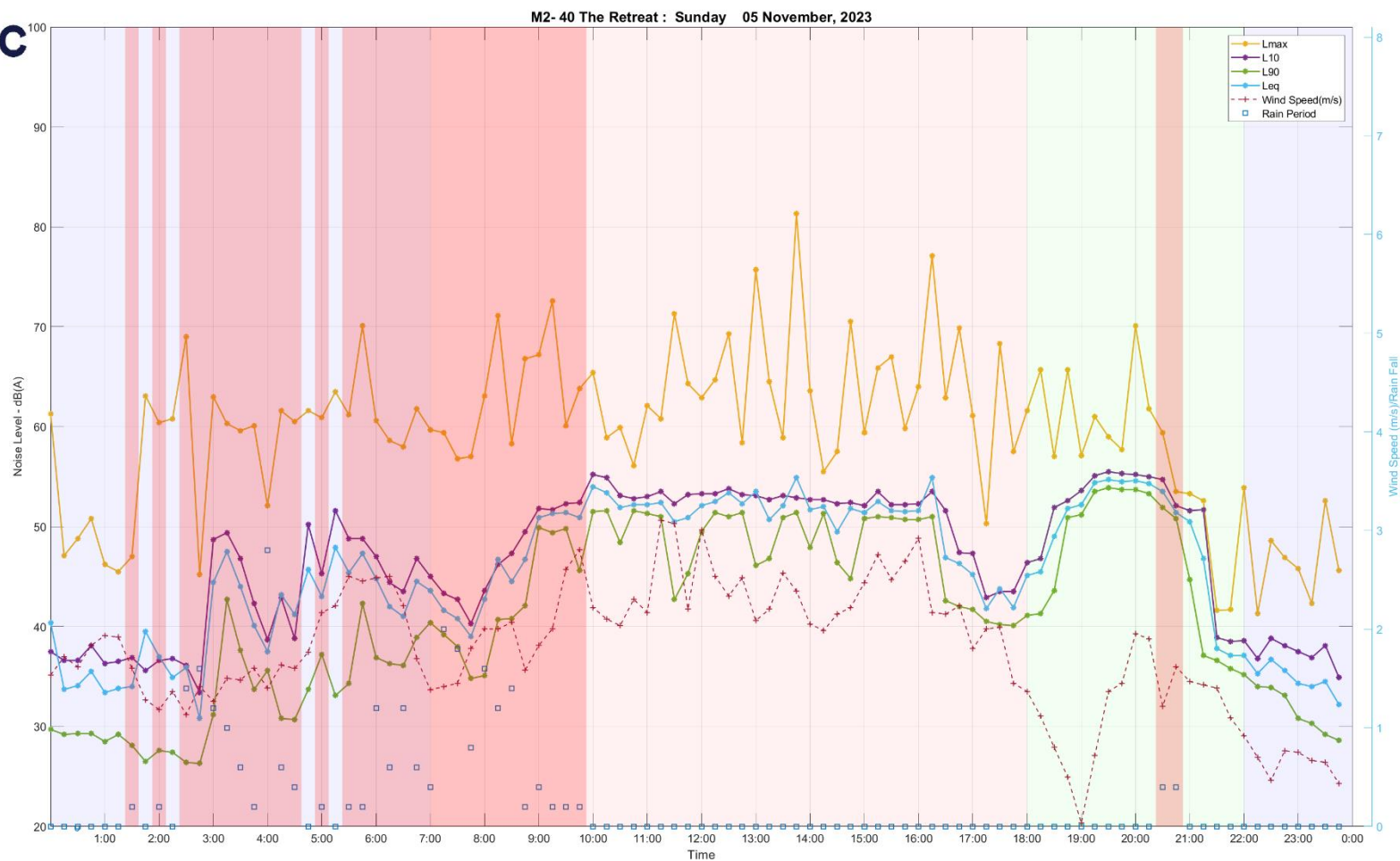


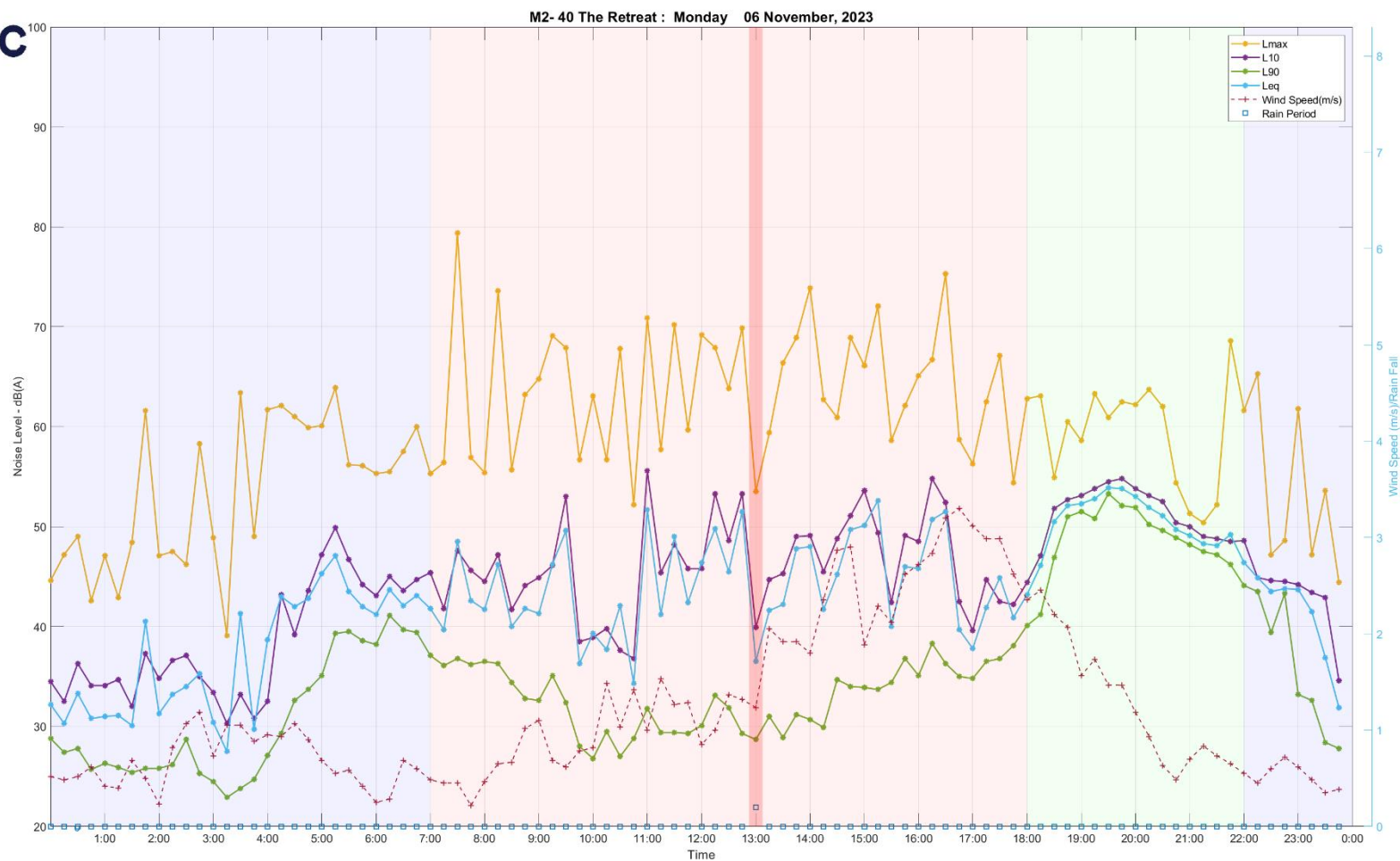


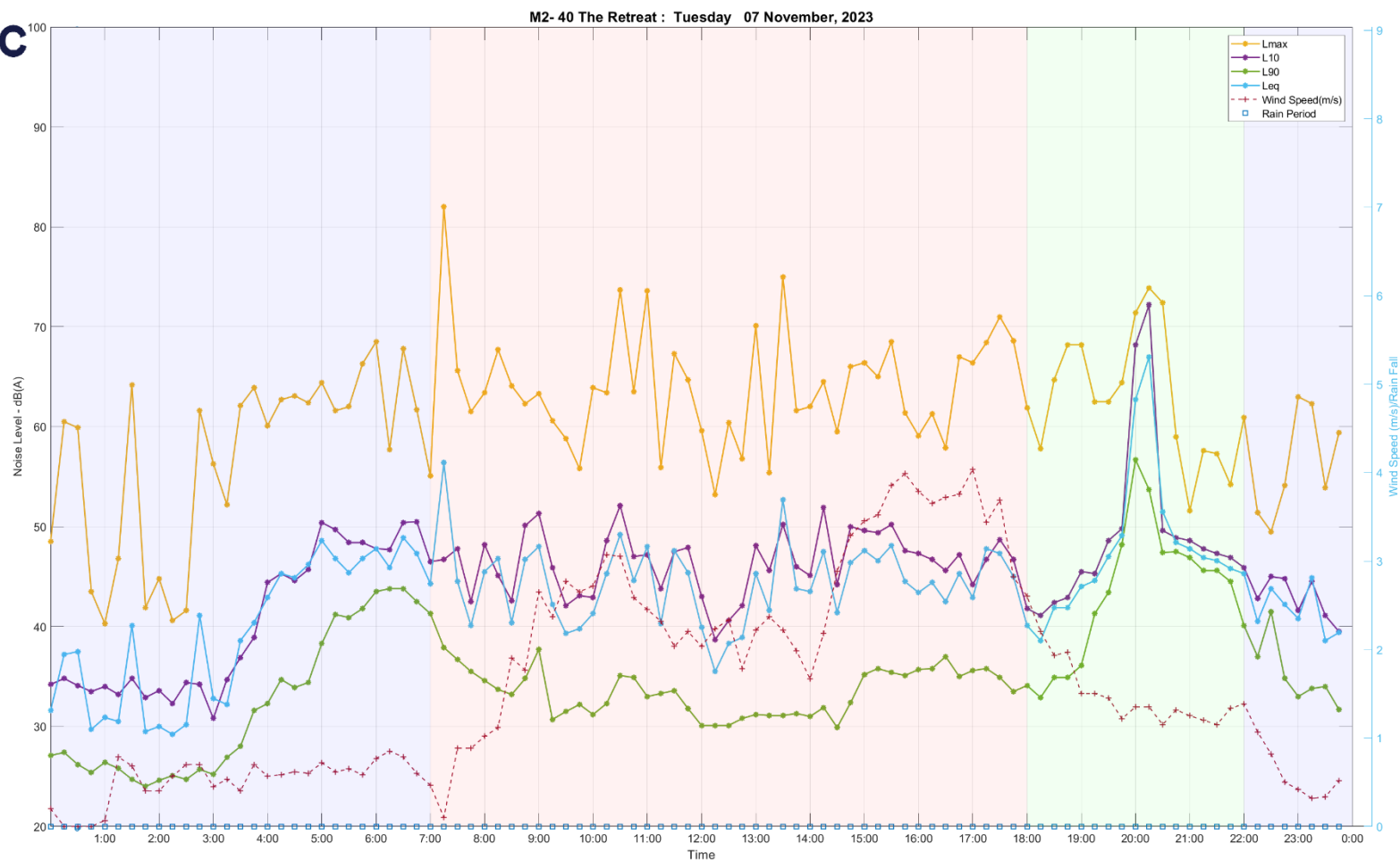
