

FS204 LEANDER VIEW SERVICE STATION, 184 HENLEY ROAD, READING FORECOURT REDEVELOPMENT

Noise Impact Assessment

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1.0 Introduction

Motor Fuel Group has appointed SLR Consulting Limited to undertake a noise impact assessment for a proposed forecourt redevelopment at Leander Service Station, 184 Henley Road, Reading, Berkshire (the Site).

This document has been prepared to support Reading Borough Council (RBC) planning application number 221842 for the following, proposed redevelopment of the service station forecourt.

“Creation of a charging zone, erection of EV chargers, erection of canopy, substation enclosure, and associated forecourt works.”

New equipment has been proposed to include 5 No. electric vehicle (EV) charging bays with canopy, 1 No. air/water/vacuum combi unit and a 1500 kVA substation along the north east boundary of the Site, in replacement of similar in-situ equipment types.

Consultation response from RBC Environmental Protection has provided an objection to the above-listed application in absence of a noise impact assessment:

“Applications which include noise generating plant when there are nearby noise sensitive receptors should be accompanied by an acoustic assessment carried out in accordance with BS4142:2014+A1:2019 methodology.

This application involves moving the air and vacuum closer to residential properties behind the petrol station, and also the installation of a substation close to the boundary with residential properties. Both of these have potential to generate noise which will impact on the residents, and suitable mitigation may need to be incorporated into the design.

A noise assessment has not been submitted with the application and therefore I cannot determine the likely noise impact of the proposal and whether the proposals are acceptable. I therefore recommend refusal unless a noise assessment can be submitted and considered by us before the application is determined...”

The commentary subsequently highlighted a potential condition that could be used to control noise emissions.

This report has been prepared to inform noise impacts from the proposed development following the assessment principles of British Standard BS 4142:2014 + A1:2019 *Methods for rating and assessing industrial and commercial sound*. Additional assessment has been provided following DEFRA commissioned research NNR45¹ from the University of Salford with respect to the proposed substation and available information.

Site operating hours have been referenced from historic RBC planning approval (re. 83/TP/289) between the hours of 07:00 to 22:00 daily. Proposed use of the Site and new forecourt equipment has been considered between these approved opening hours, with 24/7 operation in relation to the proposed substation.

This report has been prepared by an acoustician of 20-years consulting experience and a corporate member of the Institute of Acoustics.

Whilst reasonable effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, a glossary of terminology has been included in **Appendix 01**.

¹ Moorhouse, A T, Waddington D C and Adams, M. Procedure for the assessment of low frequency noise complaints. Revision 1. London: Department for Environment, Food and Rural Affairs, 2011.

2.0 Site Description

Leander Service Station has been noted of nominally 0.13 hectares to the north of the A4155 Henley Road in Reading.

2.1 Proposed Development

The planned proposal has included for the removal of 2 No. EV charging bays existing along the north east boundary of the service station forecourt, with replacement by 5 No. EV charging bays and associated canopy. A new combi unit has been proposed adjacent to these EV bays and canopy, as providing air, water and vacuum facilities in replacement of separate air/water and vacuum machines situated towards the eastern site exit. A new and enclosed substation of 1500 kVA has been proposed to the north corner of the Site, the substation will be surrounded on three sides by a 2.4 m high timber fence.

The proposed development has been viewed as comparable in nature to existing uses, with the replacement of modern equipment variants across the forecourt intended for use during approved operating hours. The substation has been viewed as an entirely new plant type that has been necessary to support the proposed extension of EV charging facilities and by nature, would operate on a 24/7 basis.

2.2 Noise Sensitive Receptors

The Site has been noted to reside in a predominantly residential area as surrounded on three sites. Noise sensitive receptors (NSRs) in the immediate vicinity to the proposals have been noted of residential use along Henley Road and Marlow Court. Those NSRs of note within this assessment have been referenced as:

- A. 186-188 Henley Road. The nearest noise sensitive location has been noted as a pair of semi-detached residential properties immediately north east of the forecourt and overlooking to the front and rear. The NSR at No. 186 has been noted to reside immediately adjacent to existing plant items along the north east boundary of the Site, as including 2 No. EV charging bays and separate air/water and vacuum machines situated towards the eastern forecourt exit. Nominal 1.8 m tall lap panel fencing has been noted to divide forecourt areas from the rear garden of this NSR. First floor and rear facing windows of these residences have been considered to have clear line-of-sight to the proposals.
- B. 2 Marlow Court. This end terrace residential property been noted due north of the forecourt, comprising of a first floor, coach-house flat above garages, with skylights facing toward the Site. These windows have been reviewed approximately 15 m away from the north west corner of the forecourt beyond a nominal 1.8 to 2.0 m tall boundary fence and overlooking the proposals.
- C. 3-4 Marlow Court. These residential premises have been noted to the north west of the forecourt and include overlooking windows at first and roof levels to the planned proposals. The nearest façade of these properties has been reviewed 10 m away from the north west Site boundary and behind a nominal 2.0 m tall close boarded fence.
- D. 5 Marlow Court. This corner-terraced residential property has been noted nominally 15 m from the north west boundary with first and second floor windows overlooking the north of the forecourt. This property has been viewed of restricted line-of-sight to the proposed by means of an intervening garage immediately beyond the north west forecourt boundary.
- E. Other noise sensitive receptors have been noted to the south on the opposite side of Henley Road, with the closest receptors typically defined by No. 177-183 Henley Road.

All above-listed receptors have been identified within the site plan of Figure 2-1 below.

Figure 2-1
Location Plan and Identification of NSRs



3.0 Planning and Noise Guidance

3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was introduced by The Department for Communities and Local Government in March 2012, with the latest revision dated July 2021.

The NPPF defines the Government's planning policies for England and sets out the framework, within which local authorities must prepare their local and neighbourhood plans, reflecting the needs and priorities of their communities. The Government's stated purpose in producing the NPPF was to streamline policy, so the planning process is less restrictive, to give a more easily understood framework for delivering sustainable development.

Under the heading of conserving and enhancing the natural environment and Paragraph 174 e), one aim of the NPPF is *"preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution..."*.

Paragraph 185 requires planning policies and decision to ensure that new development is appropriate for its location. It stipulates a need to account for the likely effects of pollution on health and other matters, requiring the planning process to *"mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life"*.

The NPPF acknowledges that there is a host of existing sources of national and international guidance which can be used, in conjunction with the Framework, to inform the production of Local Plans and decision making.

3.2 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010. It sets out the long-term vision of government noise policy, which is fundamentally to: *"Promote good health and good quality of life through the effective management and control of noise within the context of Government policy on sustainable development"*. The vision is supported by three key aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and reduce to a minimum, other adverse impacts on health; and
- Where possible, contribute to the improvement of health and quality of life.

The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The NPSE has adopted the following concepts, to help consider whether noise is likely to have "significant adverse" or "adverse" effects on health and quality of life:

SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available (Defra, 2010)."

3.3 National Planning Practice Guidance

Revised Planning Practice Guidance was released in March 2014 to support the NPPF and last updated in July 2019. The Guidance stipulates that Local Planning Authorities' plan making and decision making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

The guidance has also provided the following noise exposure hierarchy table *"when noise could be a concern"*.

Table 3-1
Planning Practice Guidance Noise Exposure Hierarchy Table

Response	Example of Outcomes	Increasing Effect Level	Action
NOEL – No observed effect level			
Not present	No effect	NOEL	No specific measures required
No observed adverse effect level			
Present and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL – Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for sleep disturbance. Affects acoustic character of the area and creates a perceived change in quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL – Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.4 BS 4142:2014 +A1:2019

The British Standard BS 4142:2014 +A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound* (BS 4142) notably describes methods for rating and assessing sound of an industrial or commercial nature. It has been referenced where required in policy and guidance documents to assess the potential impact of sound of an industrial and/or commercial nature, at existing and proposed noise-sensitive receptor locations within the context of the existing sound environment.

In this assessment, industrial/commercial sources have been present on the Site with respect to proposed development emission, where the onus lies with the developer to mitigate any associated impacts arising from existing and proposed sources of commercial noise.

Certain acoustic features can increase the significance of impact from a comparison of the specific sound level to the background sound level where these features are likely to affect perception and response. Where such features are present at the assessment location, a character correction (or penalty) to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

- Tonality: A correction of 0 dB to + 6 dB for sound ranging from not tonal to prominently tonal.
- Impulsivity: A correction of up to + 9 dB can be applied for sound that is impulsive.
- Intermittency: A penalty of + 3 dB can be applied if on/off conditions are readily distinctive within the reference time interval over the period of the greatest amount of on-time.
- Other characteristics: A penalty of + 3 dB can be applied in the absence of all other defined characteristics, where the specific sound contains a distinctive feature in the residual acoustic environment.
- The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.

The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level.

- Typically, the greater the difference, the greater the magnitude of the impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background level, this is an indication that the specific sound source will have a low impact, depending on the context.

BS 4142 has stipulated that context is important when assessing the impact of sound of a commercial and/or industrial nature. Amongst a range of advocated considerations, this can include mitigation, residual sound levels, location and absolute sound levels in the consideration of context.

The scope of BS 4142 recognises that human response to sound can be subjective as affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

3.5 DEFRA NANR 45 Procedure for Assessment of Low Frequency Noise

This guidance document was prepared by the University of Salford under contract NANR45 for the Department of Environment, Food and Rural Affairs (DEFRA), to aid the evaluation of existing cases by determining whether a low frequency environmental noise exists that could be the cause of complaints. It was intended for use by Environmental Health practitioners in the handling of complaints of low frequency noise as efficiently and correctly as possible.

The guidance has been prepared to assist in the evaluation of existing situations, so states that the procedure would not be as reliable if used to predict the likelihood of complaint at planning stage, where noise sources and receptors are not present. Notwithstanding, NANR 45 has been viewed as a favourable document to indicate whether a low frequency problem would likely exist, in the absence of any other known guidance for this topic. It has often been advocated in planning situations as a method to review if low frequency noise could be present and possible to cause disturbance. Clause 1.3 of BS 4142 has otherwise been noted to preclude that the standard is not applicable to the assessment of low frequency noise and reference should be made to NANR 45.

The NANR 45 guidance document only applies to internal noise levels within dwellings, such that the performance of the building façade would play a part in reducing incident noise inside of a building. This has been a fundamentally different consideration to the use of BS 4142 which applies to the external environment.

The procedure has included a criterion curve for night time periods in one-third octave bands as shown in Figure 3-1 and Table 3-2 below, that can be relaxed by 5 dB for daytime periods and for less-intrusive steady noise sources. At night, the relaxed (+ 5dB) criterion for steady state sounds have been shown in Table 3-2.

Figure 3-1
Low Frequency Noise Criterion Curve

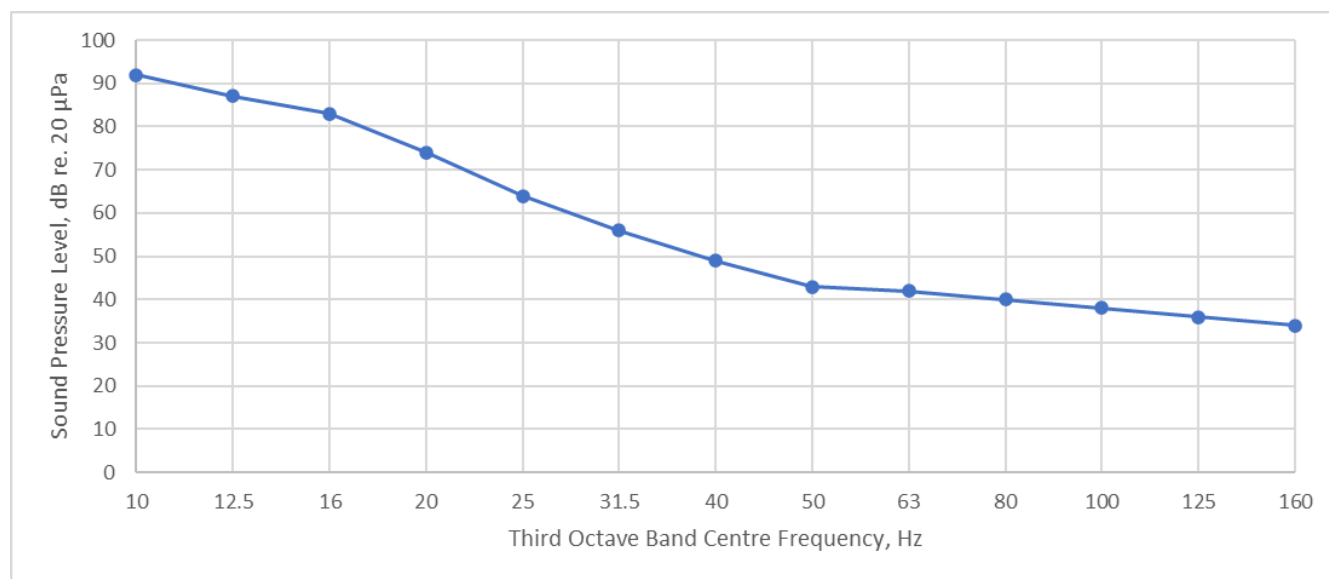


Table 3-2
Low Frequency Noise Criterion, dB Leq, T

Third Octave Band Centre Frequency, Hz	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
LFN Criterion Curve	92	87	83	74	64	56	49	43	42	40	38	36	34
+ 5 dB for Steady State	97	92	88	79	69	61	54	48	47	45	43	41	39

3.6 Reading Borough Council

Consultation commentary from RBC planning application number 221842 has provided the following basis for noise impact assessment when considering BS 4142 methodology.

