

NOISE IMPACT ASSESSMENT

NORTH MANCHESTER GENERAL HOSPITAL

Manchester University NHS Foundation Trust

2062435-RSKA-RP-002-(02)

RSK Acoustics Limited Reg. in England and Wales No.7102436
rskacoustics.com info@rskacoustics.com +44(0)1932 829007

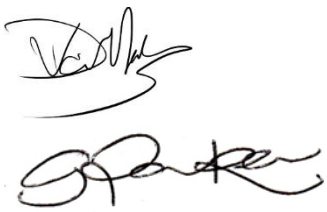
Registered Office: Spring Lodge, 172 Chester Road, Helsby, WA6 0AR
Addlestone | Bristol | Coventry | Edinburgh | Helsby | Hemel | Leeds | London | Manchester



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Author(s):	Daniel Lilley BSc (Hons) AMIOA Daniel Vallis BSc (Hons) CEnv MIOA MIEnvSc	Technical reviewer:	Daniel Vallis BSc (Hons) CEnv MIOA MIEnvSc Graeme Parker BSc (Hons) MIOA
Signature:		Signature:	
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1 Introduction

1.1 Instruction and Objectives

RSK Acoustics (RSKA) has been instructed by Manchester University NHS Foundation Trust to undertake a noise impact assessment to evaluate the operational noise impact due to the relocation of a waste compound at North Manchester General Hospital (NMGH).

The assessment is informed by a baseline noise survey and an attended noise monitoring exercise. Following the previous iteration of this report, further survey works were undertaken to determine the sound reduction performance of the hospital façade, so to provide further context to the likely degree of impact upon occupants of the hospital rooms.

This report expands on that issued previously (2062435-RSKA-RP-001-(02)), assessing the predicted noise impact of both site activity and plant items when further mitigation measures are introduced to limit noise levels where practicable.

1.2 Exclusions

It is anticipated that the proposed development will not result in significant vibration. Therefore, operational vibration has been scoped out of the assessment.

It is noted that Crescent Drive forms part of the public highway with existing traffic flow present on the road. Additionally, this road is part of the route travelled by HGVs to the existing waste compound and wider hospital site. As such, it is considered appropriate to exclude HGV movements along this road link from the assessment.

1.3 Site Location and Description

The development site is currently a car park off Crescent Road, to the east of North Manchester General Hospital (NMGH). An agricultural area is situated immediately to the east of the development site, with a heavy goods vehicle (HGV) rental yard located beyond. To the north-west, the site is largely surrounded by further hospital buildings. Further afield lies a series of residential estates and occasional parkland, serviced by a local road network.

1.3.1 Existing Receptors

The following NSRs have been identified as being the closest and/or most exposed to the development site. for assessment purposes:

Ref.	NSR Name	NSR Type	Distance from Development (m; Direction)
NSR1	Closest Hospital façade	Hospital	14; W
NSR2	12 Longshaw Close	Residential	101; SE

Table 1 NSR Locations

1.4 Development Proposals

It is understood that the development plans are to convert the existing car park area into a waste compound similar to that which is currently situated to the north of the hospital site. Plans involve the construction of a waste compound and staff welfare unit including an air source heat pump (ASHP), the relocation of two waste compactors and relocation of bin stores and associated activities. Following discussions with the client, it is understood that there will be no bin/bin collection activities outside of daytime hours (07:00-23:00). It is also understood that compactors will only be in use during daytime hours and that only one compactor unit will ever be in use at any one time.

2 Regulatory Framework

2.1 National Policy and Guidance

2.1.1 National Planning National Planning Policy Framework (NPPF): 2024

The National Planning Policy Framework (NPPF) describes how noise is considered within the planning regime. The NPPF does not contain assessment design targets, instead providing a series of policies, giving local authorities the flexibility in meeting the needs of local communities. The NPPF states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by […] preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

2.1.2 Noise Policy Statement for England (NPSE): 2010

Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

The significance of impacts from noise are defined within the NPSE as follows:

"There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

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

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

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

The three aims of the NPSE are to:

"Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

2.1.3 Planning Practice Guidance (PPG)

The Department for Communities and Local Government 'Planning Practice Guidance' (PPG) expands upon the NPPF and NPSE. The guidance does not include any specific noise levels but sets out further principles that should underpin a noise assessment. The PPG states:

"Plan-making and decision making need to 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."*

It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to SOAEL, LOAEL and NOEL and presents a table, reproduced below. The implication of the final line of the table is that only the 'noticeable and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation.