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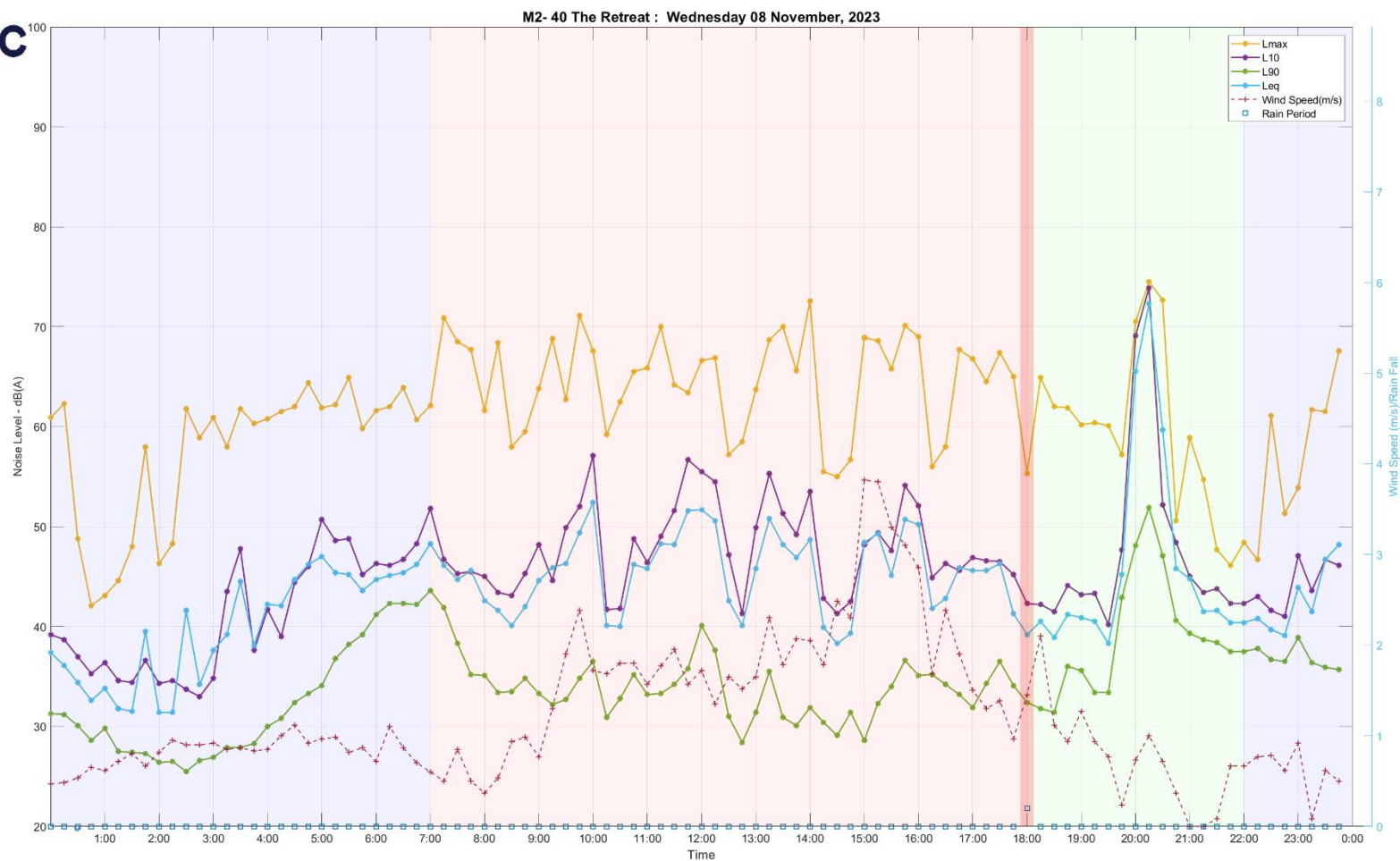