“N2 MECHANICAL PLANT (NOISE ASSESSMENT REQUIRED)

No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out for in accordance with BS4142:2014+A1:2019 methodology.

The predicted specific sound level ($L_{Aeq,TR}$) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation.

The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive facade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation.

The plant shall thereafter only be installed in accordance with the assessment and shall thereafter be maintained so that it operates to the same standard.

REASON: To safeguard the amenities of the adjoining premises and the area generally, in accordance with Policy CC8 and EN17 of the Reading Borough Local Plan 2019.”

The above listed commentary has provided reference to specific Policies CC8 and EN17 of the Reading Borough Local Plan 2019. Further clarifications have been provided below in reference to noise.

Policy CC8 titled ‘Safeguarding Amenity’, has been provided to ensure that “*development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties...*”; where noise and disturbance has been listed as one consideration of this policy.

The requirements of Policy EN17 ‘Noise Generating equipment’ has been understood from the Local Plan to relate specifically to the phenomenon of ‘background creep’, stating:

“Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.”

4.0 Environmental Sound Survey

To establish the prevailing sound climate at the Site, a baseline survey was undertaken over a weekday and weekend period between Thursday 16th and Monday 20th February 2023.

The period of surveying incorporated the deployment of a weather station to monitor meteorological conditions. These were generally conducive for sound surveying works throughout the site assessment in compliance with BS 4142, with an absence of rainfall and average windspeeds below 5 m/s. On occasion, a few gusts have been noted above 5 m/s however these have been considered insignificant to the entire dataset or assessment. In the avoidance of doubt, any measurement with wind speeds above 5 m/s have been excluded herein as provided within **Appendix 03**.

4.1 Equipment and Measurements

Sound pressure level measurements were carried out using the following equipment listed in Table 4-1, confirming to Class 1 acoustic accuracy for sound level meters and matched calibrators.

The sound level meters were calibrated before the measurements using the handheld acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift was observed with calibration offsets of + 0.08 dB. The calibration chain of equipment has been maintained to traceably to national standards, no greater than one year for sound calibrators and two years for sound level meters.

Table 4-1
Sound Monitoring Equipment

Location	Description	Serial No.
Location 1	Cirrus CR:831B Class 1 Sound Level Meter	G0330390
	Cirrus CR:511E Acoustic Calibrator	97661
	Davis Instruments – Vantage Vue Weather Station: 6250UK	MT220531011

Sound level measurements at Location 1 were viewed to be a directly representative proxy of all overlooking premises to the rear of the forecourt. This location was nominally 3.5 m from the northern boundary fence. The measurements have been considered fully representative of adjacent NSRs and were recorded in free field conditions, as measured in-situ 1.5 m above ground and 3.5 m from the rear boundary fence.

The monitoring protocol consisted of substantially unattended readings over the survey period with attendance at the start and end of the monitoring periods, covering nominally 94-hours.

The following sound level indices have been reported at 15-minute intervals in decibels (dB):

- $L_{Aeq,T}$ – The A-weighted equivalent continuous noise level over the measurement period.
- $L_{A90,T}$ – The A-weighted noise level exceeded for 90% of the measurement period.
- $L_{A10,T}$ – The A-weighted noise level exceeded for 10% of the measurement period.
- $L_{Amax(F)}$ – The maximum A-weighted noise level during the measurement period.

Full survey results describing unattended monitoring periods have been provided for the above-listed metrics within **Appendix 03**.

Figure 4-1
Monitoring Location



4.2 Sound Climate

The sound climate at the measurement location consisted mainly of constant road traffic movements at low speed along Henley Road and vehicle movements about the forecourt. Mid altitude aircraft was also noted overhead. The unattended time history of data recorded has generally reflected an expected, diurnal pattern of transportation sources amongst other activities.

Existing forecourt operations were present at the time of site attendances, comprising the arrival and departure of vehicles, filling operations and use of forecourt equipment. The service station was understood to be in typical function during the times of assessment as operational over its approved usage times.

Mechanical plant was deemed to be audible at the monitoring location and has not been evidenced from the time history of data recorded. Sound from the natural environment included birdsong.

4.3 Residual and Background Sound Levels

The 'typical' background sound levels have been reported in this section in accordance with BS 4142 as established from histograms of the recorded dB $L_{A90,15min}$ data at Location 1, shown in **Appendix 03**. The measurement locations have been used to describe the underlying sound climate at NSRs during proposed operating periods.

In line with Section 8.1.4 of BS 4142, the monitoring duration should reflect the range of background sound levels for the period assessed. In practice, there is no single level for background sound as this is a fluctuating parameter, although a representative value of the period should be used. Note this has not been either the lowest or mean average value of dB $L_{A90,T}$ according to the assessment standard.

Table 4-2
Summary of Measured Sound Levels

Measurement Details				Residual sound level dB $L_{Aeq,15min}$		Background sound level dB $L_{A90,15min}$	
Date Range	Location	Period	Time HH:MM	Range	Typical*	Range	Typical*
Thu 16/02/2023 - Mon 20/02/2023	1	Day	07:00 – 19:00	49 – 65	56	39 – 58	49
		Evening	19:00 – 22:00	47 – 66	52	36 – 50	42
		Night	22:00 – 07:00	39 – 58	43	31 – 46	33
* Typical values of background sound level have been established from counts of data from Appendix 03. Typical residual sound levels have been equated at times of typical background sound.							

5.0 Noise Impact Assessment

The impact of noise from the proposed development on the surrounding environment will depend on several factors, including (but not limited to) the time of day, frequency of occurrence and nature of sound source. Development activities will naturally pose greater noise risk where permissible during noise sensitive periods of the evening and night where the likelihood of annoyance or sleep disturbance increases. Human response to noise depends on sociological factors, attitudes and perceptions which can be difficult to define and account for any individual case.

The recognised methodology for assessment has been taken from BS 4142:2014 + A1:2019 *Methods for rating and assessing industrial and commercial sound* which includes consideration of sound from fixed plant installations. The numerical assessment has been provided below for relevant periods of proposed operation, following the definition of specific sound levels.

5.1 Plant Sound Power levels

The following input data of Table 5-1 has been summarised from manufacturers data sheets for all plant items provided in **Appendix 02**.

Table 5-1
Input Data Summary for Noise Modelling

Type	Detail	Quantity	Sound power level dB L _{WA} re. 1 pW	On time	Period
Combined air / water / vac unit	Istobal Combo	1	78	50 %	Daytime & Evening
Rapid Charging Point	Alpitronic HYC 150 EV Chargers	5	70	50 %	Daytime & Evening
Substation	1500kVA transformer Envico TR7 housing	1	61	100 %	24 hours

The on-time assumptions have been provided on SLR's experience of similar and successful applications for development elsewhere and as not to underpredict the resulting impacts. The on-time assumptions have been made to reflect a realistic in-situ use, but with tendency towards the worst-case.

5.1.1 Substation Sound Power Levels

The upper limit of sound power level for the distribution transformer has been referenced from the Energy Networks Association Technical Specification TS 35-1 (ENA TS 35-1). Further reference has also been taken from IEC 60076-10 Power transformers Part 10: Determination of sound levels, where it has been understood that the substation would also need to comply with all sections of this standard.

According to the standard method ENA TS 35-1, a transformer with a rating of 1500 kVA must comply with a standard maximum sound power level of 61 dB L_{WA}. This has been noted to relate to the reduced maximum sound power level of IEC 60076-10 for a transformer of this size.

Reference has been made to empirical spectra² for transformers located indoors and in small rooms, to provide an engineering estimate of spectral sound level. This has been noted to describe prominent sound energy at low frequency, typically seen as primary tonal components of 100 Hz (or 125 Hz octave band) with harmonics above.

Table 5-2
Transformer Octave Band Sound Power Level, dB

Equipment Description	Sound Power Level dB L_w per Octave Band Centre Frequency Hz								Sum
	63	125	250	500	1000	2000	4000	8000	L_{wA}
1500 kVA Indoor Transformer	61.2	66.2	61.2	61.2	52.2	44.2	39.2	32.2	60.5

As the exacting type and manufacturer of the transformer remains unknown at this stage of planning, only a referenced estimate can be provided on the likely emission. The above information of Table 5-2 has been provided as the best available for planning stage works.

The type of GRP enclosure for the substation has been initially reviewed as an Envico Engineering TR7 housing. Given the open nature of this enclosure as primarily instated for weather protection, any acoustic sound insertion loss value has been ignored to represent a worst case.

5.2 Specific Sound Level Calculations

To understand specific sound levels for the purposes of assessment, a noise model has been created using CadnaA with input sound power level data in **Appendix 02**. All sources have been modelled at their proposed locations and heights shown, and at provided maximum duties.

The modelling process has followed the technical requirements of ISO 9613 Parts 1 and 2, accounting for all plant items at their developed location. The format of calculations has included all noise sources at least 1 m above ground with receptor locations of 1.5 m and +3.0 m per upper floor as appropriate to the receptor, following propagation over mixed ground ($G = 0.5$) with a reflection order of 2.

The on-time for all equipment has been considered in consistent operation, despite the realisation that all plant would not be continuously operational and at maximum capacity during day and night assessment periods. This on-time assumptions have been made to reflect a tendency towards the worst-case to appraise the potential for 24/7 operation of relevant plant items.

The following specific sound levels have been estimated from this process, with results tabulated in Table 5-3 and illustrated in Figure 5-1 and **Error! Reference source not found.** Results have highlighted the highest level on the façade, at either ground or upper floor level appropriate to the height of the receptor.

Two scenarios have been considered to understand the level of sound in relation to different plant items that might be expected through different times of the day:

- 1) All proposed plant in operation.
- 2) Only the substation in operation.

² Bies, D., Hansen, C., Engineering Noise Control pp554-556

Table 5-3
Model Outputs of Specific Sound Levels, Highest at Building Façade

NSR Reference	NSR Street Name	Model Predicted Sound Pressure Level dB $L_{Aeq,T}$	
		All Plant	Substation Only
A	186-188 Henley Road	≤ 38	≤ 23
B	2 Marlow Court	≤ 31	≤ 17
C	3-4 Marlow Court	≤ 35	≤ 22
D	5 Marlow Court	≤ 28	≤ 11
E	177-183 Henley Road	≤ 33	≤ 13

Figure 5-1
Model Outputs of Specific Sound Levels, Highest dB $L_{Aeq,T}$ at Building Façades – All Plant



Figure 5-2
Model Outputs of Specific Sound Levels, Highest dB $L_{Aeq,T}$ at Building Façades – Substation Only



5.3 BS 4142 Assessment

The following numerical assessments have been provided in accordance with BS 4142 to provide a comparison between rating sound levels of the proposal against the typical sound levels existing prior to development.

Table 5-4
BS 4142 Assessment of Proposed Development – Worst Case NSRs

Results	<i>All Plant Operational</i> Day 07:00 – 19:00	<i>All Plant Operational</i> Evening 19:00 – 23:00	<i>Substation Only</i> Night 23:00 – 07:00	Commentary
Residual sound level, dB $L_{Aeq,T}$	56	52	43	Representative residual and background sound levels from Location 1 of the assessment as directly representative of NSRs adjacent to the site.
Background sound level, dB $L_{A90,T}$	49	42	33	
Reference time interval	1-hour	1-hour	15-min	
Specific sound level, dB $L_{Aeq,T}$	38	38	23	Highest off-site values established from Table 5-3 relevant to NSR A during opening hours.
Acoustic feature correction, dB	+ 3	+ 3	+ 3	A 3 dB feature correction has been applied to account for a source that could have intermittent or other sound characteristics inherent to forecourt plant.
Rating level, dB $L_{Ar,Tr}$	41	41	26	Specific sound level plus acoustic feature correction.
Excess of rating over background sound level	- 8	- 1	- 7	
Assessment indicates likelihood of <i>*depending on context</i>	Low Impact*			Where the rating level does not exceed the representative background sound level this is an indication of low impact, depending on context.
Uncertainty of the assessment	Not significant			Uncertainty was minimised by measuring over an extended period, with low wind speeds at a location directly relevant to the nearest residential NSRs.

The numerical assessments have highlighted a low impact at the worst affected NSR, where the rating sound levels have been predicted to be below the representative background sound levels at all times of operation.

5.4 Context

It has been acknowledged that assessments in Table 5-4 need to be considered in context, following the requirements of BS 4142. The concept of “context” has been notably emphasised in Section 11 of BS 4142 when considering numerical impacts established from applying the standard.

During operational hours, predictions have provided large differences (i.e. greater than 10 dB) between the residual sound level over the specific sound level, such that in context, the ambient sound level should not change by a perceptible degree due to the development. It has subsequently been considered in context that these development activities will be largely indistinguishable for most of the time and masking will be afforded by the residual sound level.