Response	Examples of outcomes	Increasing effect level	Action
***NOAEL** (No Observed Effect Level)*			
Not present	No effect	No observed effect	No specific measures required
***NOAEL** (No Observed Adverse Effect Level)*			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No observed adverse effect	No specific measures required
***LOAEL** (Lowest Observable Adverse Effect Level)*			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum

Response	Examples of outcomes	Increasing effect level	Action
***SOAEL** (Significant Observed Adverse Effect Level)*			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable adverse effect	Prevent

Table 2 Summary of noise exposure hierarchy

2.2 Local Policy and Guidance

2.2.1 Planning Application Ref. 140631/FO/2024

Conditional planning approval was granted by Manchester City Council on 18 September 2024. Of particular relevance to this assessment is the following:

"10) a) Any externally mounted ancillary plant, equipment and servicing to be installed shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to its installation, the scheme shall be submitted to and approved in writing by the City Council as Local Planning Authority in order to secure a reduction in the level of noise emanating from the site.

b) Prior to any externally mounted ancillary plant, equipment and servicing to be installed becoming operational, an approved verification report shall be submitted to and approved in writing by the City Council as Local Planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non - conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies DM1 and SP1 of the Manchester Core Strategy. Based on the information within the submitted Noise Assessment, noise levels would be too high at noise sensitive receptors."

2.2.2 Manchester City Council- Planning and Noise Technical Guidance: October 2022

It is understood that the rationale behind Condition 11 of the extant planning permission originates from the above document. In particular, Section 3.1.7.5 *Industrial / Commercial Developments* states the following:

"The Council consider that new developments should contribute and enhance the area in which they are located and where possible i.e. prevent 'noise creep', contribute to the improvement of people's health and quality of life as per the NPSE. With this in mind, the design objective should be:

'The development should be designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.'



Where this criterion cannot be achieved, the various noise control measures considered as part of the assessment should be fully explained (i.e. relocation of noise sources, use of quieter equipment, enclosures, screening, restriction of the hours of operation) and the achievable noise level should be identified. This information will allow a judgement to be made concerning the application and its likely impact on the surrounding area."

2.3 British Standards and other Guidance Documents

2.3.1 British Standard (BS) 7445-1:2003

The three-part standard BS 7445 'Description and measurement of environmental noise. Guide to quantities and procedures' provides the framework within which environmental noise should be quantified. Part 1 provides a guide to quantities and procedures and Part 2 provides a guide to the acquisition of data pertinent to land use. Part 3 provides a guide to the application of noise limits.

BS 7445 also refers to a further standard, BS EN 61672, which prescribes the equipment necessary for such measurements. Whilst BS 7445 does not prescribe the meteorological conditions under which noise measurements should or should not be taken, it does (part 2, paragraph 5.4.3.3) recommend that in order:

"…to facilitate the comparison of results (measurements of noise from different sources), it may be necessary to carry out measurements under selected meteorological conditions which are reproducible and correspond to quite stable propagation conditions."

These conditions include:

- Wind speed not exceeding 5 m/s (measured at a height of 3 to 11 metres above the ground);
- No strong temperature inversions near the ground; and
- No heavy precipitation

2.3.2 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound'* describes the methods for rating and assessing noise of an industrial or commercial nature. The standard is applicable for the purpose of assessing sound from multiple sources at existing dwellings, including the following:

- Sound for industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from the premises or processes, such as that from forklift trucks, or that from train of ship movements on or around an industrial and/or commercial site.

Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment. The difference between the background noise level and the noise rating (including any penalties) is then calculated.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.



As indicated above, the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS4142 states that:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context".

Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;
- The character and level of the residual sound; and
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
    - façade insulation treatments;
    - ventilation and/or cooling; and
    - acoustic screening.