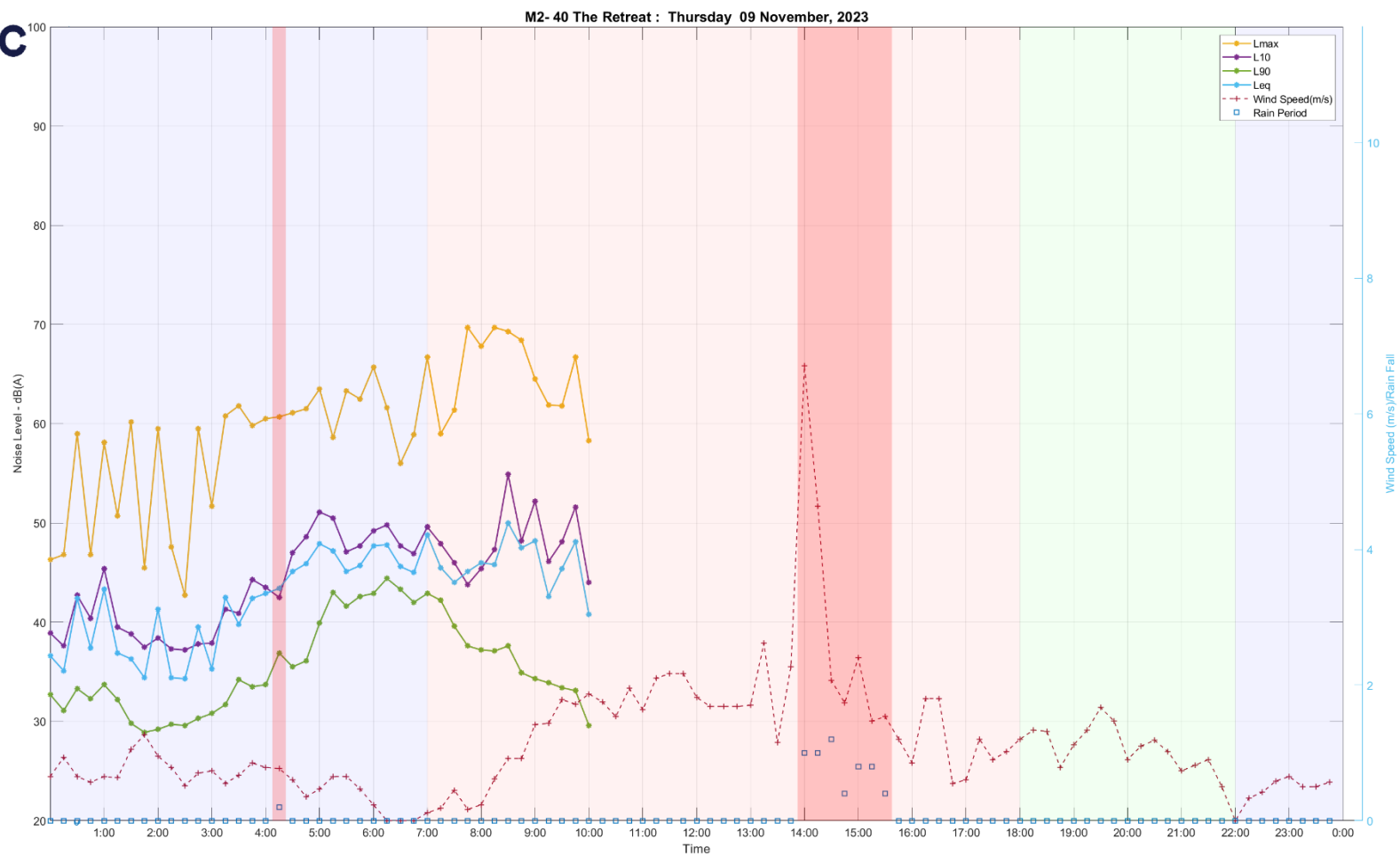




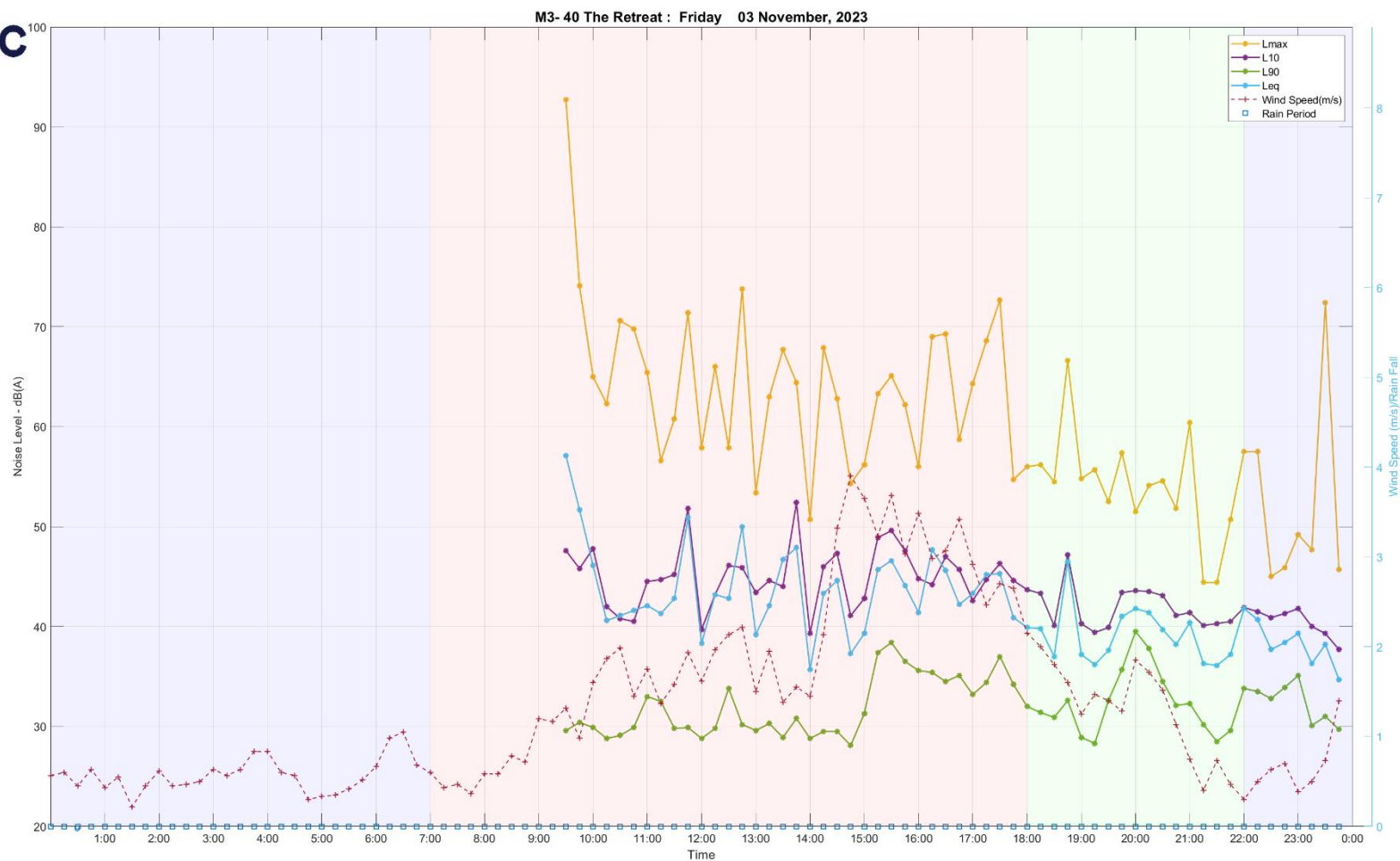


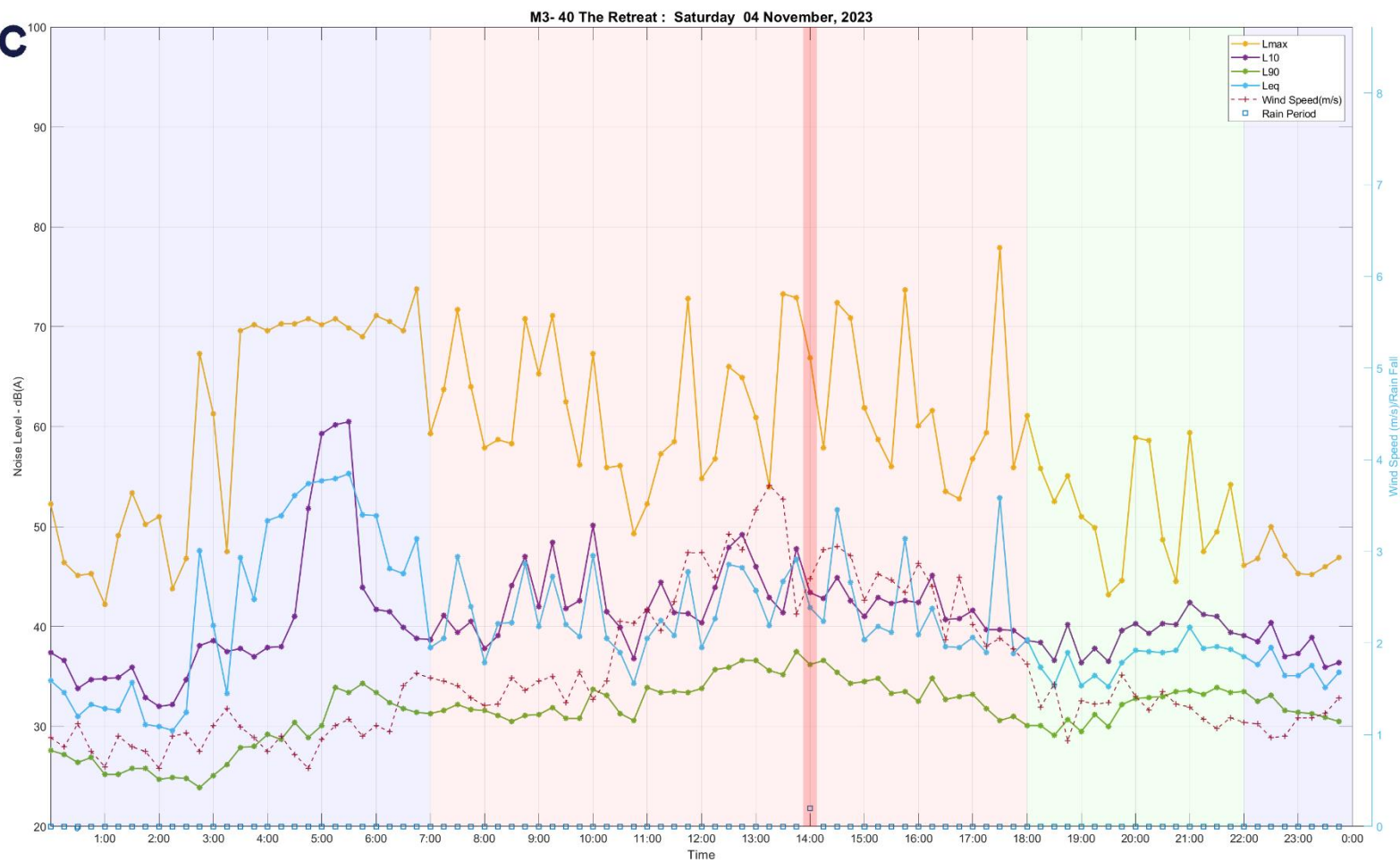