The evening and night have been considered particularly sensitive periods of operation where it would normally be appropriate to consider that residents will likely be resting or sleeping within their homes. During this time, it could be expected that residents may choose to leave windows open, where a level difference of approximately 13 dB would normally be expected inside the dwelling through a partially open window. The nearest NSRs have not been noted to contain any sound insulation provisions that allow residences to keep windows closed (e.g. mechanical ventilation) therefore an open window assessment has been considered appropriate in context.

Internal ambient noise levels within the worst affected dwellings have been predicted to relate to the residual sound climate where this prevails beyond the specific sound levels of this assessment. In combination and at any time, the resulting ambient sound level would not change because of the development and comprise mainly of the residual sound from road traffic and extraneous activities, rather than that of the development as including new forecourt plant.

Where any industrial or commercial sound remains audible, as might be possible during periods of operation, then it has been considered possible in context for some very minor level of effect. This has been considered relevant for any source character that could have different temporal or spectral characteristics than the prevailing residual climate.

The existing sound climate will contain similar sound levels to those proposed in the development, where the context of the assessment changes existing forecourt plant (comprising of separate air / water and vacuum machines and EV chargers) with *directly comparable* plant. Some benefit would be achieved from decommissioning older plant items to newer variants, particularly in terms of positioning of plant and specific sound levels at NSR A. Those plant items to be replaced or relocated in the scheme have been considered directly comparable in nature to sounds existing at the forecourt. Some differences may occur with respect to a substation which may be its own character but would be relatively low level.

Further contextual requirement has been noted from the commentary and RBC Policy EN17 requirement to minimise background creep. A subsection has been provided below to explore the potential implications of achieving this guidance.

BS 4142 has also been noted to include a relevant statement of context applicable in this instance with respect to the substation in particular *“Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.”* Further assessment has therefore been deemed necessary with respect understanding the implications from Local Policy EN17 as well as further assessment of noise from the substation in terms of its absolute level and potential low frequency content at night.

5.4.1 Reading Borough Council Policy EN17

Section 3.6 has highlighted RBC Policy EN17 where noise generating equipment the “*specific level (plant noise level) should be at least 10dBA below the existing background level*”. This subsection has been added to explore application of the Local Policy requirement further to the BS 4142 assessment of Table 5-4.

It has been noted that the wording of Policy EN17 includes the word “should” as inferring a recommendation, rather than “shall” as inferring a requirement. The distinction has been important for the purposes of assessment context, because achieving a specific sound level 10 dB below the background sound level may not be easy to achieve or necessarily required when the background sound level is low.

Table 5-5 has been provided to demonstrate a comparison of specific sound levels against specific sound levels of this assessment.

Table 5-5
Review of Sound Levels For Local Policy EN17

Results	All Plant Operational Day 07:00 – 19:00	All Plant Operational Evening 19:00 – 23:00	Substation Only Night 23:00 – 07:00
Background sound level, dB $L_{A90,T}$	49	42	33
Specific sound level, dB $L_{Aeq,T}$	38	38	23
Excess of specific sound level over background sound level, dB	- 11	- 4	- 10

Despite the indication of a low impact per Table 5-4, it can be seen from Table 5-5 that the specific sound level may not lie below the background sound level by a margin of 10 dB during the evening period as to achieve the recommendation of RBC Policy EN17. Exceedance to this policy has been noted when all plant could be used during the evening period only.

If necessary to grant planning approval, a restriction of usage time has been considered possible to enforce with the proposed air-water and vacuum combi machine. Notwithstanding, it must be understood that the proposals seek to remove similar equipment positioned closer to the nearest receptor such that *some level* of background creep in one location would be offset by *some level* of improvement in another. This would remain a local phenomenon where any attributable effects would lie below the level of human perceptibility in an area of much higher levels of residual sound.

In following it has been considered from PPGN that the proposed noise could “*slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life*”.

5.4.2 Environmental Health Discussions

Following the submission of Version 1 of this NIA report and number of queries were raised by Rebecca Moon, a Principal Environmental Health Officer (EHO) for Reading Borough Council. SLR and Rebecca discussed via Microsoft Teams on Monday 13th March several options and reviewed the current situation on Site. The aim of the discussion was to reduce the effects of the combi unit noise where previous review of Local Policy EN17 provided the equipment would exceed policy during the evening period 19:00 – 23:00 at NSRC, namely 3-4 Marlow Court.

To understand the potential effect of existing operations i.e. if this proposal were not to go ahead, the current scenario has been modelled for the evening period, it has been assumed that existing plant variants are no louder than those of the proposal. The results are modelled in Figure 5-3 and for the worst affected receptors NSR A and C tabulated in Table 5-6.

Figure 5-3
Model Outputs of Specific Sound Levels, Highest dB LAeq,T at Building Façades – Do Nothing
As Existing Evening Sound Level



Table 5-6
Review of Sound Levels For Local Policy EN17 – NSR A & C – As Assessed / Existing

Results	NSR A		NSR C	
	<i>All Plant Operational</i> Evening 19:00 – 23:00	<i>As Existing (Do Nothing)</i> Evening 19:00 – 23:00	<i>All Plant Operational</i> Evening 19:00 – 23:00	<i>As Existing (Do Nothing)</i> Evening 19:00 – 23:00
Background sound level, dB $L_{A90,T}$	42	42	42	42
Specific sound level, dB $L_{Aeq,T}$	38	51	35	36
Excess of specific sound level over background sound level, dB	- 4	+ 9	- 7	- 6
Policy EN17 Achieved? (Y/N)	No	No	No	No

The proposal has been viewed in context as a benefit for both NSR A and C in comparison to the existing situation. That benefit has been considered significant at NSR A (i.e. greater than 10 dB) therefore the beneficial impacts at NSR A has deemed to offset only minor (just perceptible impacts) seen at NSR C.

Version 2 of this NIA has assessed the proposed combi unit in a mediating position which is more comparable in location to that which currently exists, and while it would not meet RBC Policy EN17 at either NSR A or C, the effect remains directly comparable to the existing situation at NSR C (within 1 dB) but a substantial improvement (less 13 dB) at NSR A.

At the front of the premises it has been considered like that raised background levels would be present in comparison to those presented within this report, because the receptor windows are closer to Henley Road. All results for NSR A must therefore be appreciated in such context.

Further consideration has been given below to the substation at night given that background sound levels have been shown as low during the night. It should also be borne in mind that this assessment has considered 0 dB insulation from the proposed GRP substation enclosure as an absolute worst-case. Following discussions with Rebecca Moon, a 2.4 m high close-boarded timber fence around three of the substation sides has now been proposed.

5.4.3 Substation and Low Frequency Noise

The scope of BS 4142 has been noted to state that it is not applicable to the assessment of low frequency noise and provides reference NANR45 for further information. The following assessment of low frequency noise provides a comparison between the predicted low frequency noise levels from the substation, the baseline residual environment and the findings from NANR45, in following of contextual considerations.

The sound levels of the substation have been described as comprising prominent low frequency sound energy at 100 Hz (or 125 Hz octave band). It has not been considered that the type of substation proposed will exhibit significant low frequency energy below the derived sound spectra assumed for this assessment (e.g. octave band sound energy at or below 63 Hz).

A comparison has been made in Table 5-7 below, between the 23 dB $L_{Aeq,T}$ sound level spectra predicted from the substation against the **lowest** 39 dB $L_{Aeq,15min}$ residual sound level measured at Location 1, as occurred in the early morning of Sunday 19th February between 02:45 – 03:00.

Table 5-7
Comparative Specific and Residual Sound Levels in Octave Bands, dB

Description	Sound Pressure Level $L_{eq,T}$ per Octave Band Centre Frequency Hz						Sum (A)
	31.5	63	125	250	500	1000	
Predicted substation sound level	-	23.1	28.3	23.3	23.3	14.4	22.7
Lowest-measured residual sound level	39.1	42.7	40.8	37.8	31.7	32.8	38.5
<i>Difference</i>	-	-19.6	-12.5	-14.5	-8.4	-18.4	-16.1

The comparison table above has highlighted that low frequency noise from the substation incident on the nearest receptors has been predicted to lie significantly below the lowest residual level in any low frequency octave band by at least 8 dB *during the quietest period of the night*. This has provided an indication that low frequency substation will not be readily perceptible in the existing environment at the nearest NSRs.

Table 5-8 below has also provided an indicative comparison between the predicted specific sound level from the substation (externally outside the receptor) with the guidance curve for internal levels from NANR45 (internally inside a dwelling) for a steady state source.

Table 5-8
Low Frequency Noise Comparison, dB

Third Octave Band Centre Frequency, Hz	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
LFN Curve for Steady State $L_{eq,T}$ (INTERNAL)	97	92	88	79	69	61	54	48	47	45	43	41	39
Specific sound level, dB $L_{eq,T}$ (EXTERNAL)	-	-	-	-	-	-	-	23			29		

Where the specific sound level has been calculated in octave bands, the sound level will be at least that of the highest third-octave band sound level (given that the octave band level is the logarithmic sum of the three third-octave bands within it). Given the nature of the sound source as a transformer, it would be expected for the highest 125 Hz octave band to be comprised of 100 Hz third-octave band data.

The comparison table above highlights that the low frequency components of the substation are predicted to be at or below the LFN Criterion Curve *externally* to the receptor before any losses through the building envelope have been accounted for. Furthermore, this assessment has considered 0 dB insulation from the proposed GRP enclosure in the worst-case.

Recent research³ has provided that for ordinary open windows that are fully open, spectral losses in the low frequency octave bands would typically lie in the region of 5 dB, with low-frequency weightings of 5-8 dB $R_w + C_{tr}$ when viewed as a single number. This has provided further positive indication that the substation will not impact the receptors internally, based on the NANR45 steady state guidance curve during the hottest hours of the year.

³ Figure 51, Page 126. <https://www2.mst.dk/Udgiv/publications/2019/03/978-87-7038-050-8.pdf>

It is summarised that the assessed sound sources have been viewed to support a “low impact” in accordance with BS 4142 and in the environment in which they have been proposed, where possible effects of the proposal have been considered and supported in context, including in consideration of low frequency noise.

5.5 Statement of Uncertainty

Uncertainty has been considered as a limit to the accuracy of any noise assessment, including associated steps of measurement, calculation, or prediction. Factors have been considered to include (but not limited to) the following:

- The inherent accuracy limitation of methodology in Standards and guidance.
- Variability in meteorological conditions.
- The accuracy of sound source input data of a calculation.
- Use of noise modelling software.

It has been a requirement of the assessment standard BS 4142 to minimise uncertainty to a level commensurate with the intention of the assessment objective. Measures taken in this assessment to minimise uncertainty have included:

- Baseline sound levels have been measured over a reasonably long period and therefore provide a good indication of representative background and residual sound levels.
- Baseline sound level measurements undertaken in accordance with recognised Standards, using a tall environmental windshield and during acceptable weather conditions e.g. low wind speeds and precipitation.
- A direct measurement location was used to provide a representative basis for background sound levels at the nearest receiver locations.
- Field calibration checks were undertaken before and after measurements to record very low levels of equipment drift.
- The calculations have been conservative as not to under-predict the resulting impacts.

These measures have been considered to reduce uncertainty to a level considered not to have any significance to the outcome of this assessment.

5.6 Predicted Noise Impacts, Planning and Mitigation

The evaluated noise impacts in this report should be considered by Reading Borough Council mindful of the National Planning Policy Framework and Noise Policy Statement for England that define policy and decision-making requirements for planning and noise.

It has been provided within Section 3.0 of this report, that the NPSE suggests noise levels above the SOAEL should be avoided and that if noise levels fall between the LOAEL and SOAEL all reasonable steps should be taken to minimise and mitigate adverse effects, while considering guiding principles of sustainable development.

The range of noise impacts for the proposed forecourt development have been deemed acceptable with respect to overarching requirements for planning and noise. Resulting impacts with suitable mitigation have been anticipated between the NOEL and LOAEL thresholds of the NPSE.

It is expected that the development sound would be largely unnoticeable, or just perceptible during the most noise sensitive periods of assessment. If it is possible for the sound to be audible, it is not expected to cause any change in behaviour or attitude. The development could marginally affect the acoustic character of the area but not to the extent that there is a perceived change in quality of life.

Commensurate measures have been considered to “mitigate and minimise adverse impacts on health and quality of life” which have been included within the detail of this proposal as:

- EV design to include nominal 3.0 m tall screening to rear of each bay.
- The substation to be enclosed on three sides by a 2.4 m high timber fence.

If necessary to grant planning approval, further considerations have been given in context to:

- Usage hours restriction to proposed combi unit plant.

6.0 Conclusions

An assessment of environmental sound levels has been carried out for a proposed development at Leander Service Station in Reading. Environmental sound levels have been taken from a site survey at a location representative of nearest noise sensitive receptors.

A noise impact assessment has been carried out in line with BS 4142 methodology by a suitably qualified acoustician. Cumulative rating sound levels have been predicted at nearest sensitive receptors using noise modelling techniques of all new plant and equipment defined by quantitative noise emissions.

The numerical assessment in Section 5.0 have predicted worst-case rating levels below the representative background sound levels. Predicted noise impacts have been supported as low when considering the context of the Site. Associated noise impacts from the proposed substation have been considered low in context to its resulting sound levels and environment in which it has been proposed.