2.3.3 World Health Organization Guidelines for Community Noise, 1999

The Health Organisation (WHO) *Guidelines for Community Noise* was published in 2000 as a response to a need for action together with a generic need for improvements in legislation at a national level. Although not legislation, this document provides general guidance and guidelines which have been set for different health effects, using the lowest noise level that produces an adverse health effect in specific human environments.

The levels which are relevant to this assessment are set out in Table 3:

Environment	Critical health effect(s)	dB L_{Aeq}	Time base (h)	dB L_{AFMax}
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45 [1]
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
Notes [1] Should not exceed 45 dB LAFmax more than 10-15 times per night.				

Table 3 WHO Guidelines for Community Noise

2.3.4 IEMA Guidelines for Environmental Noise Impact Assessment

The Institute of Environmental Management and Assessment (IEMA) has compiled guidance for conducting noise impact assessments, particularly for the use in environment impact assessments (EIAs) but with the wider aim of providing guidance for assessing the impact from any new noise sources.

The guidelines state that, for any assessment, the noise level threshold and significance statements should be determined by the assessor, based on the specific evidence and likely subjective response to the noise. The methodology for the assessment in accordance with the IEMA Guidelines facilitates the determination of impacts from a comparison of future noise against existing noise.

A description of the effect levels, reproduced from Table 7-12 of the IEMA Guidelines, is shown below. Whilst these are based on an example of road traffic noise (using guidance from DMRB), it is reasonable to apply the same magnitude of change thresholds to other sources where the change in noise level is due to the introduction of a noise with the same frequency and/or temporal characteristics as the sounds making up the existing noise climate.

IEMA Degree of Effect	Description / Metric
Very Substantial	Greater than 10 dB LAeq change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB LAeq change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB LAeq change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB LAeq change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB LAeq change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 4 Effect Descriptors (IEMA Guidelines)



3 Noise Survey Method

3.1 Survey Details

3.1.1 Baseline and Attended Surveys

A baseline noise survey was undertaken from 11 April 2024 to 14 April 2024 to obtain data for both midweek and weekend periods. Unattended noise monitoring was undertaken at two locations, one adjacent from the closest hospital façade in the staff carpark situated off Crescent Drive and one further location situated in the lower staff carpark (access adjacent to Lilac Centre Gynaecology Department).

The measurement locations were selected with consideration to the site constraints, security of the monitoring equipment and accessibility of positions with the intention of quantifying noise from surrounding sources such as the contribution from road traffic, overall hospital activity and the third-party HGV yards situated further to the east. It was not possible to install the sound level meter within the curtilage of the NSRs and, therefore, proxy locations were chosen based on proximity to the identified NSRs. Observations made during installation and collection determined that the noise environment at the monitoring location was consistent with that witnessed at the NSRs.

In addition, attended noise monitoring was undertaken in the early hours of 16 April 2024 to quantify the noise impact of early morning site activities. Currently, all waste disposal activities are undertaken at an existing waste compound in the north of the site, including the early morning movement and disposal of 770L Stericycle clinical waste bins between the hours of 04:00-06:00.

A summary of the measurement locations is provided in Table 5 and are shown graphically in Figure 1. With specific reference to the attended measurements, distances from the measurement location to site activities are detailed in Section 4.2.

Measurement Location	Location Coordinates (Lat, Long)
Unattended Monitoring Locations	
MP1	53.515383, -2.227630
MP2	53.515300, -2.226750
Attended Monitoring Location	
MP3	53.518879, -2.225816

Table 5 Measurement Location Details



Figure 1 Attended and Unattended Monitoring Positions

3.1.2 Façade Sound Insulation Testing

Sound insulation testing was undertaken on 9 October 2024 to obtain representative data for the degree of noise attenuation provided by windows installed at the new hospital façade adjacent to the proposed waste compound.

Measurement locations were selected with consideration to the various room types and windows installed at the hospital façade.

For each measurement, a loudspeaker with a pink noise generator was placed externally, 3 m from the building façade. One sound level meter was then positioned externally and another centrally within the room; both positions were confirmed to be 2 m from the building façade.

Pink noise was then played at a high level, whilst internal and external measurements were undertaken concurrently for a duration of 30 seconds. Additionally, measurements were undertaken in the absence of pink noise to quantify and characterise the existing ambient level and to ensure reliable data was collected (i.e., without the influence of extraneous noise sources).