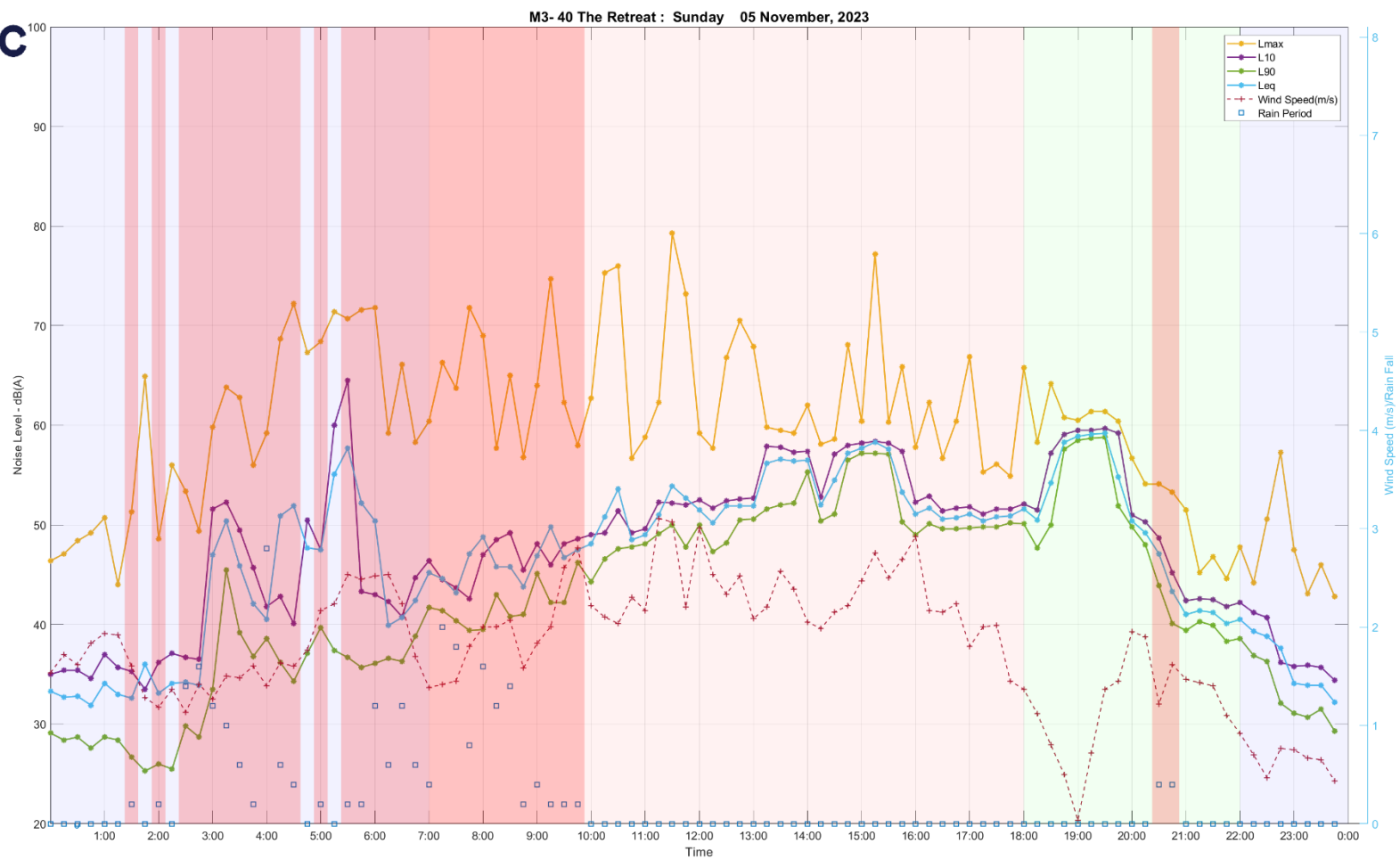


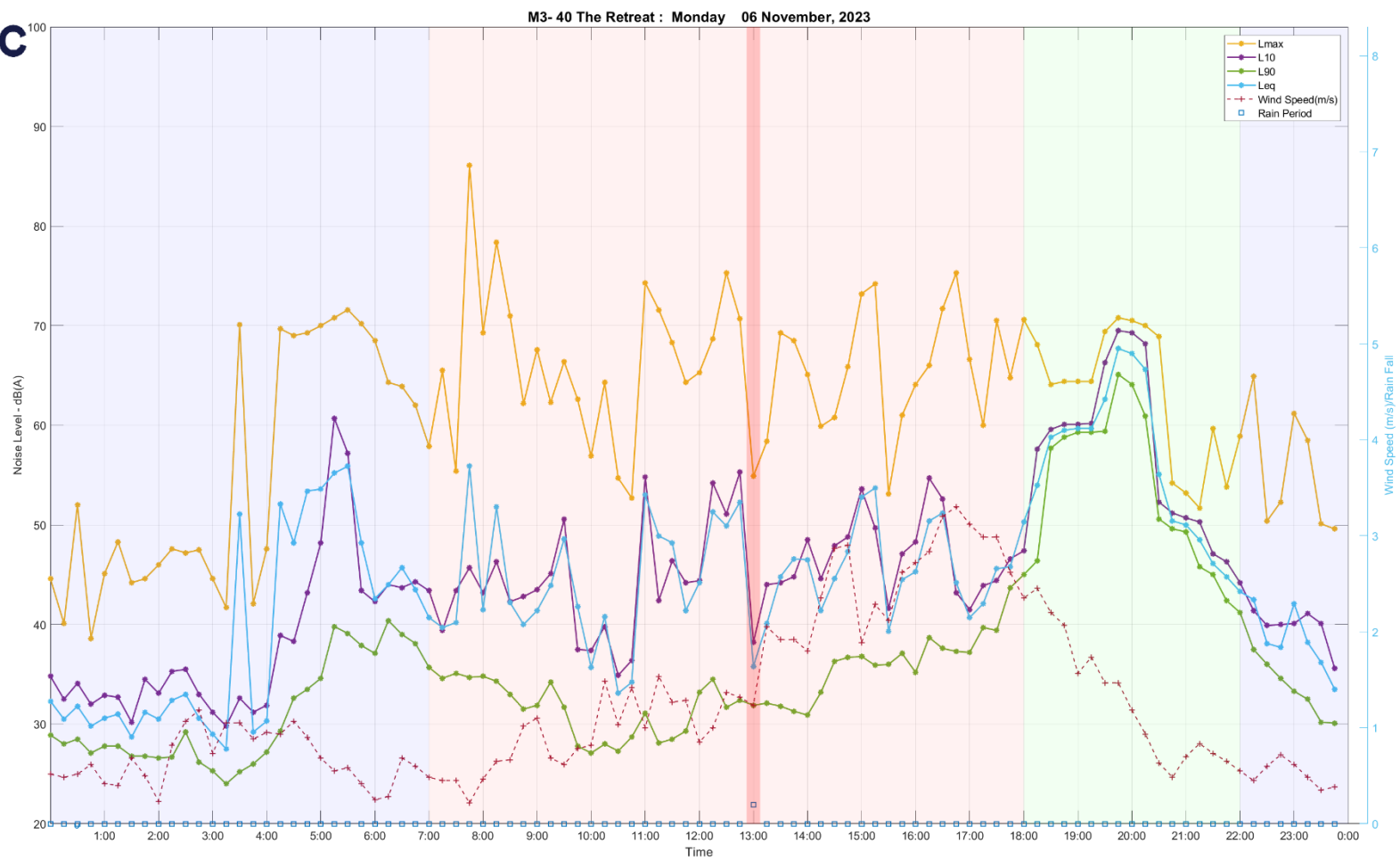