It has been concluded from the findings of this assessment that the range of noise impacts for the proposed forecourt redevelopment are acceptable with respect to overarching requirements for planning and so, noise should not present reasonable grounds for planning refusal. The likely acoustic effects have been established below the LOEAL threshold of the NPSE, such that noise would not cause any change in behaviour or attitude or a perceivable change in the quality of life. Commensurate mitigation has been provided as necessary to include in the consideration of planning approval.

APPENDIX 01

Glossary of Terminology

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-01
Sound Levels Commonly Found in the Environment

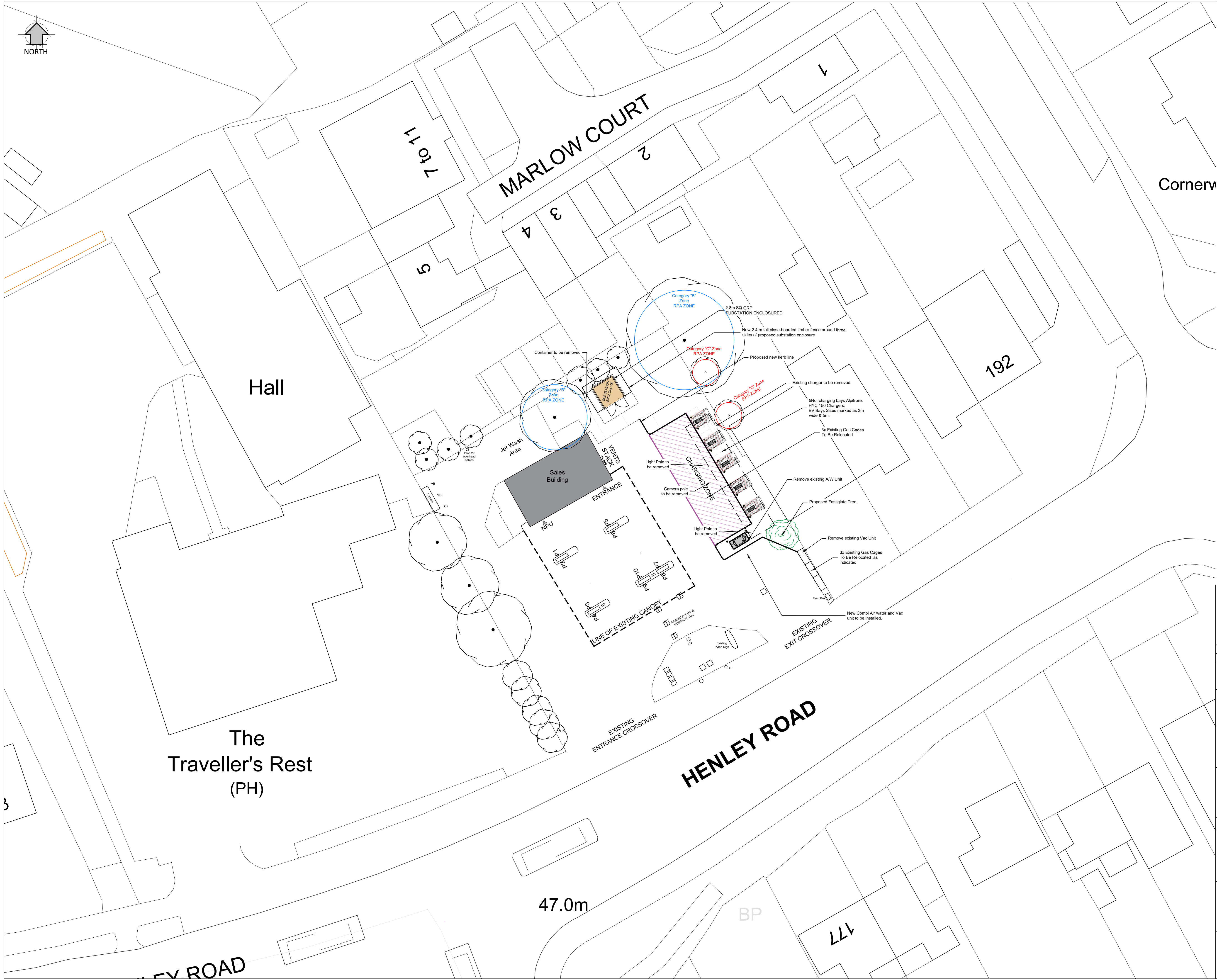
Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (of 20 μ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	$L_{Aeq, T}$ is defined as the notional steady sound level which, over a stated period T, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
$L_{A10, T}$ & L_{A90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
$L_{Amax(F)}$	$L_{Amax(F)}$ is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 02

Drawings and Plant

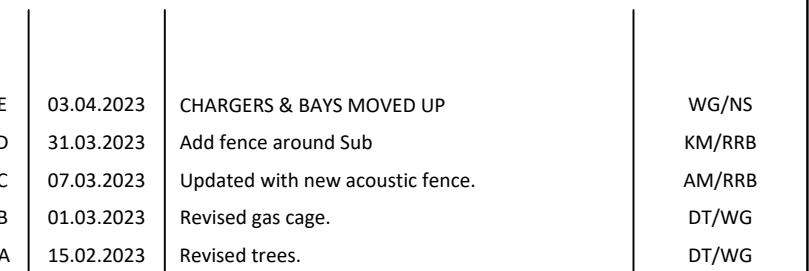


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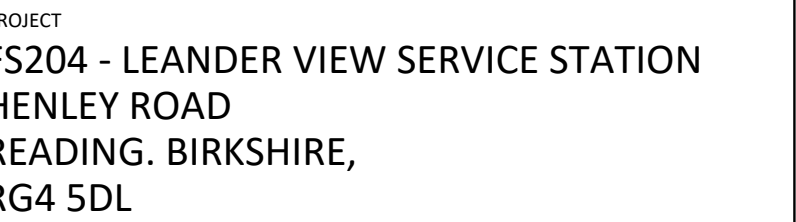
A yellow square icon with a black border, containing the text "SUBSTATION ENCLOSURE" in black capital letters.

NOTES CHARGING POST
ALPITRONICS HYC 150



mbh

CLIENT



PROPOSED SITE LAYOUT

DRAWN BY	DATE	SCALE	PAPER SIZE
KM	17.10.2022	1:200	A1
CHECKED BY	DRAWING NUMBER		REV.
RRB	13664-P02-FS204		E

HYC150

75 kW / 150 kW Rapid charging point for electric vehicles

Key features



*Details in mm

- Maximum output current up to 500 A
- Full performance from 300 V battery voltage
- Future-proof output voltage range from 150 V to 1000 V
- Highly integrated power electronics in an ultra-compact design
- Option for parallel DC charging
- hypercharger Power-Stack concept enables scalable and retrofittable power levels

Product data sheet hypercharger 150

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39100 Bolzano BZ, Italy

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www.hypercharger.it
Tel.: +39 0471 096 450

HYC150

75 kW / 150 kW Rapid charging point for electric vehicles

Technical data

SYSTEM SPECIFICATIONS	
DC interfaces	CCS2 up to 500 A CHAdeMO up to 200 A
AC interfaces	22 kW AC socket/cable (optional)
Payment system	Choose between different card readers for credit cards or EC cards
Load and charging management	Smart, dynamic allocation of power modules and distribution of charging power to charging points
Environmental conditions, in operation	-30° up to +55° C (derating from 40° C), Operating height ≤ 2,000 m
Environmental conditions, in storage	-40° up to +55° C (1K22*/1Z2/1B1/1C1/1S10/1M10) * Minimum temperature in deviation from the standard
Environmental conditions, under transport	-40° up to +70° C (2K12*/2B1/2C1/2S1/2M4) * Minimum temperature in deviation from the standard
Humidity (in operation, storage)	0% - 95% relative (non-condensing)
Efficiency	>94% at full charge
Protective class	Class I (protective earth connection)
Degree of pollution	Class 3
Noise emission	<62 dB(A) at 1m distance @22° C, at full charging (average value throughout entire charging process) Option to set parameters for Silent Mode (reduction of noise emissions by means of power derating)
Installation location	Indoor and outdoor installation
Type of installation	Floor mounted on plinth or base (optional foundation base in concrete)
Protection rating	IP54
Impact resistance	IK10 in accordance with IEC 62262
Dimensions (H x W x D)	2235 x 420 x 663 mm (footprint)
Weight	325 kg up to 462 kg
Accessibility	optional, barrier-free design for the operating elements and plugs in terms of installation height (1,050 mm each) is possible (in accordance with DIN 18040-3)

DRAWING NOTES

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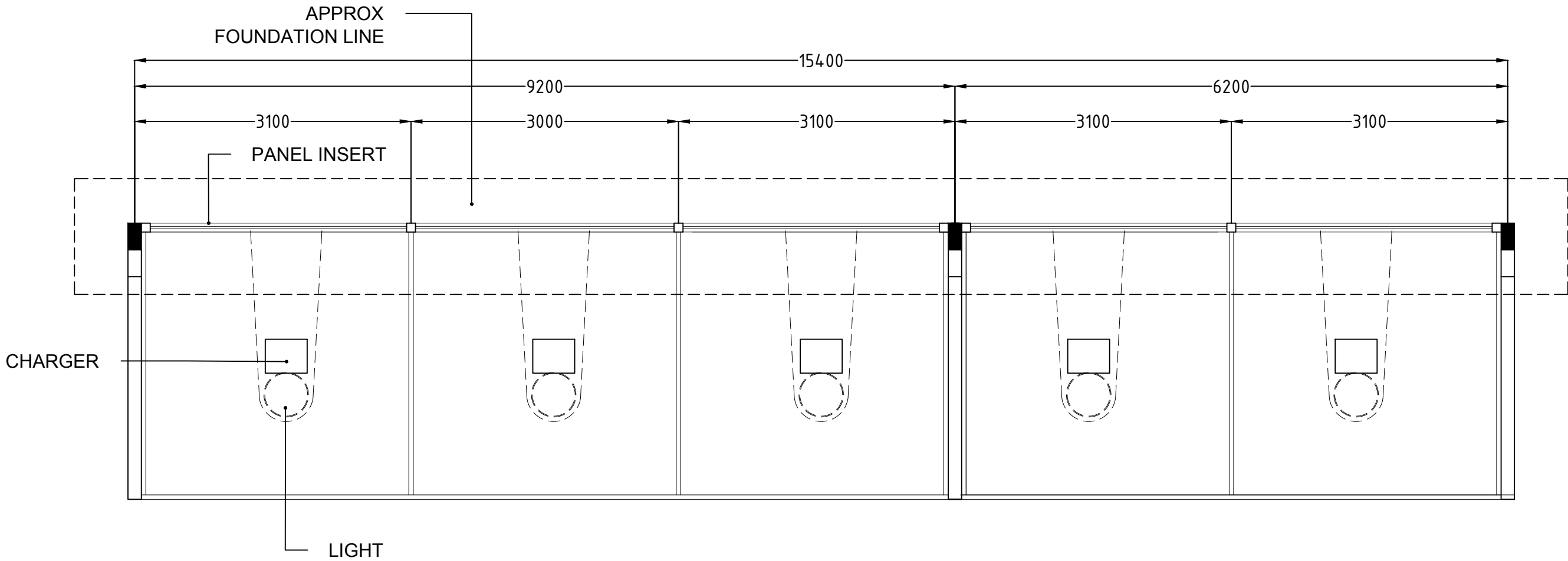
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Materials

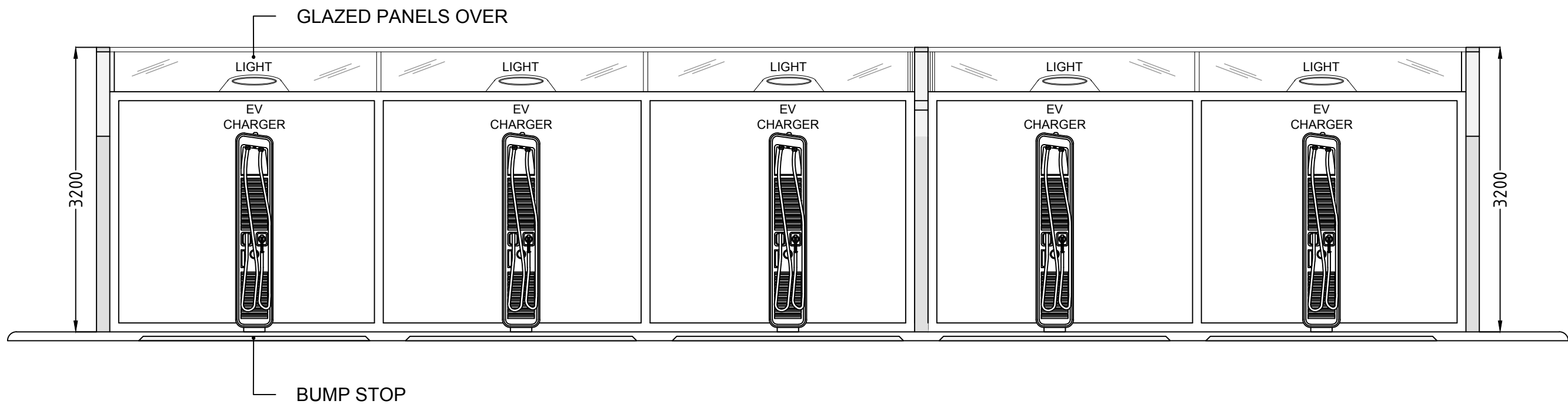
- Powder coated aluminium cladding panels, blue RAL 5015
- Steel frame columns and rafters, powder coated blue RAL 5015
- Glass support beam SHS finished in grey RAL 7016.
- Roof finished in 10mm toughened glass