Where applicable in rooms where windows could be opened, the measurement procedure was repeated with windows half and fully open.

3.2 Survey Observations

3.2.1 Baseline Noise Survey (MP1, MP2)

The acoustic environment was observed by the consultant to comprise the following during the equipment installation:

MP1:

- Consistent birdsong.
- Road traffic noise audible in instances of passing traffic on Crescent Drive.
- Construction noise from adjacent hospital works site consisting of plant beacons, plant engine noise/plant movement and intermittent banging.

MP2:

- Consistent birdsong largely dominant in absence of other noise sources.
- Wider road network audible and consistent.
- Intermittent low-level construction noise audible from adjacent hospital site consisting of plant beacons and intermittent banging.

3.2.2 Attended Survey (MP3)

To inform computer noise modelling, attended noise monitoring of Stericycle bin collection activities was undertaken to obtain representative noise data of site activities and also inform perceptive observations of the noise impact of site activities. Discussions with Stericycle staff allowed for the activities to be split into separate monitoring periods, so that representative data of each activity could be obtained.

3.3 Survey Equipment

All noise monitoring was undertaken using the following equipment, detailed in Table 6:

Survey	Equipment	Type	Serial Number	Calibration Due
Baseline Survey	Class 1 sound level meter	Svantek 307	119105	02.02.25
	Class 1 sound level meter	Rion NL-52	453835	29.08.25
	Acoustic calibrator	Rion NC-75	34524164	14.08.25
Attended Survey	Class 1 sound level meter	Svantek 971A	121062	24.04.24
	Acoustic calibrator	Rion NC-75	34524164	14.08.25
Façade Testing	Class 1 sound level meter	Svantek 971A	113229	02.02.25
	Class 1 sound level meter	Svantek 971A	121060	29.08.25
	Acoustic calibrator	Rion NC-75	34991931	05.09.26
	Dodec Loudspeaker	Look Line	C1277	N/A

Table 6 Noise Monitoring Equipment – Unattended Survey

All measurements were undertaken with the microphone positioned away from reflecting surfaces and at a height of 1.5 m above the ground, considered to be under free-field measurement, to the requirements of BS 7445. The calibration of each sound level meter was checked before and after the measurements, using the acoustic calibrator at 94 dB at 1 kHz; no significant calibration drift was noted (+/- 0.3 dB). The sound level meters used conform to the Class 1 requirements of BS EN 61672-1: 2013 'Electroacoustics. Sound level meter, Specifications'. The calibrator used conforms to the requirements of BS EN 60942: 2018 'Electroacoustics, Sound calibrators.' The equipment used has a calibration history that is traceable to a certified calibration institution.

3.4 Weather Conditions

3.4.1 Baseline Survey

Weather conditions during the unattended measurement period were obtained from Wunderground (www.wunderground.com), using the weather station closest to the measuring location (with available historical data). This was judged to be Tariff Street (IMANCH162); the weather data is summarised in Table 7 overleaf.

Date	Temperature (°C)		Wind Speed High (m/s)	Accum. Precipitation (mm)
	High	Low		
11.04.24	14	5	5.3	1.4
12.04.24	17	11	5.3	0
13.04.24	17	9	3.6	3.9
14.04.24	14	7	4.2	0

Table 7 Summarised Weather Data During Monitoring Period

When considering the weather conditions throughout the monitoring period, it was noted that rainfall had occurred on occasion during periods of interest. However, further scrutiny of the measurement data concluded that these periods have not materially affected the baseline conditions or the subsequent statistical analyses for the measurement data. As such, conditions were conducive for noise monitoring.

3.4.2 Attended Survey

Weather conditions during the attended measurement period were considered by the consultant in attendance to be conducive to source noise level monitoring (clear/dry/low wind speeds). This was confirmed via a handheld anemometer operated by the RSKA staff member in attendance.

3.4.3 Façade Sound Insulation Testing

Weather conditions during sound insulation testing were observed to be dry with an intermittent light breeze. As such, conditions were deemed conducive for the testing procedure.