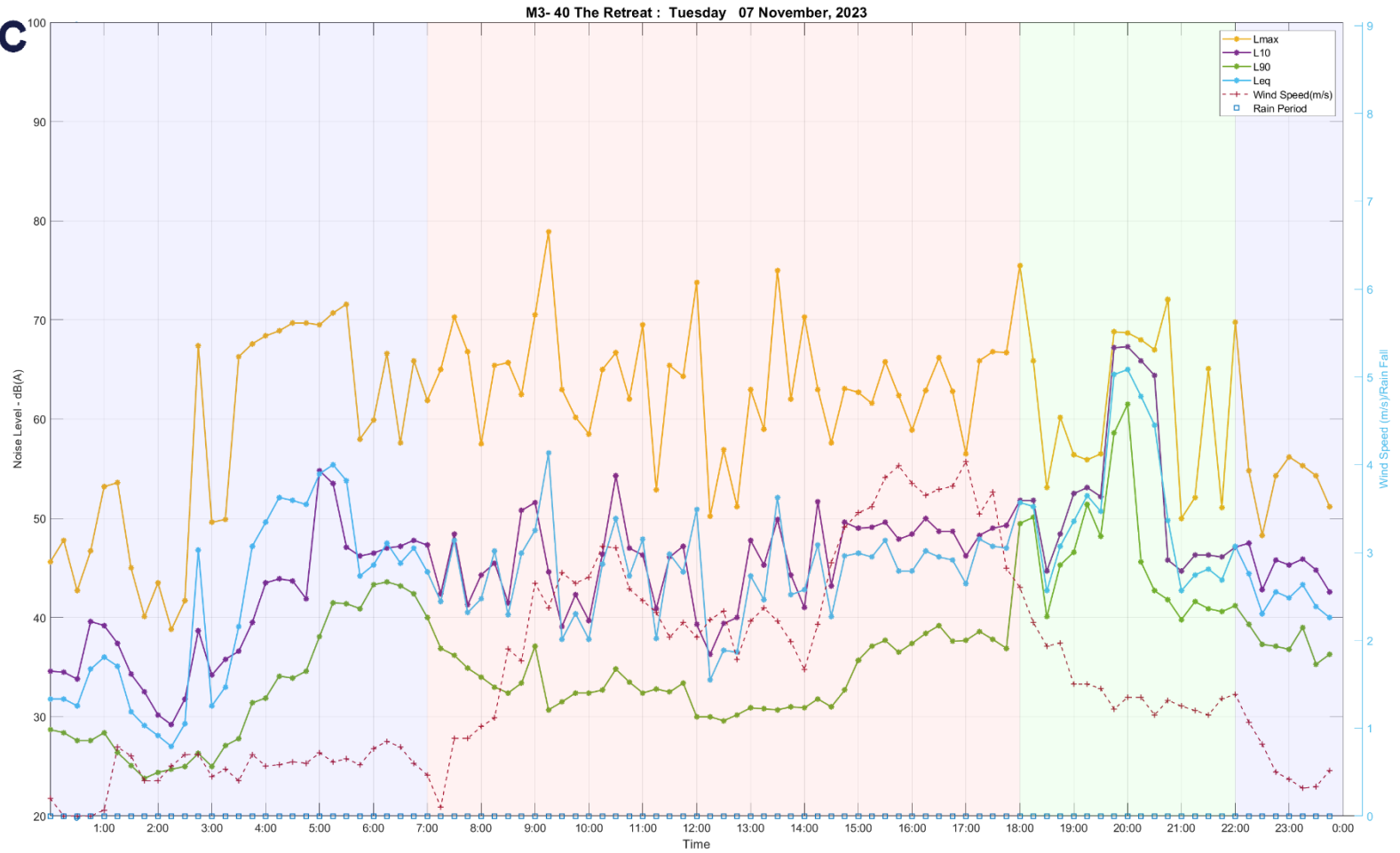
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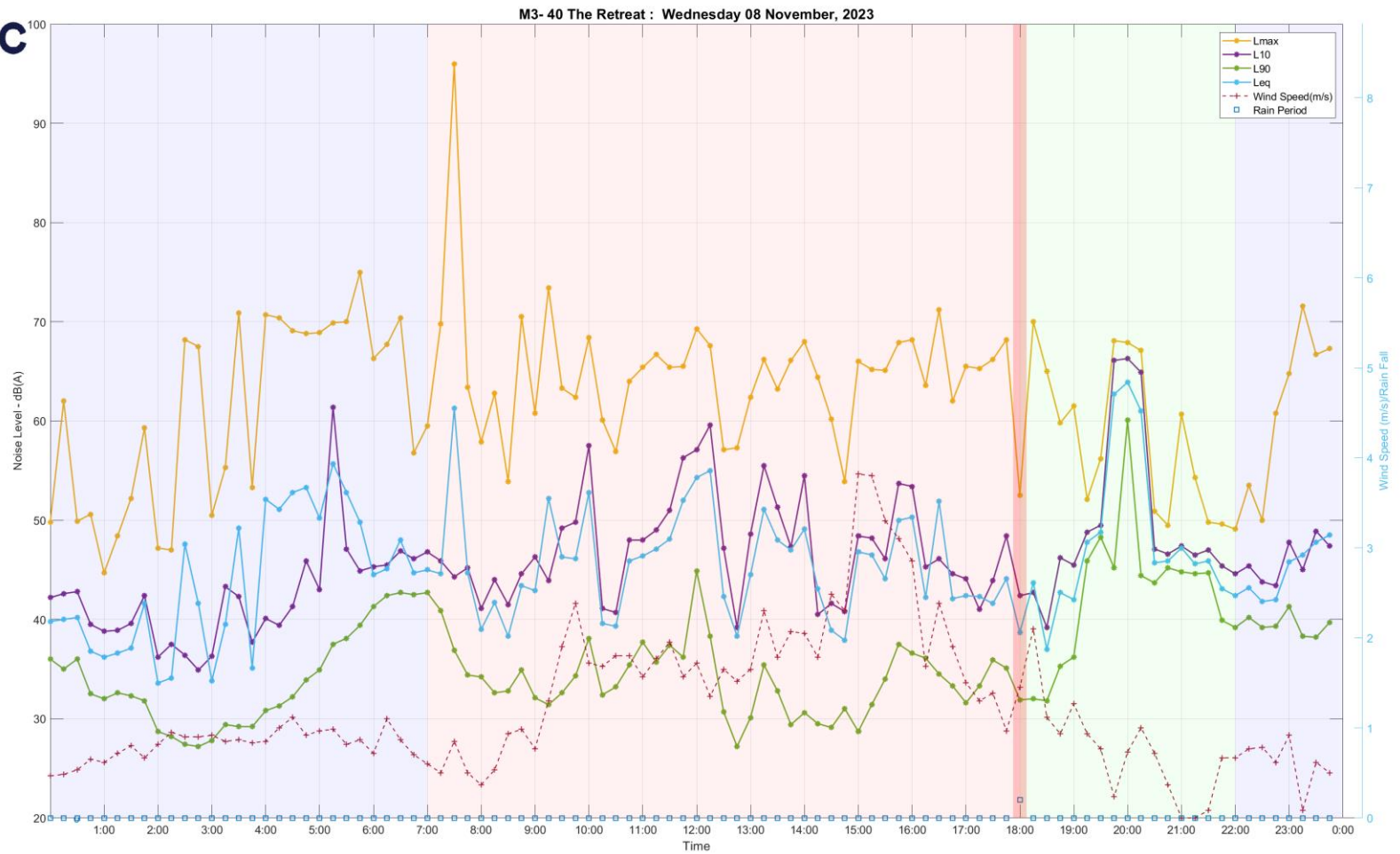