Lighting

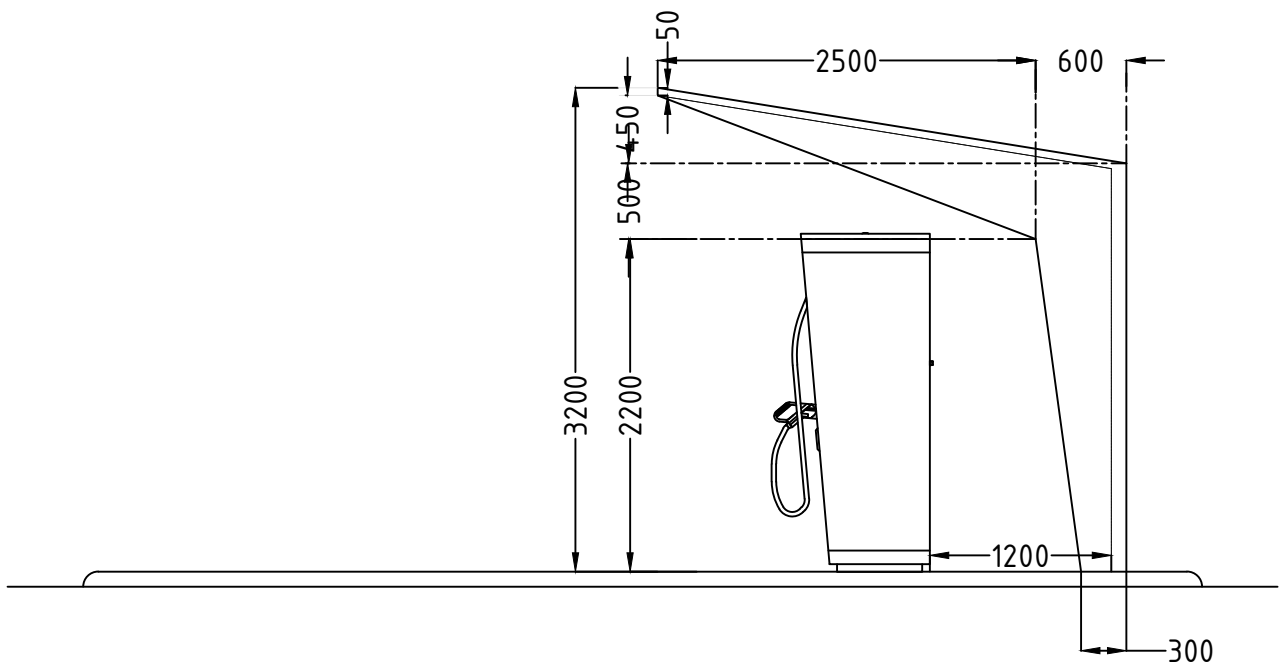
- LED Down lights to achieve 100 lux on each bay



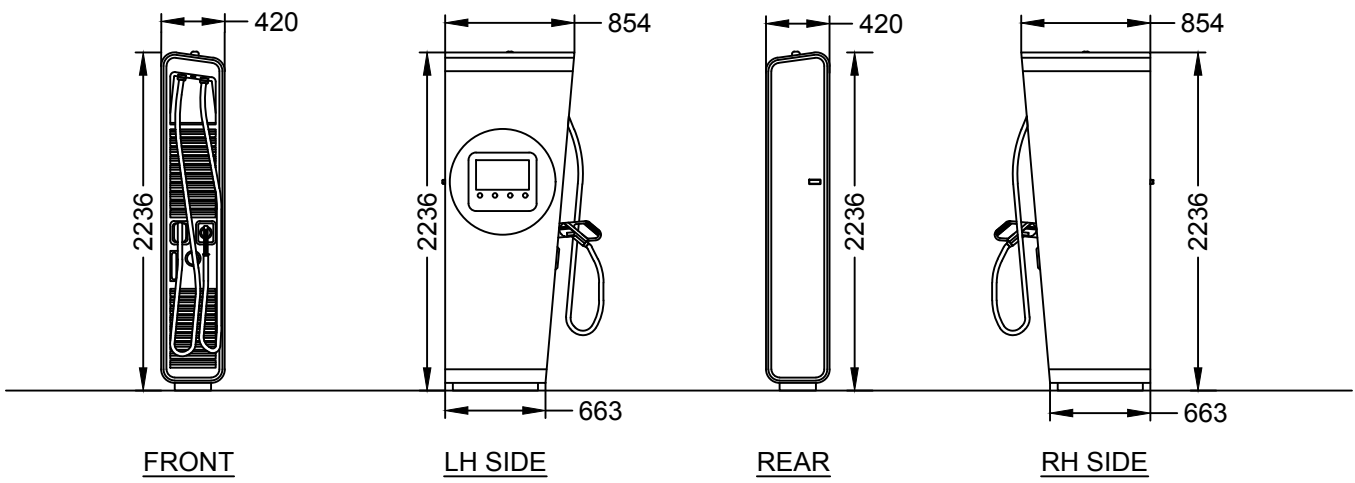
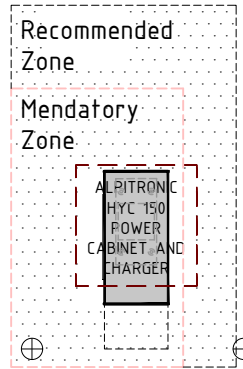
EV CANOPY - PLAN
Scale 1:50



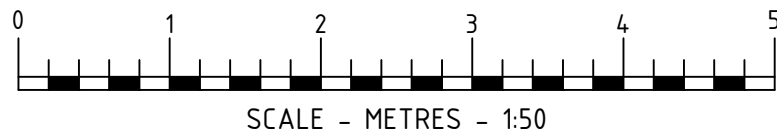
EV CANOPY - FRONT ELEVATION
Scale 1:50



EV CANOPY - SIDE ELEVATION
Scale 1:50



ALPITRONIC 150 HYC CHARGER
Scale 1:50



REVISION NOTES			
REV	DATE	DESCRIPTION	DRAWN/CHECKED
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DRAWING TITLE EV CANOPY DETAIL			
DRAWN BY KM	DATE 17.10.2022	SCALE 1:50	PAPER SIZE A1
CHECKED BY RRB	DRAWING NUMBER 13664-P03-FS204	REV. -	

COMBO

General features

- > Compact
- > Versatile
- > Practical

Features:

- > Stainless steel structure. AISI 304
- > LED display with countdown timer; two possible configurations depending on function chosen
- > Function can be easily changed

> Vacuum

Turbine and filtering system with high suction power and low noise level

> Sprayer

Fragrances, dashboard, tyre polish, etc.
Possibility of including up to 4 different products for the final cleaning of your vehicle.

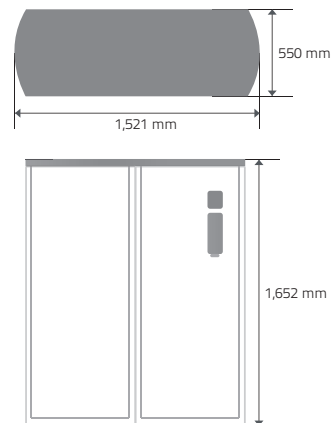
> Gauge

Air: Easy-to-use digital gauge with hose reel.
Possibility of including an internal compressor.

- > **Screen washer:** Hose with reel with water or washer fluid service.

ALL IN ONE,
THE PERFECT
COMBINATION OF
CLEANLINESS AND
SAFETY

- > Do those little but important safety check-ups **while you vacuum** and clean your vehicle, like **pumping up the tyres** or **filling up the screen wash tank**.



Model 4KA00

VACUUM,
SPRAYER AND GAUGE,
ALL IN ONE

Voltage Ratio	Type	Phase	Rating (kVA)	Short-Circuit Impedance (%)	Sound Power Level (dBA)
6 600/250 or 11 000/250 or 20 000/250 (2-wire system)	3 3 3	Single	16 25 50	4.5 4.5 4.5	45 45 45
6 600/500-250 or 11 000/500-250 or 20 000/500-250 (2- or 3-wire system)	1 3 3	Single	25 50	4.5 4.5	45 45
6 600/250-0-250 or 11 000/250-0-250 or 20 000/250-0-250 (3-wire system)	1 3	Single	100	4.5	48
6 600/433-250 or 11 000/433-250 or 20 000/433-250	3 1 3 1 3 1 3 1 2 3 1 2 1 2 1 2 1 2 1 2 1 2 1 2	Three	25 50 100 200 315 500 800 1 000 1 250 1 500 2 000	4.5 4.5 4.75 4.75 4.75 4.75 4.75 4.75 5.0 5.5 6.0	45 45 48 52 54 56 58 59 60 61 62
11 000-6 600/433-250 Dual ratio	1 1 2 1 2 1 2 1 2 1 2 1 2 1 2	Three	200 315 500 800 1 000 1 250 1 500 2 000	4.75 4.75 4.75 4.75 4.75 5.0 5.5 6.0	52 54 56 58 59 60 61 62

Notes:

- The numbers 1-3 in the column headed "Type" refer to:
 - Cable connected transformer
 - Unit substation transformer
 - Pole-mounted transformer
- The above no-load secondary voltages are chosen so as to facilitate provision of the following nationally declared low voltages:

Three-phase	400/230 V, 4-wire
Single-phase	230 V, 2-wire
	230-0-230 V, 3-wire
- The above rated primary voltages of 6 600 V, 11 000 V and 20 000 V relate to highest voltage for equipment of 7.2 kV, 12 kV and 24 kV respectively.
- The rated output of dual ratio transformers shall be available when either ratio is in use and on any tapping position.
- The rated power shall be available when low voltage fusegear is mounted directly on transformers and also when high voltage switchgear is directly mounted on unit substation transformers.
- Sound power levels are maximum values.
- The column heading "impedance (%)" refers to the impedance voltage corrected to 75°C expressed as a percentage of normal voltage, and in the case of dual ratio transformers, shall refer to the 11 000 V connection.