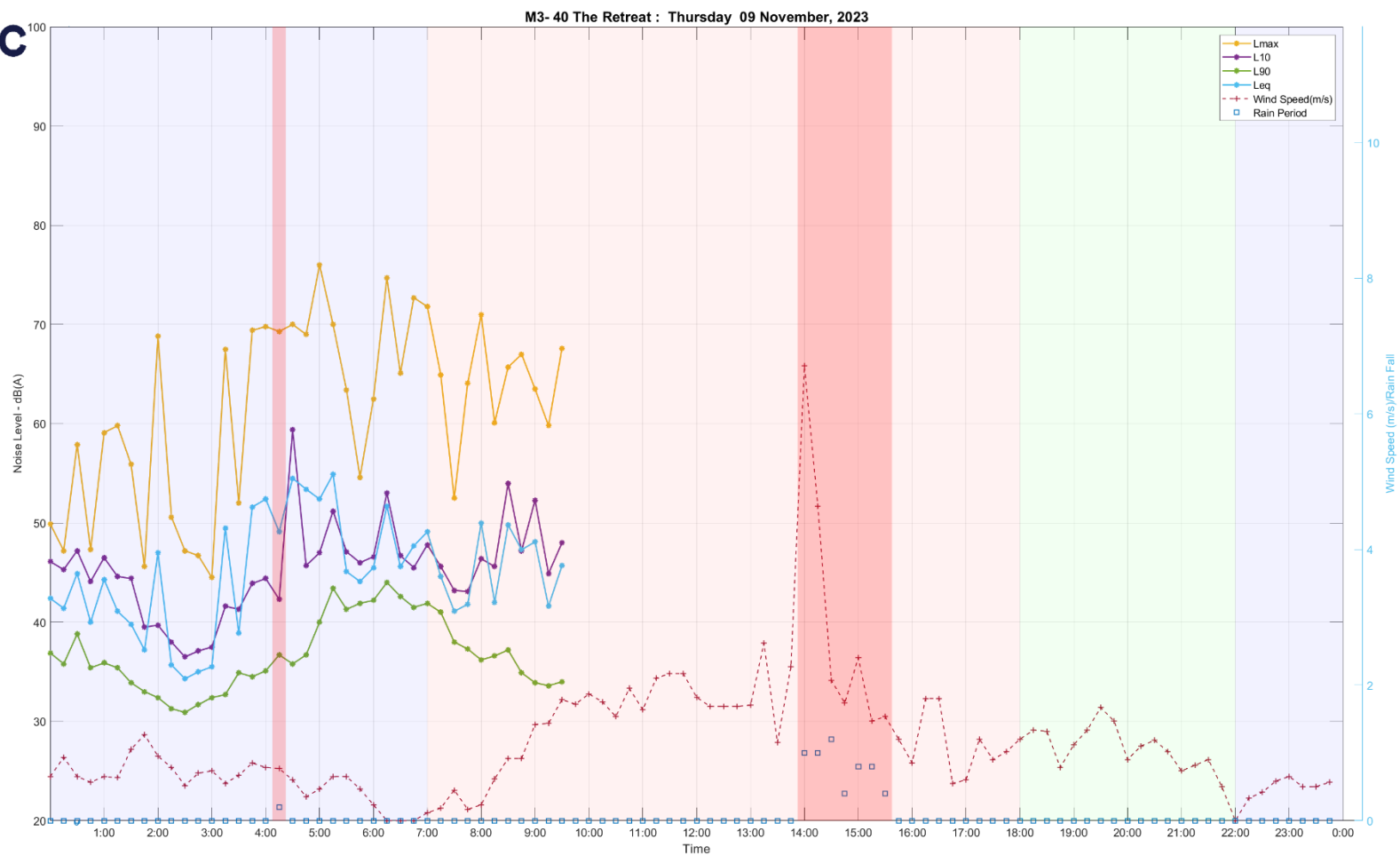




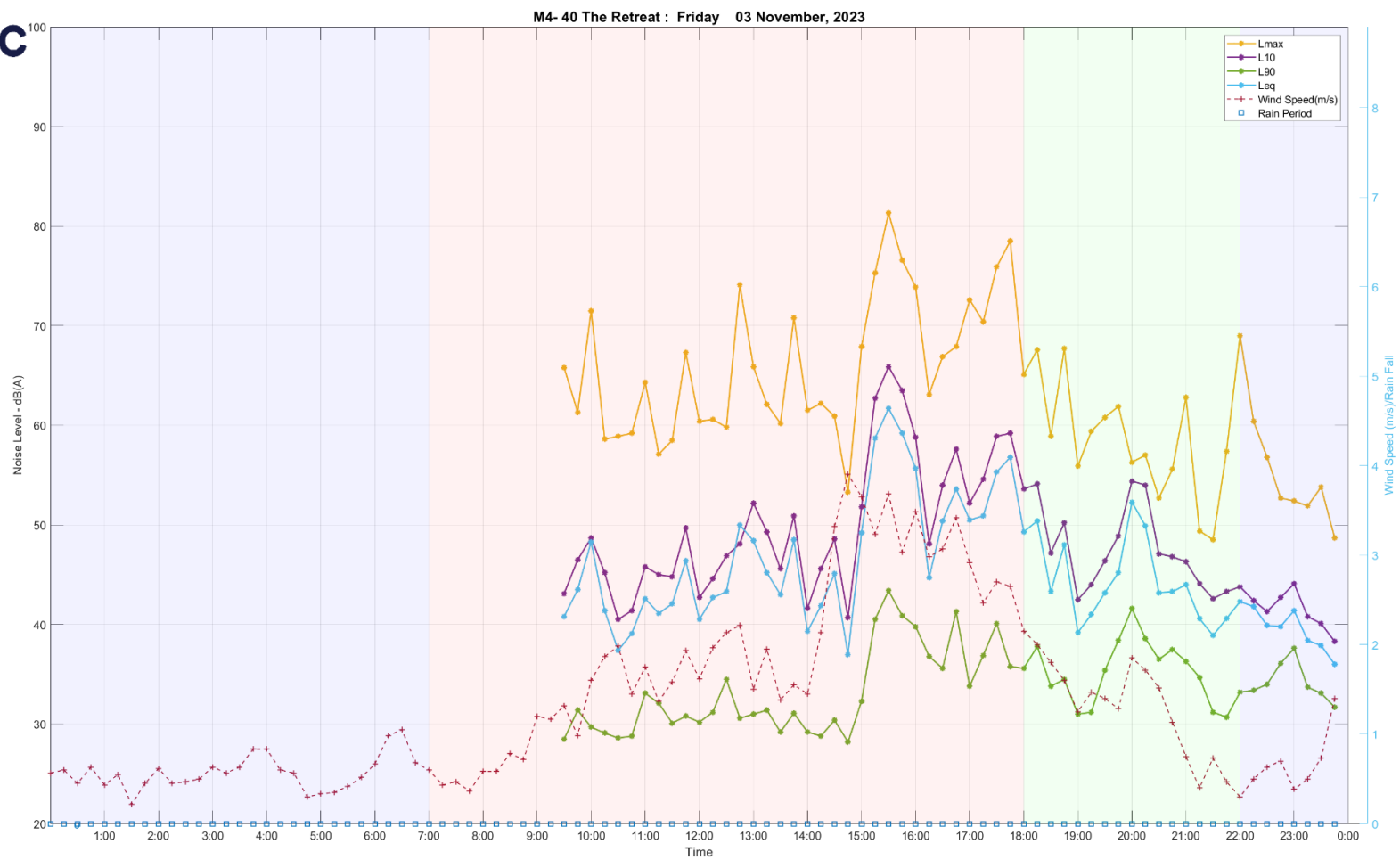


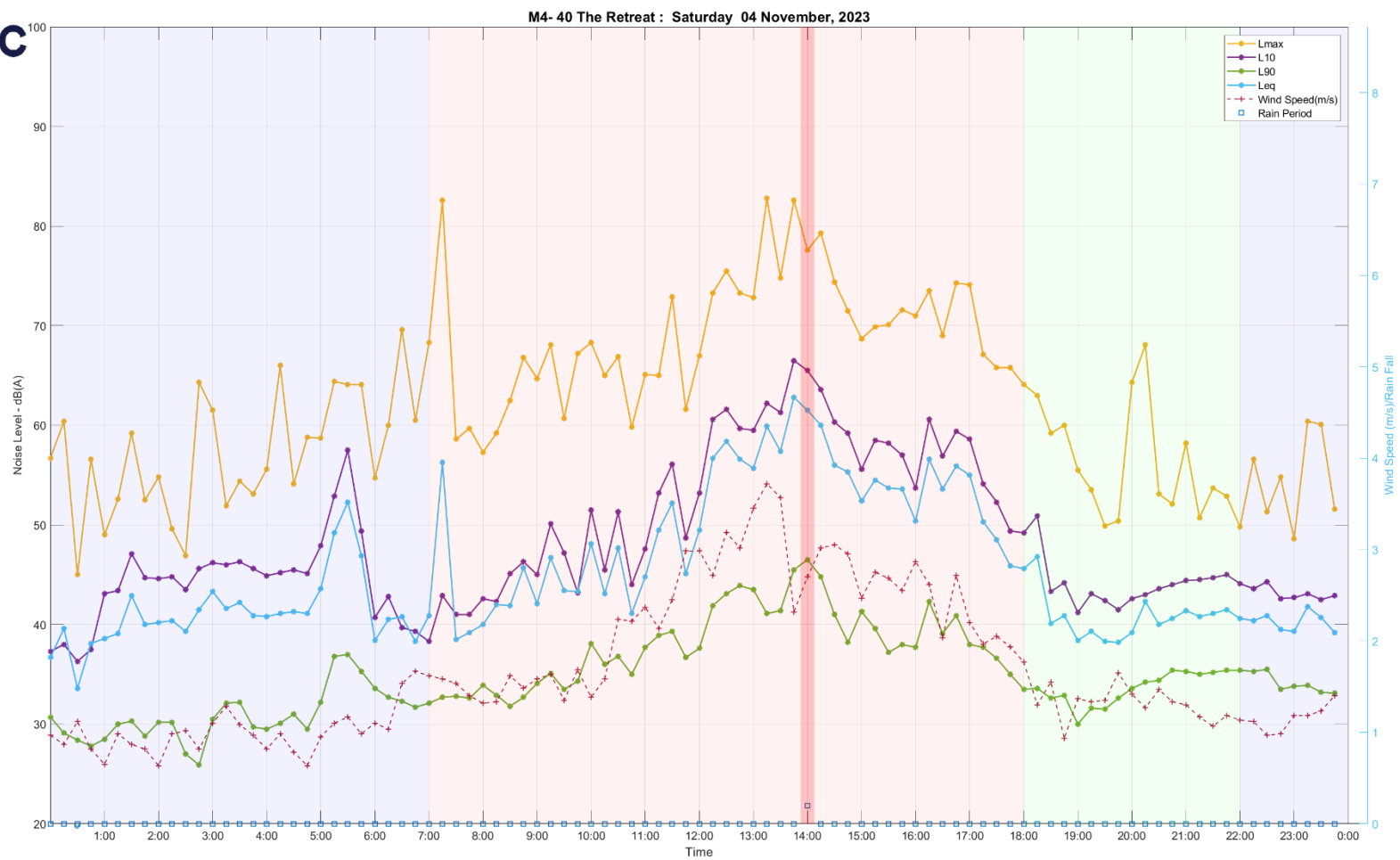


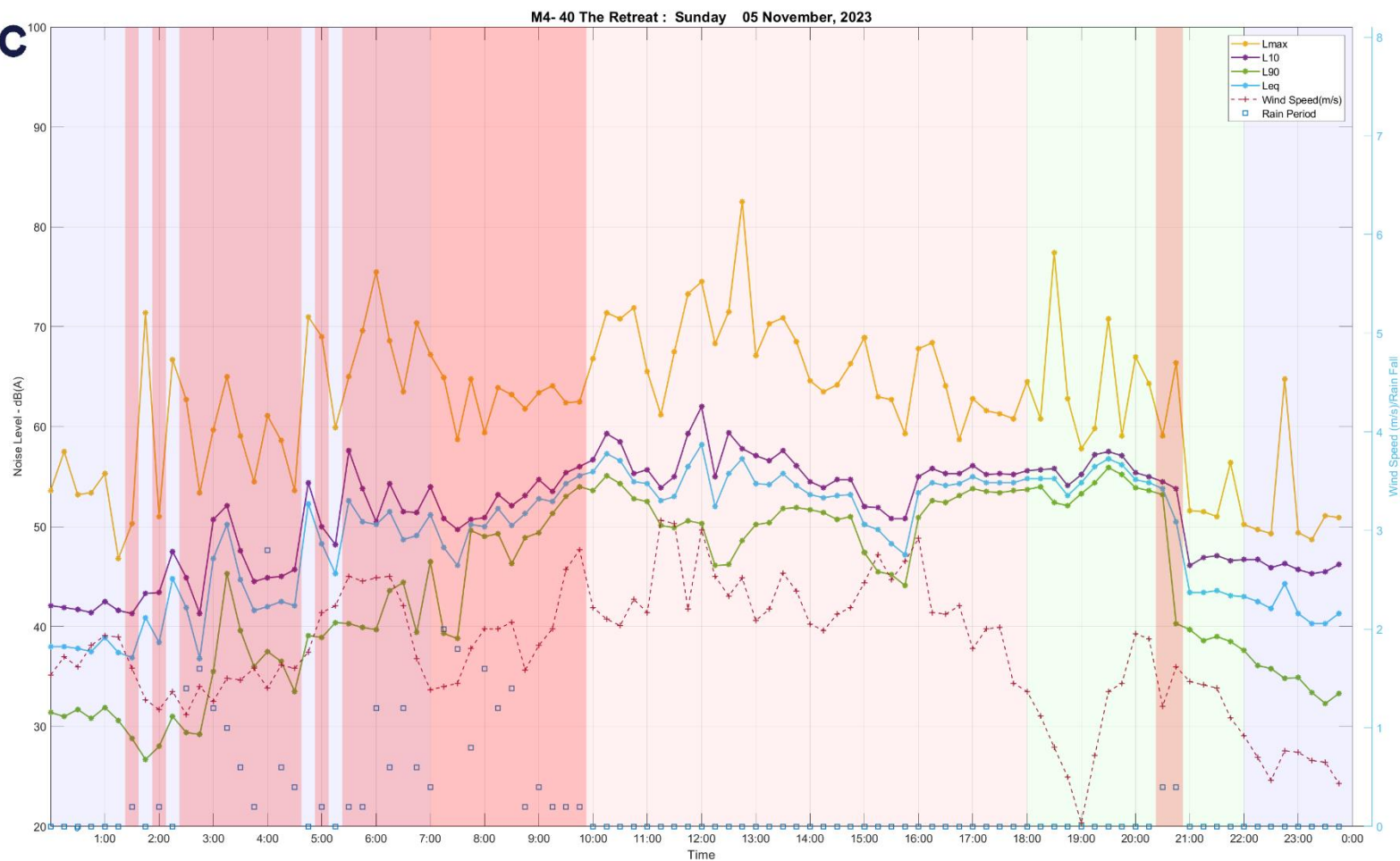


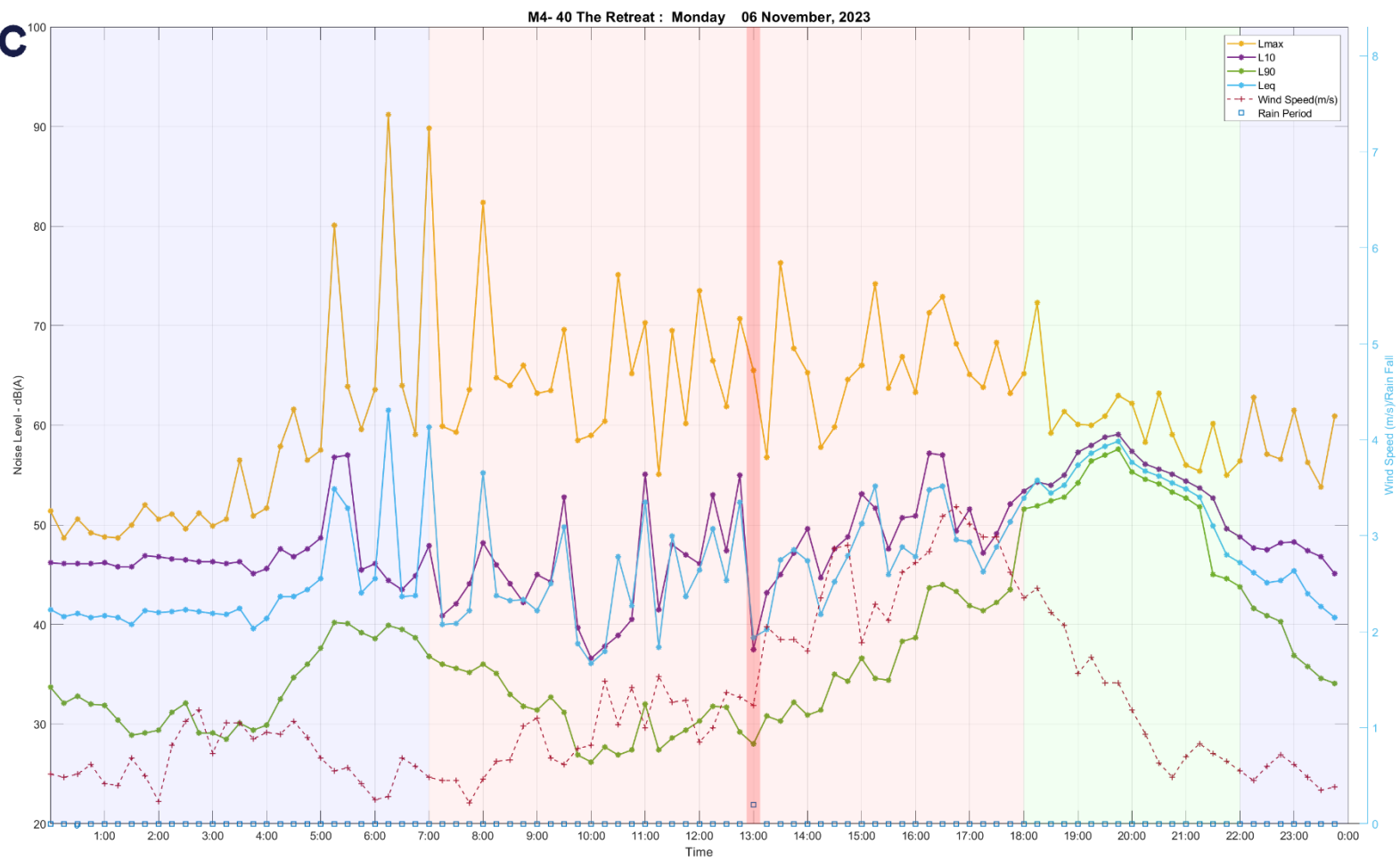


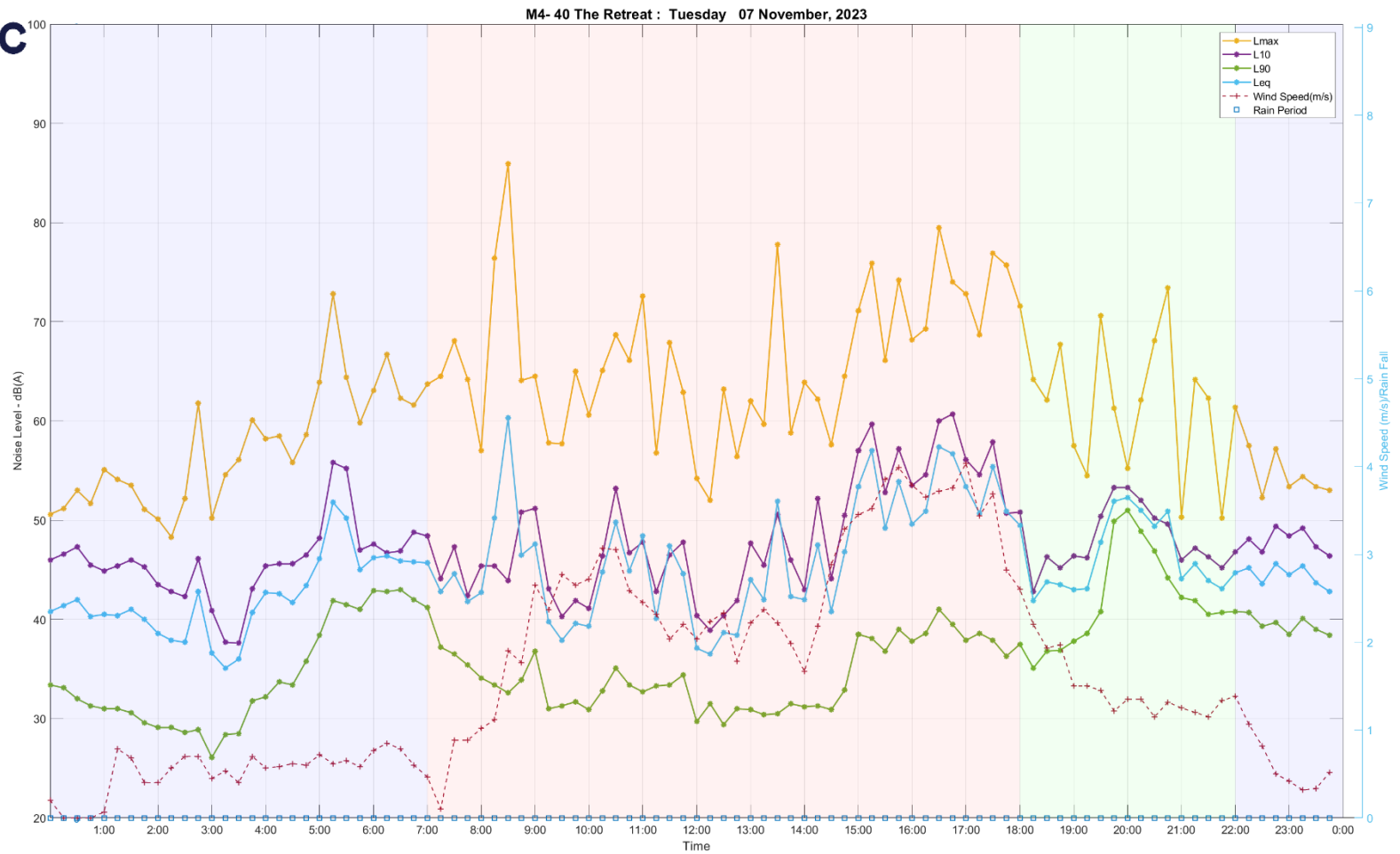
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