Table 1 - Transformer Details

APPENDIX 03

Survey Results

Table 03-01
15-minute Unattended Daytime History Results – Location 1, dB

Day, Date and Time	<i>L</i> _{Aeq,15min}	<i>L</i> _{A90,15min}	<i>L</i> _{A10,15min}	<i>L</i> _{Amax(F)}	Weather Excl.
Thu 16/02/2023 15:30	55.0	46.9	57.7	71.0	
Thu 16/02/2023 15:45	55.7	45.9	57.7	78.3	
Thu 16/02/2023 16:00	56.4	47.4	59.0	76.1	
Thu 16/02/2023 16:15	57.7	48.7	60.5	81.3	
Thu 16/02/2023 16:30	56.9	52.9	59.0	70.9	
Thu 16/02/2023 16:45	59.8	51.8	60.3	83.7	
Thu 16/02/2023 17:00	55.8	49.2	58.2	75.2	
Thu 16/02/2023 17:15	54.9	48.7	57.3	71.8	
Thu 16/02/2023 17:30	56.7	48.9	59.5	75.5	
Thu 16/02/2023 17:45	54.8	47.7	57.9	64.9	*
Thu 16/02/2023 18:00	54.3	47.3	57.4	63.6	
Thu 16/02/2023 18:15	55.7	46.8	59.0	69.7	
Thu 16/02/2023 18:30	58.9	51.2	60.7	84.4	
Thu 16/02/2023 18:45	54.2	46.4	57.1	75.8	
Thu 16/02/2023 19:00	54.5	49.4	57.2	77.2	
Thu 16/02/2023 19:15	54.4	49.5	57.1	67.4	
Thu 16/02/2023 19:30	53.6	45.3	56.8	67.7	
Thu 16/02/2023 19:45	53.9	45.8	57.3	64.9	
Thu 16/02/2023 20:00	56.0	47.1	57.6	78.2	
Thu 16/02/2023 20:15	52.3	42.9	56.1	63.5	
Thu 16/02/2023 20:30	52.2	42.9	55.6	76.9	
Thu 16/02/2023 20:45	53.7	42.4	55.4	78.9	
Thu 16/02/2023 21:00	51.7	41.9	55.7	70.1	
Thu 16/02/2023 21:15	49.8	41.4	54.2	65.9	
Thu 16/02/2023 21:30	52.0	41.6	55.5	65.1	
Thu 16/02/2023 21:45	50.8	40.9	55.2	60.6	
Thu 16/02/2023 22:00	51.0	40.8	55.2	66.0	
Thu 16/02/2023 22:15	50.1	40.5	54.8	62.8	
Thu 16/02/2023 22:30	50.2	38.7	54.5	64.9	
Thu 16/02/2023 22:45	48.8	38.4	53.5	62.7	
Thu 16/02/2023 23:00	48.9	38.1	53.2	62.0	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Thu 16/02/2023 23:15	47.8	37.5	52.3	63.7	
Thu 16/02/2023 23:30	48.2	37.9	52.9	63.1	
Thu 16/02/2023 23:45	46.8	36.7	49.6	62.8	
Fri 17/02/2023 00:00	43.0	34.8	44.4	59.6	
Fri 17/02/2023 00:15	46.7	35.9	50.3	64.2	
Fri 17/02/2023 00:30	45.8	35.7	46.9	65.1	
Fri 17/02/2023 00:45	45.1	35.1	47.9	62.1	
Fri 17/02/2023 01:00	43.8	34.3	46.5	59.2	
Fri 17/02/2023 01:15	45.7	35.8	47.6	64.0	
Fri 17/02/2023 01:30	41.3	34.6	40.5	64.0	
Fri 17/02/2023 01:45	41.5	33.7	39.6	62.6	
Fri 17/02/2023 02:00	41.2	34.7	41.2	57.8	
Fri 17/02/2023 02:15	39.9	35.1	40.8	58.8	
Fri 17/02/2023 02:30	43.2	36.6	46.4	57.3	
Fri 17/02/2023 02:45	43.4	36.6	45.2	60.0	
Fri 17/02/2023 03:00	46.8	37.4	50.3	66.3	
Fri 17/02/2023 03:15	43.4	34.7	45.3	62.5	
Fri 17/02/2023 03:30	43.4	36.1	45.5	59.3	
Fri 17/02/2023 03:45	45.1	36.5	46.9	62.2	
Fri 17/02/2023 04:00	47.5	38.5	49.0	66.6	
Fri 17/02/2023 04:15	44.2	37.1	45.3	67.1	
Fri 17/02/2023 04:30	45.7	36.4	46.4	65.8	
Fri 17/02/2023 04:45	46.4	38.0	49.2	61.5	
Fri 17/02/2023 05:00	48.5	39.8	51.6	64.2	
Fri 17/02/2023 05:15	50.0	38.1	53.4	66.8	
Fri 17/02/2023 05:30	51.0	40.8	54.4	66.6	
Fri 17/02/2023 05:45	51.4	41.7	54.8	67.1	
Fri 17/02/2023 06:00	52.9	42.1	56.1	70.7	
Fri 17/02/2023 06:15	51.8	44.5	55.7	67.9	
Fri 17/02/2023 06:30	56.2	45.1	59.5	78.2	
Fri 17/02/2023 06:45	55.7	45.5	58.8	74.3	*
Fri 17/02/2023 07:00	60.7	48.0	61.4	79.9	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Fri 17/02/2023 07:15	56.6	48.5	59.8	71.1	
Fri 17/02/2023 07:30	56.4	48.8	59.3	73.1	
Fri 17/02/2023 07:45	57.0	51.2	60.2	69.6	
Fri 17/02/2023 08:00	56.2	49.4	58.9	69.7	
Fri 17/02/2023 08:15	56.6	49.9	59.8	70.7	
Fri 17/02/2023 08:30	58.2	52.0	62.4	76.8	
Fri 17/02/2023 08:45	57.2	49.9	59.7	68.2	
Fri 17/02/2023 09:00	59.6	57.8	61.1	70.8	
Fri 17/02/2023 09:15	58.7	55.7	60.9	66.6	
Fri 17/02/2023 09:30	57.5	52.5	60.0	72.6	
Fri 17/02/2023 09:45	58.7	51.6	62.5	71.7	
Fri 17/02/2023 10:00	57.2	50.9	59.5	77.3	
Fri 17/02/2023 10:15	56.1	50.9	58.5	70.1	
Fri 17/02/2023 10:30	55.9	49.6	58.4	70.5	
Fri 17/02/2023 10:45	59.6	56.2	62.0	69.8	
Fri 17/02/2023 11:00	58.0	55.6	59.8	69.2	*
Fri 17/02/2023 11:15	57.0	54.1	58.8	67.9	
Fri 17/02/2023 11:30	55.7	50.8	58.0	74.7	
Fri 17/02/2023 11:45	58.2	55.0	60.2	78.6	*
Fri 17/02/2023 12:00	57.4	51.4	61.5	69.2	
Fri 17/02/2023 12:15	57.9	52.5	59.8	83.8	
Fri 17/02/2023 12:30	57.4	50.0	58.8	84.8	
Fri 17/02/2023 12:45	55.9	49.4	58.7	68.8	
Fri 17/02/2023 13:00	56.4	50.4	59.0	71.0	
Fri 17/02/2023 13:15	56.4	50.5	59.1	68.3	
Fri 17/02/2023 13:30	57.0	52.2	59.5	70.1	
Fri 17/02/2023 13:45	61.6	49.4	61.1	91.4	
Fri 17/02/2023 14:00	55.0	48.4	57.6	70.3	
Fri 17/02/2023 14:15	57.5	50.5	61.9	77.5	
Fri 17/02/2023 14:30	56.6	51.6	59.1	67.1	
Fri 17/02/2023 14:45	55.7	50.9	58.0	69.2	
Fri 17/02/2023 15:00	56.4	51.4	58.7	71.3	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Fri 17/02/2023 15:15	59.2	51.6	59.4	85.0	
Fri 17/02/2023 15:30	57.5	52.5	59.9	69.5	
Fri 17/02/2023 15:45	56.6	50.7	59.6	76.7	
Fri 17/02/2023 16:00	55.6	49.8	58.4	67.9	
Fri 17/02/2023 16:15	56.5	49.1	59.2	72.6	
Fri 17/02/2023 16:30	56.5	49.0	59.2	72.0	
Fri 17/02/2023 16:45	60.2	50.0	59.0	84.8	
Fri 17/02/2023 17:00	58.5	51.4	60.5	72.8	
Fri 17/02/2023 17:15	59.2	56.9	61.2	73.2	
Fri 17/02/2023 17:30	58.9	56.1	60.7	73.7	
Fri 17/02/2023 17:45	55.9	50.8	58.4	69.4	
Fri 17/02/2023 18:00	55.3	50.5	58.3	67.9	
Fri 17/02/2023 18:15	60.7	48.4	59.8	88.3	
Fri 17/02/2023 18:30	59.2	48.2	58.1	85.0	
Fri 17/02/2023 18:45	53.7	45.9	56.7	66.0	
Fri 17/02/2023 19:00	53.8	46.0	56.3	72.8	
Fri 17/02/2023 19:15	55.8	46.5	59.3	72.1	
Fri 17/02/2023 19:30	55.6	46.7	59.8	67.8	
Fri 17/02/2023 19:45	65.9	44.7	60.0	90.5	
Fri 17/02/2023 20:00	51.7	42.4	55.3	65.8	
Fri 17/02/2023 20:15	55.1	42.0	58.5	85.1	
Fri 17/02/2023 20:30	51.2	42.1	54.8	65.1	
Fri 17/02/2023 20:45	51.0	42.3	54.9	67.7	
Fri 17/02/2023 21:00	51.3	42.9	54.4	67.5	
Fri 17/02/2023 21:15	50.6	41.0	54.5	66.8	
Fri 17/02/2023 21:30	51.3	41.1	56.0	62.0	
Fri 17/02/2023 21:45	50.7	41.1	54.9	65.9	
Fri 17/02/2023 22:00	50.7	41.2	55.0	66.6	
Fri 17/02/2023 22:15	52.9	42.2	54.5	85.1	
Fri 17/02/2023 22:30	49.7	40.5	53.4	64.9	
Fri 17/02/2023 22:45	49.7	40.9	53.7	62.1	
Fri 17/02/2023 23:00	48.8	40.2	53.4	60.7	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Fri 17/02/2023 23:15	49.3	39.4	53.9	59.7	
Fri 17/02/2023 23:30	49.6	39.9	54.1	64.1	
Fri 17/02/2023 23:45	48.6	38.9	52.9	61.8	
Sat 18/02/2023 00:00	49.4	39.6	53.0	68.4	
Sat 18/02/2023 00:15	49.0	39.3	53.5	63.9	
Sat 18/02/2023 00:30	47.7	37.7	50.5	67.7	
Sat 18/02/2023 00:45	47.5	39.1	51.3	64.0	
Sat 18/02/2023 01:00	45.7	39.5	47.6	64.2	
Sat 18/02/2023 01:15	46.3	38.2	48.9	62.3	
Sat 18/02/2023 01:30	46.5	38.7	49.4	61.5	
Sat 18/02/2023 01:45	47.8	38.1	50.2	66.2	
Sat 18/02/2023 02:00	46.7	37.5	48.4	68.0	
Sat 18/02/2023 02:15	45.7	38.2	48.2	63.4	
Sat 18/02/2023 02:30	47.0	39.3	49.7	64.3	
Sat 18/02/2023 02:45	46.6	38.4	51.0	59.5	
Sat 18/02/2023 03:00	46.7	39.4	49.4	60.9	
Sat 18/02/2023 03:15	44.9	38.6	47.4	59.5	
Sat 18/02/2023 03:30	46.1	39.2	49.3	68.2	
Sat 18/02/2023 03:45	46.3	38.9	46.7	71.8	
Sat 18/02/2023 04:00	46.2	38.1	46.7	69.9	
Sat 18/02/2023 04:15	49.9	39.0	51.5	70.9	
Sat 18/02/2023 04:30	46.0	38.8	48.5	60.3	
Sat 18/02/2023 04:45	46.4	38.1	47.1	66.1	
Sat 18/02/2023 05:00	44.7	37.0	46.2	61.5	
Sat 18/02/2023 05:15	48.4	36.7	47.9	74.4	
Sat 18/02/2023 05:30	47.4	38.4	49.1	63.0	
Sat 18/02/2023 05:45	46.7	39.2	48.2	66.0	
Sat 18/02/2023 06:00	48.3	40.1	50.2	64.3	
Sat 18/02/2023 06:15	51.4	41.0	53.6	70.9	
Sat 18/02/2023 06:30	52.4	42.2	54.7	78.3	
Sat 18/02/2023 06:45	52.0	43.2	55.3	70.7	
Sat 18/02/2023 07:00	51.7	43.4	55.5	63.0	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Sat 18/02/2023 07:15	53.8	46.3	57.0	74.8	
Sat 18/02/2023 07:30	54.3	47.5	57.7	67.4	
Sat 18/02/2023 07:45	55.8	48.6	58.9	70.7	
Sat 18/02/2023 08:00	57.6	49.4	59.9	67.2	
Sat 18/02/2023 08:15	58.6	56.8	60.0	69.1	
Sat 18/02/2023 08:30	57.6	55.2	59.2	69.2	
Sat 18/02/2023 08:45	56.3	51.7	58.5	64.4	
Sat 18/02/2023 09:00	55.3	50.9	57.7	72.0	
Sat 18/02/2023 09:15	55.7	49.9	58.6	69.2	
Sat 18/02/2023 09:30	55.0	48.4	58.4	67.3	
Sat 18/02/2023 09:45	55.7	49.6	58.6	70.0	
Sat 18/02/2023 10:00	55.8	49.9	58.5	68.4	
Sat 18/02/2023 10:15	55.7	49.9	58.3	71.3	
Sat 18/02/2023 10:30	55.1	48.6	57.9	66.8	
Sat 18/02/2023 10:45	64.8	48.7	58.0	92.8	
Sat 18/02/2023 11:00	55.5	48.7	58.0	77.5	
Sat 18/02/2023 11:15	55.6	50.0	58.3	65.8	
Sat 18/02/2023 11:30	57.0	51.1	59.9	65.9	
Sat 18/02/2023 11:45	55.2	50.6	57.6	68.1	
Sat 18/02/2023 12:00	57.8	51.2	58.6	81.9	
Sat 18/02/2023 12:15	56.9	52.5	59.7	66.6	
Sat 18/02/2023 12:30	55.6	50.4	58.2	66.8	
Sat 18/02/2023 12:45	54.6	47.8	57.2	69.1	
Sat 18/02/2023 13:00	55.4	45.8	58.7	69.3	
Sat 18/02/2023 13:15	54.8	49.4	57.7	64.8	
Sat 18/02/2023 13:30	55.9	51.5	58.1	70.2	
Sat 18/02/2023 13:45	56.6	52.6	58.8	64.9	
Sat 18/02/2023 14:00	57.5	54.4	59.6	67.7	
Sat 18/02/2023 14:15	57.2	52.2	59.5	66.4	
Sat 18/02/2023 14:30	54.8	48.9	57.7	64.6	
Sat 18/02/2023 14:45	55.2	49.2	58.2	68.5	
Sat 18/02/2023 15:00	59.3	56.6	62.0	65.8	

Day, Date and Time	<i>L</i> _{Aeq,15min}	<i>L</i> _{A90,15min}	<i>L</i> _{A10,15min}	<i>L</i> _{Amax(F)}	Weather Excl.
Sat 18/02/2023 15:15	58.7	56.6	60.1	69.4	
Sat 18/02/2023 15:30	57.5	52.2	59.4	75.4	
Sat 18/02/2023 15:45	54.2	48.9	56.8	73.2	
Sat 18/02/2023 16:00	55.1	49.3	58.1	78.2	
Sat 18/02/2023 16:15	56.2	48.2	58.6	77.2	*
Sat 18/02/2023 16:30	55.5	49.4	58.2	70.2	
Sat 18/02/2023 16:45	54.6	48.8	57.2	68.8	
Sat 18/02/2023 17:00	55.6	51.3	57.9	68.4	
Sat 18/02/2023 17:15	55.4	49.6	58.1	69.4	
Sat 18/02/2023 17:30	56.0	49.1	58.0	75.6	
Sat 18/02/2023 17:45	54.7	47.3	57.4	73.0	
Sat 18/02/2023 18:00	55.3	47.6	58.1	66.9	
Sat 18/02/2023 18:15	59.3	46.7	58.0	83.1	
Sat 18/02/2023 18:30	55.0	46.1	57.4	76.3	
Sat 18/02/2023 18:45	52.9	44.4	56.4	67.6	
Sat 18/02/2023 19:00	54.1	44.3	58.1	63.3	
Sat 18/02/2023 19:15	51.9	44.0	55.8	62.8	
Sat 18/02/2023 19:30	53.9	43.3	57.4	76.5	
Sat 18/02/2023 19:45	52.1	42.2	56.3	63.0	
Sat 18/02/2023 20:00	52.3	43.8	56.1	69.9	
Sat 18/02/2023 20:15	53.9	42.9	57.5	74.9	
Sat 18/02/2023 20:30	53.8	42.7	58.4	63.8	
Sat 18/02/2023 20:45	54.1	42.4	56.6	75.5	
Sat 18/02/2023 21:00	51.9	39.8	55.2	70.1	
Sat 18/02/2023 21:15	51.9	41.8	55.8	66.3	
Sat 18/02/2023 21:30	50.4	40.3	55.1	61.2	
Sat 18/02/2023 21:45	50.4	40.6	54.4	70.6	
Sat 18/02/2023 22:00	50.7	39.4	53.9	80.8	
Sat 18/02/2023 22:15	49.8	39.0	53.8	70.7	
Sat 18/02/2023 22:30	49.8	39.3	54.5	62.1	
Sat 18/02/2023 22:45	50.4	39.9	53.9	72.0	
Sat 18/02/2023 23:00	50.7	39.0	54.9	79.4	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Sat 18/02/2023 23:15	49.8	37.1	54.0	63.7	
Sat 18/02/2023 23:30	48.8	36.9	54.2	60.5	
Sat 18/02/2023 23:45	57.5	38.0	54.0	84.2	
Sun 19/02/2023 00:00	48.6	36.7	53.8	62.0	
Sun 19/02/2023 00:15	47.3	36.8	52.0	61.9	
Sun 19/02/2023 00:30	44.8	35.2	48.7	61.6	
Sun 19/02/2023 00:45	45.8	35.0	49.5	61.4	
Sun 19/02/2023 01:00	43.5	33.6	44.5	63.6	
Sun 19/02/2023 01:15	44.9	33.7	47.7	65.1	
Sun 19/02/2023 01:30	42.7	33.5	43.5	68.9	
Sun 19/02/2023 01:45	45.4	33.5	48.9	60.7	
Sun 19/02/2023 02:00	43.3	32.4	45.0	61.4	
Sun 19/02/2023 02:15	42.5	33.7	43.0	67.3	
Sun 19/02/2023 02:30	47.6	33.0	48.1	69.6	
Sun 19/02/2023 02:45	38.5	31.9	40.9	55.8	
Sun 19/02/2023 03:00	41.0	32.3	41.8	60.5	
Sun 19/02/2023 03:15	42.5	32.1	44.9	60.8	
Sun 19/02/2023 03:30	43.2	31.7	45.2	64.5	
Sun 19/02/2023 03:45	44.0	33.0	46.9	61.5	
Sun 19/02/2023 04:00	43.4	32.5	45.9	59.1	
Sun 19/02/2023 04:15	44.0	32.6	46.2	60.7	
Sun 19/02/2023 04:30	42.7	32.5	44.7	60.2	
Sun 19/02/2023 04:45	42.3	32.0	43.5	64.0	
Sun 19/02/2023 05:00	43.8	32.3	46.3	62.4	
Sun 19/02/2023 05:15	40.2	30.8	38.8	65.5	
Sun 19/02/2023 05:30	44.3	32.1	46.2	65.1	
Sun 19/02/2023 05:45	48.6	33.2	51.7	66.3	
Sun 19/02/2023 06:00	46.5	34.2	47.2	66.1	
Sun 19/02/2023 06:15	49.7	34.9	53.4	66.9	
Sun 19/02/2023 06:30	48.3	35.8	52.9	67.2	
Sun 19/02/2023 06:45	48.7	36.8	53.0	63.3	
Sun 19/02/2023 07:00	49.3	38.5	53.4	61.4	

Day, Date and Time	<i>L</i> _{Aeq,15min}	<i>L</i> _{A90,15min}	<i>L</i> _{A10,15min}	<i>L</i> _{Amax(F)}	Weather Excl.
Sun 19/02/2023 07:15	50.7	40.3	54.6	66.0	
Sun 19/02/2023 07:30	51.2	38.9	55.4	64.3	
Sun 19/02/2023 07:45	51.9	40.7	56.0	66.6	
Sun 19/02/2023 08:00	52.5	39.6	56.3	67.6	
Sun 19/02/2023 08:15	55.5	43.8	59.2	70.8	
Sun 19/02/2023 08:30	53.4	42.0	57.3	66.7	
Sun 19/02/2023 08:45	54.8	43.9	57.8	72.8	
Sun 19/02/2023 09:00	55.3	48.5	57.9	71.6	
Sun 19/02/2023 09:15	53.7	44.2	57.8	71.2	
Sun 19/02/2023 09:30	54.1	46.7	57.1	67.3	
Sun 19/02/2023 09:45	55.4	51.0	57.9	69.3	
Sun 19/02/2023 10:00	55.1	49.1	57.8	68.8	
Sun 19/02/2023 10:15	56.1	49.6	58.4	76.0	
Sun 19/02/2023 10:30	55.2	48.2	58.0	73.7	
Sun 19/02/2023 10:45	56.7	50.2	59.2	73.5	
Sun 19/02/2023 11:00	56.0	50.2	58.3	70.5	
Sun 19/02/2023 11:15	56.3	50.7	59.9	71.8	
Sun 19/02/2023 11:30	57.5	50.8	59.5	79.9	
Sun 19/02/2023 11:45	55.8	47.9	58.8	69.3	
Sun 19/02/2023 12:00	58.5	50.4	59.9	81.6	
Sun 19/02/2023 12:15	56.4	51.8	58.8	72.7	
Sun 19/02/2023 12:30	56.3	52.3	58.7	68.5	
Sun 19/02/2023 12:45	55.9	51.1	58.6	68.9	
Sun 19/02/2023 13:00	56.9	50.3	58.9	68.8	
Sun 19/02/2023 13:15	59.5	51.6	60.9	74.6	
Sun 19/02/2023 13:30	57.3	51.4	59.8	79.5	
Sun 19/02/2023 13:45	57.3	49.5	59.7	79.0	
Sun 19/02/2023 14:00	55.6	48.8	57.8	75.8	
Sun 19/02/2023 14:15	57.4	50.5	57.4	83.8	
Sun 19/02/2023 14:30	55.3	51.0	57.6	74.4	
Sun 19/02/2023 14:45	55.0	50.1	57.7	69.8	
Sun 19/02/2023 15:00	55.7	50.0	58.1	70.8	

Day, Date and Time	<i>L</i> _{Aeq,15min}	<i>L</i> _{A90,15min}	<i>L</i> _{A10,15min}	<i>L</i> _{Amax(F)}	Weather Excl.
Sun 19/02/2023 15:15	58.3	50.2	58.9	72.4	
Sun 19/02/2023 15:30	58.0	49.9	61.5	74.4	
Sun 19/02/2023 15:45	55.3	49.4	57.5	72.8	
Sun 19/02/2023 16:00	54.7	49.5	57.2	66.2	
Sun 19/02/2023 16:15	54.2	49.3	56.7	67.9	
Sun 19/02/2023 16:30	55.0	48.1	57.7	67.1	
Sun 19/02/2023 16:45	59.4	49.3	59.8	78.1	
Sun 19/02/2023 17:00	55.8	47.3	58.8	70.2	
Sun 19/02/2023 17:15	56.9	49.1	60.6	74.6	
Sun 19/02/2023 17:30	54.2	46.3	57.4	66.0	
Sun 19/02/2023 17:45	54.6	44.9	58.1	77.7	
Sun 19/02/2023 18:00	52.8	44.1	56.6	62.4	
Sun 19/02/2023 18:15	52.8	44.3	56.4	63.7	
Sun 19/02/2023 18:30	52.5	44.2	56.0	75.4	
Sun 19/02/2023 18:45	52.1	42.8	55.8	61.9	
Sun 19/02/2023 19:00	53.5	44.4	56.7	67.6	
Sun 19/02/2023 19:15	51.7	42.9	55.0	68.0	
Sun 19/02/2023 19:30	51.8	42.7	55.7	65.5	
Sun 19/02/2023 19:45	52.8	42.0	56.6	66.9	
Sun 19/02/2023 20:00	51.8	41.9	55.3	69.1	
Sun 19/02/2023 20:15	51.5	42.2	55.1	71.1	
Sun 19/02/2023 20:30	52.8	40.3	56.0	65.4	
Sun 19/02/2023 20:45	51.6	40.5	55.4	74.1	
Sun 19/02/2023 21:00	54.2	41.0	57.1	74.6	
Sun 19/02/2023 21:15	49.2	38.7	53.7	68.1	
Sun 19/02/2023 21:30	53.1	38.7	55.9	70.1	
Sun 19/02/2023 21:45	48.2	36.8	53.5	62.3	
Sun 19/02/2023 22:00	49.0	37.7	52.9	64.5	
Sun 19/02/2023 22:15	50.2	36.0	52.6	81.9	
Sun 19/02/2023 22:30	47.7	36.9	52.0	64.4	
Sun 19/02/2023 22:45	47.4	36.4	50.8	67.2	
Sun 19/02/2023 23:00	48.6	35.3	51.6	73.9	

Day, Date and Time	<i>L</i> _{Aeq,15min}	<i>L</i> _{A90,15min}	<i>L</i> _{A10,15min}	<i>L</i> _{Amax(F)}	Weather Excl.
Sun 19/02/2023 23:15	47.8	36.8	52.3	65.5	
Sun 19/02/2023 23:30	45.5	34.0	46.7	64.7	
Sun 19/02/2023 23:45	45.3	32.9	46.1	64.8	
Mon 20/02/2023 00:00	43.4	33.6	44.6	60.7	
Mon 20/02/2023 00:15	39.5	32.9	39.6	59.0	
Mon 20/02/2023 00:30	40.0	32.8	40.9	57.8	
Mon 20/02/2023 00:45	42.7	32.7	43.0	60.8	
Mon 20/02/2023 01:00	43.6	32.7	44.6	60.5	
Mon 20/02/2023 01:15	42.0	33.4	41.5	63.0	
Mon 20/02/2023 01:30	39.1	32.6	37.7	58.9	
Mon 20/02/2023 01:45	38.8	33.1	37.9	59.7	
Mon 20/02/2023 02:00	42.8	32.9	43.2	63.4	
Mon 20/02/2023 02:15	39.9	32.6	38.9	58.4	
Mon 20/02/2023 02:30	40.4	33.1	40.7	58.7	
Mon 20/02/2023 02:45	40.4	33.2	41.4	58.8	
Mon 20/02/2023 03:00	42.3	32.9	41.4	66.3	
Mon 20/02/2023 03:15	43.1	33.4	43.3	64.3	
Mon 20/02/2023 03:30	45.3	34.2	46.1	66.1	
Mon 20/02/2023 03:45	40.6	34.2	43.7	56.7	
Mon 20/02/2023 04:00	42.8	33.6	45.2	62.1	
Mon 20/02/2023 04:15	44.3	34.4	46.4	63.7	
Mon 20/02/2023 04:30	46.6	34.5	48.1	63.6	
Mon 20/02/2023 04:45	44.7	33.7	46.9	60.5	
Mon 20/02/2023 05:00	47.3	35.4	49.6	64.4	
Mon 20/02/2023 05:15	45.6	34.5	48.0	62.3	
Mon 20/02/2023 05:30	50.2	36.5	53.3	70.9	
Mon 20/02/2023 05:45	49.7	39.1	53.2	66.6	
Mon 20/02/2023 06:00	50.6	40.1	54.5	66.4	
Mon 20/02/2023 06:15	52.6	40.4	56.7	68.8	
Mon 20/02/2023 06:30	53.2	43.3	57.2	67.0	
Mon 20/02/2023 06:45	55.0	45.5	58.4	78.3	
Mon 20/02/2023 07:00	57.8	48.6	59.7	77.2	