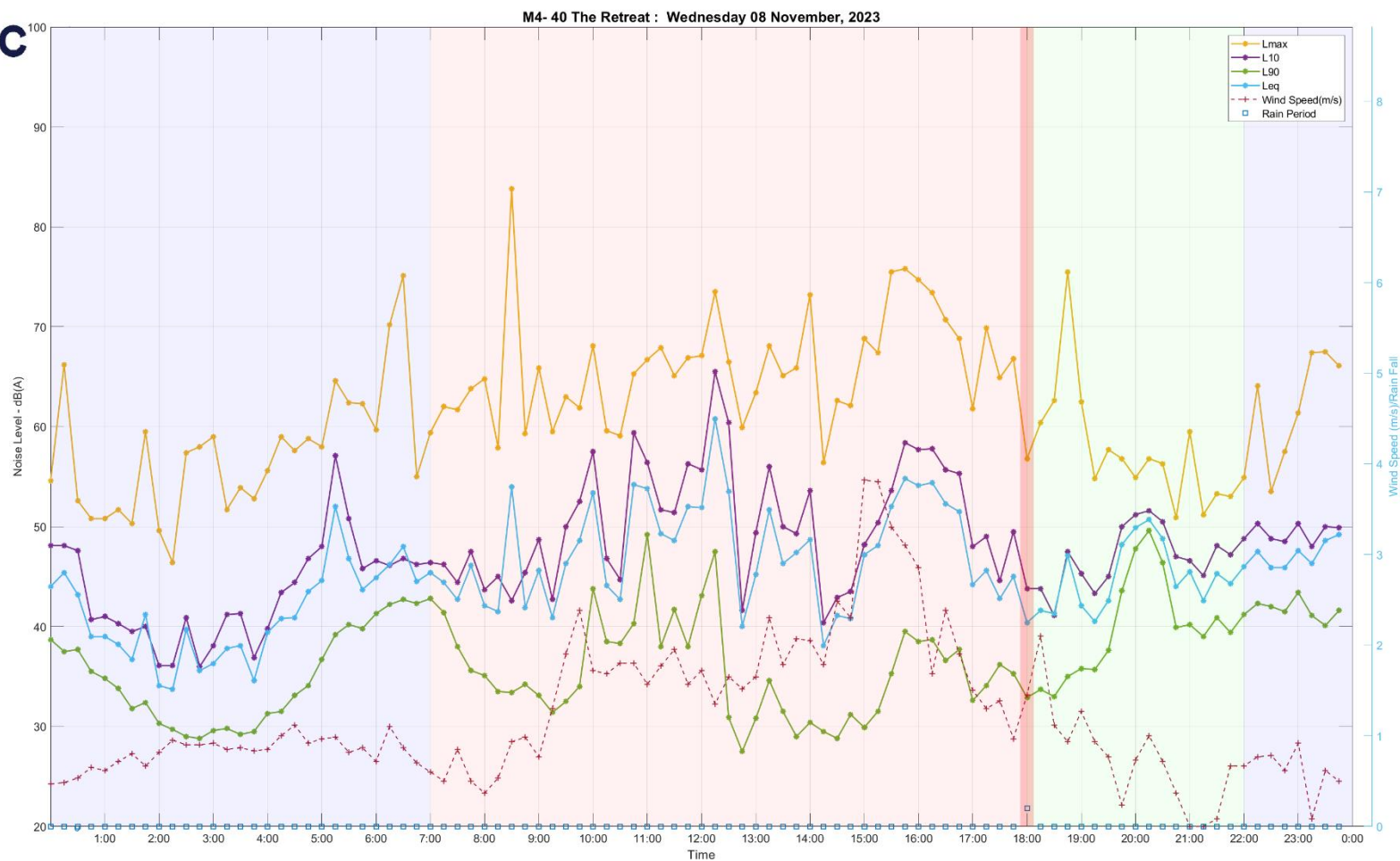


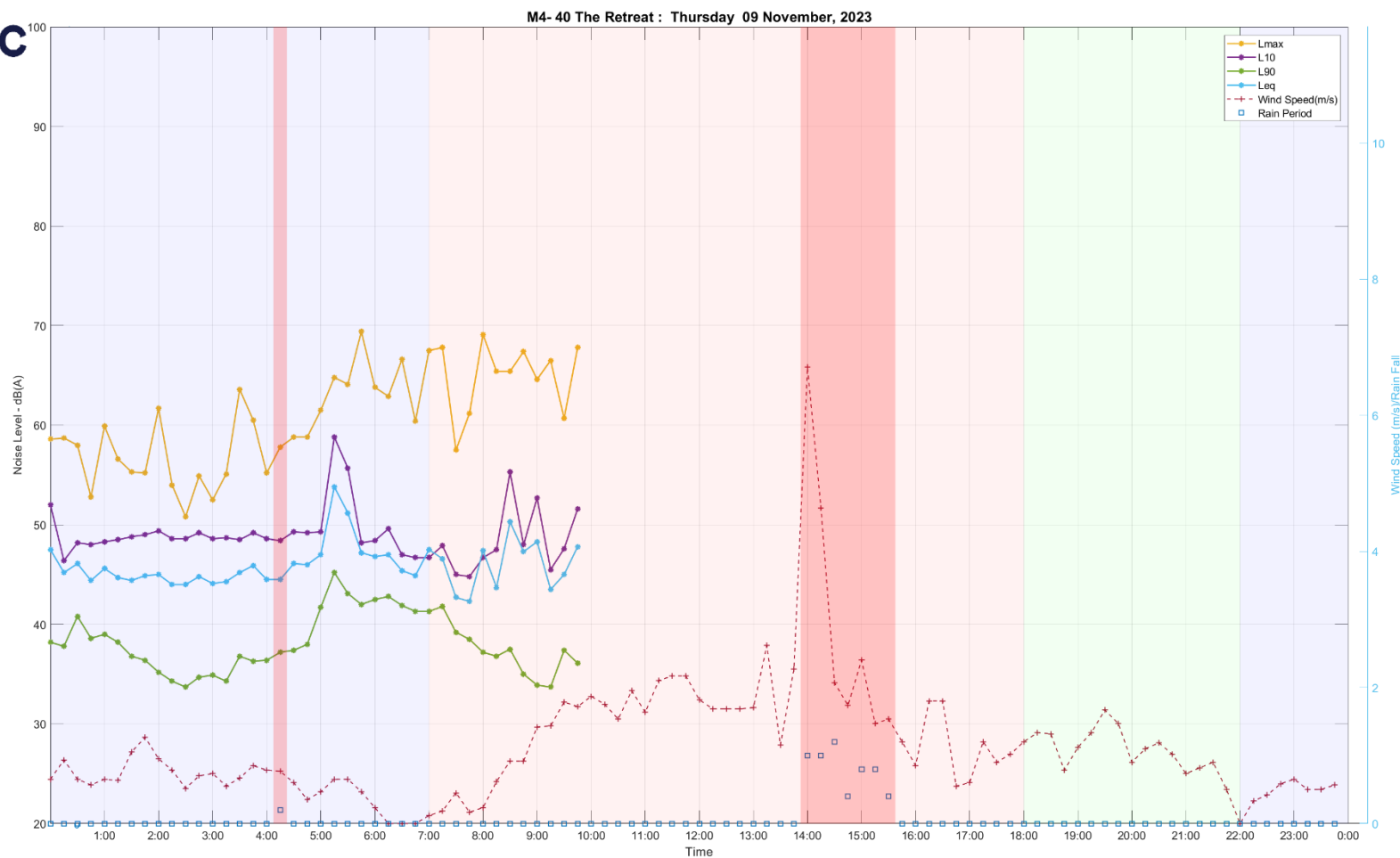












Wind Speed is corrected using factor 0.6000 based on logger location