Day, Date and Time	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax(F)}$	Weather Excl.
Mon 20/02/2023 07:15	55.9	48.7	59.0	65.6	
Mon 20/02/2023 07:30	56.8	49.9	59.6	71.7	
Mon 20/02/2023 07:45	56.1	48.6	58.9	69.9	
Mon 20/02/2023 08:00	55.6	47.7	58.7	74.7	
Mon 20/02/2023 08:15	55.5	48.7	58.4	65.1	
Mon 20/02/2023 08:30	55.4	47.2	58.4	69.2	
Mon 20/02/2023 08:45	55.3	47.6	58.5	66.9	
Mon 20/02/2023 09:00	58.0	49.1	59.2	85.1	
Mon 20/02/2023 09:15	60.5	46.7	59.8	84.5	
Mon 20/02/2023 09:30	55.1	45.8	58.4	67.2	
Mon 20/02/2023 09:45	58.2	47.4	59.6	78.2	
Mon 20/02/2023 10:00	56.2	48.0	59.3	78.2	
Mon 20/02/2023 10:15	54.5	47.6	57.7	68.2	
Mon 20/02/2023 10:30	55.8	48.9	58.5	71.4	
Mon 20/02/2023 10:45	56.3	51.1	59.6	71.0	
Mon 20/02/2023 11:00	56.4	48.3	60.2	70.9	
Mon 20/02/2023 11:15	55.5	48.4	59.9	72.7	
Mon 20/02/2023 11:30	55.5	49.5	58.6	67.5	
Mon 20/02/2023 11:45	56.8	50.9	59.7	71.2	
Mon 20/02/2023 12:00	55.7	47.6	57.7	83.2	
Mon 20/02/2023 12:15	58.5	49.0	58.2	84.3	
Mon 20/02/2023 12:30	56.5	50.0	59.0	72.5	
Mon 20/02/2023 12:45	56.9	49.1	59.1	80.0	
Mon 20/02/2023 13:00	55.7	48.5	58.2	69.7	
Mon 20/02/2023 13:15	55.7	49.8	58.2	73.9	
Mon 20/02/2023 13:30	55.0	48.9	58.0	67.8	

Figure 03-01
Time History Graph – Location 1, dB

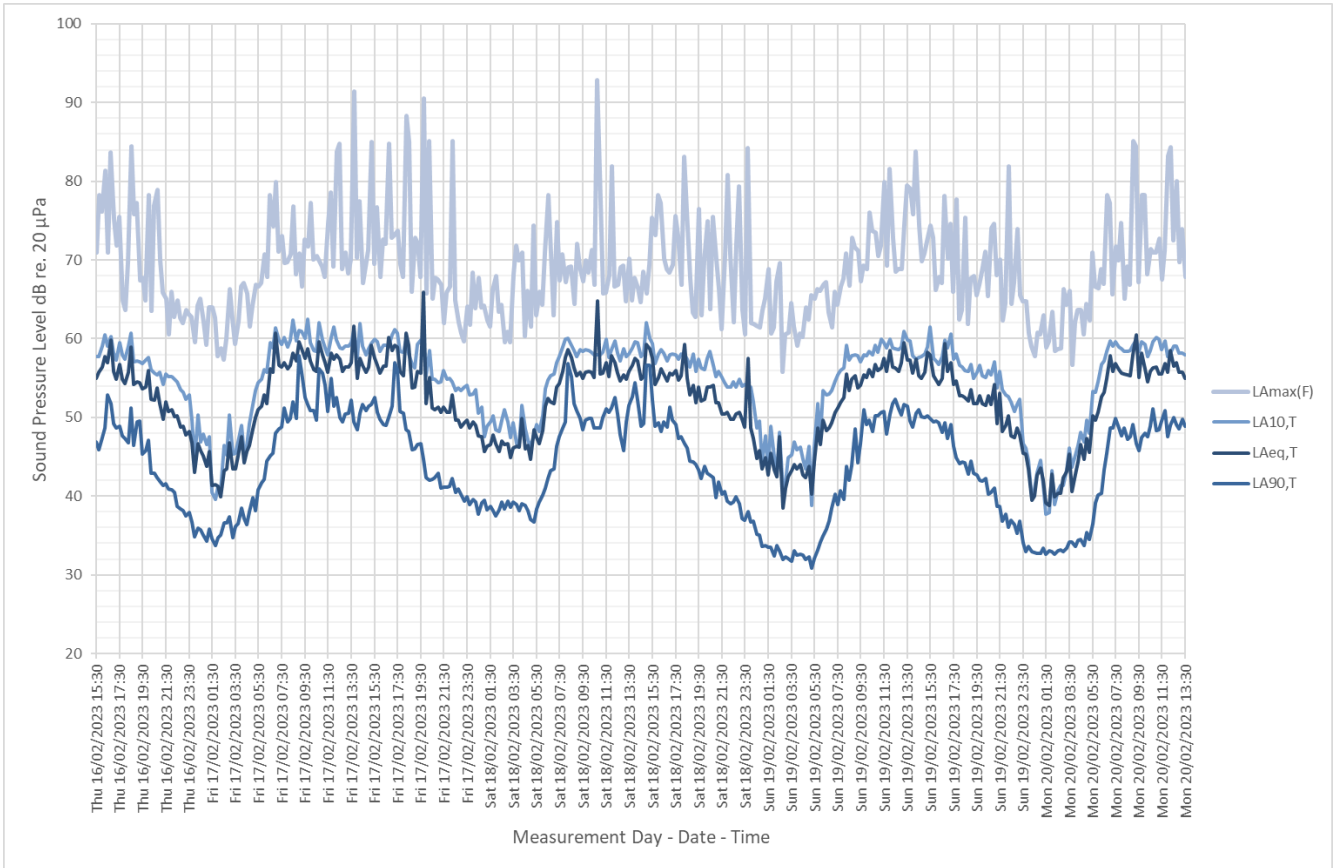


Figure 03-02
Background Sound Level Histogram – Day, Evening, Night – Weather Excluded – Location 1, dB

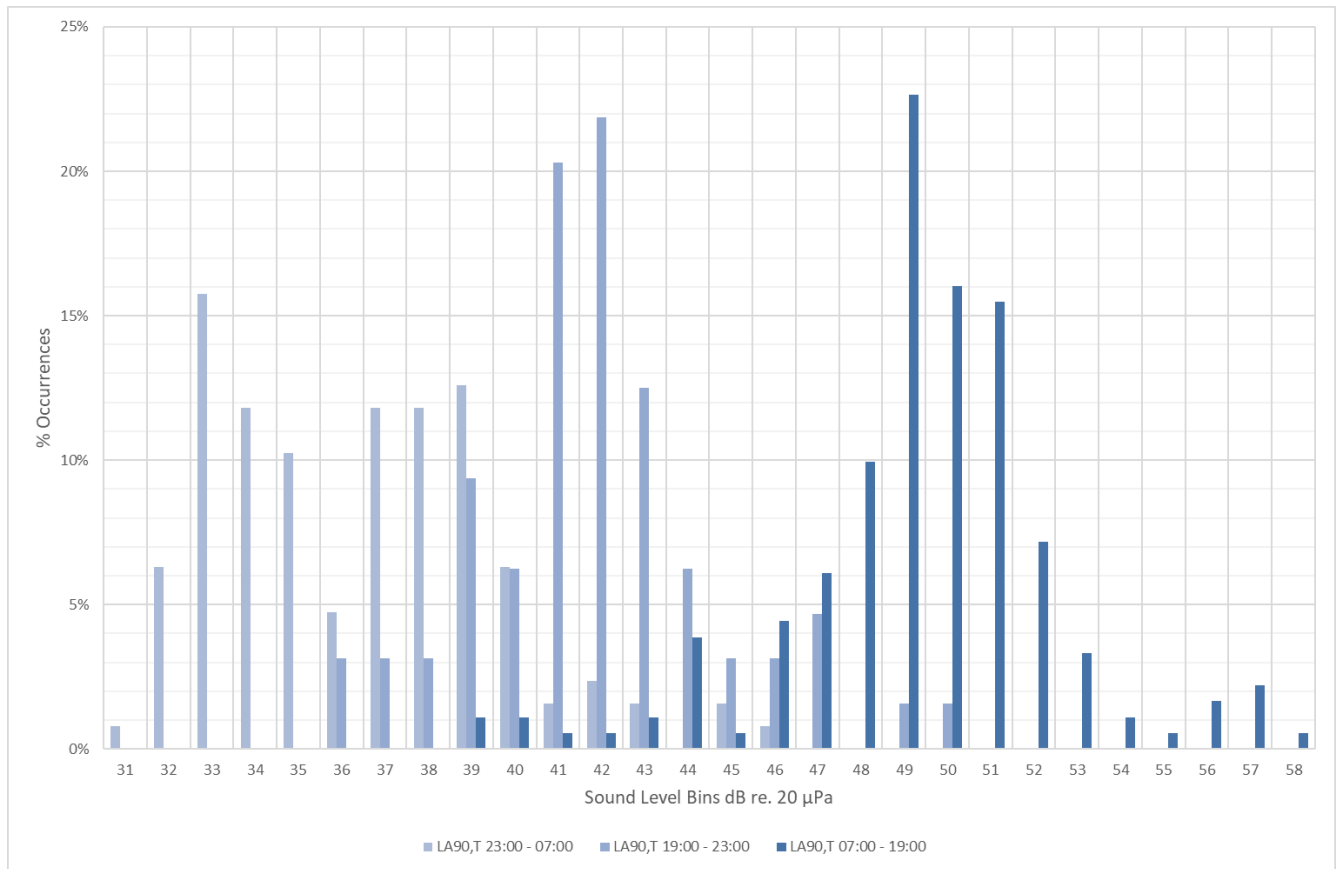
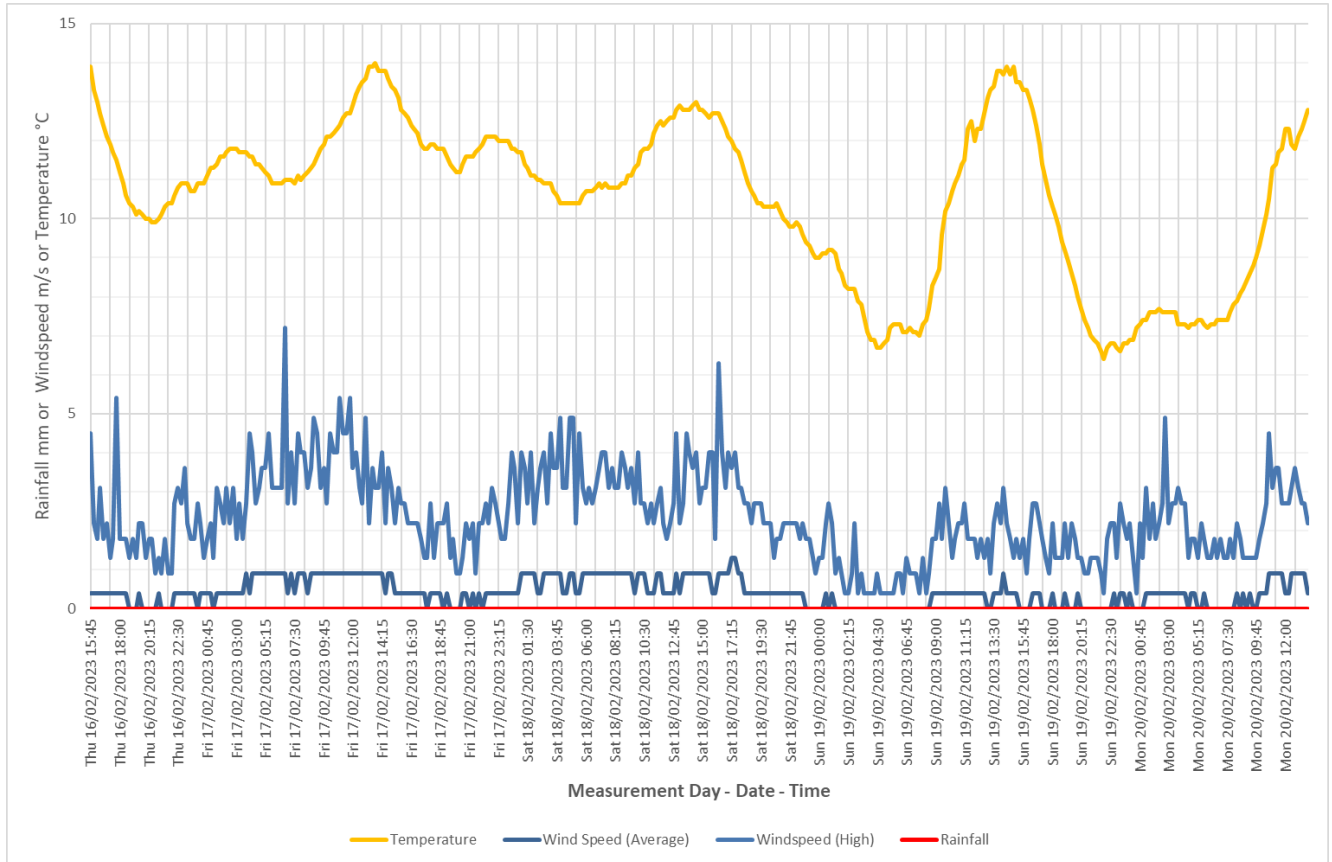


Figure 03-03
Weather Time History Graph – Location 1



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