4 Noise Survey Results

4.1 Baseline Noise Survey Results

Summary of the measured noise levels at positions MP1 and MP2 are presented in Table 8 and Table 9, respectively.

To display a summarised dataset within this section, the following methods have been used:

- Ambient levels, dB $L_{Aeq, T}$, are calculated via logarithmic average of contiguous 15-minute records across the assessment periods;
- Statistical values, dB $L_{A10, T}$ and $L_{A90, T}$, are calculated via arithmetic average of contiguous 15-minute records across the assessment periods;
- Maximum levels, dB L_{AFmax}, are summarised as the highest individual $L_{AFmax,15min}$ recorded across each assessment period; and
- All values have been rounded to the nearest decibel.

Date	Time period (hh:mm)	Measured Noise Levels, dB(A)			
		$L_{Aeq, T}$	$L_{AFmax, T}$	$L_{A90, T}$	$L_{A10, T}$
11.04.24	14:30 – 23:00	59	83	46	62
11.04.24-12.04.24	23:00 – 07:00	52	81	41	52
12.04.24	07:00 – 23:00	58	84	45	62
12.04.24-13.04.24	23:00 – 07:00	54	93	39	52
13.04.24	07:00 – 23:00	61	95	46	62
13.04.24-14.04.24	23:00 – 07:00	51	75	40	51
14.04.24	07:00 – 10:00	53	75	40	52

Table 8 Summary of Noise Measurements – MP1

Date	Time period (hh:mm)	Measured Noise Levels, dB(A)			
		$L_{Aeq, T}$	$L_{AFmax, T}$	$L_{A90, T}$	$L_{A10, T}$
11.04.24	15:00 – 23:00	48	82	45	49
11.04.24-12.04.24	23:00 – 07:00	47	76	41	49
12.04.24	07:00 – 23:00	49	79	44	50
12.04.24-13.04.24	23:00 – 07:00	47	74	39	47
13.04.24	07:00 – 23:00	51	80	45	52
13.04.24-14.04.24	23:00 – 03:45	43	59	39	45

Table 9 Summary of Noise Measurements – MP2

4.1.1 Derivation of Background Noise Levels

Representative background noise levels are provided for daytime and night-time periods. The methodology detailed in BS 4142: 2014+A1: 2019 provides an example of statistical analysis to determine the representative background noise level during the daytime ($L_{A90, 1h}$) and night-time ($L_{A90, 15min}$).

The analysis adopts the methodologies applied within the standard to the NSRs with the representative measurement location background levels. Graphs of the statistical analyses of the background noise levels are shown in Appendix C.



NSR	Representative Measurement Location	Representative Background Sound Level, dB $L_{A90, T}$	
		Daytime, $L_{A90, 1h}$ (07:00-23:00)	Night-time, $L_{A90, 15min}$ (23:00-07:00)
NSR1	MP1	42	37
NSR2	MP2	45	37

Table 10 Representative Background Sound Levels at NSRs

4.2 Attended Noise Survey Results

Details of the attended measurements are provided in Table 11 below:

Site Activity	Distance from Activity (m)	Measurement Length	Measured noise level, dB (L_{Aeq}) [1]
Loading empty bins from HGV to compound	1	1m 54s	73
Loading full bins onto HGV from compound	1	2m 38s	71
Full load on load off cycle	1	3m 37s	70
Movement of bins around compound	2-5	0m 45s	73
HGV leaving compound	6.5 [2]	0m 58s	64
Notes: [1] All dB values are rounded to the nearest whole number [2] Initial distance from monitoring position to HGV before leaving compound			

Table 11 Attended Measurement Details

4.3 Sound Insulation Testing Results

Table 12 displays the levels of attenuation afforded by the windows/façade of the rooms tested. Where applicable, multiple measurements were undertaken allowing the attenuation to be tested with the windows closed, open halfway and fully open.

Room Type	Measured Attenuation, dB(A)		
	Windows Closed	Windows Half Open	Windows Fully Open
Accessible Bedroom	50	N/A [1]	N/A [1]
Corridor/Reception Area	48	N/A [1] [2]	28
Staff Room	47	26	24
Standard Bedroom	47	24	20
TV Room	59	N/A [1] [2]	26
Notes [1] Where the table defines the measured attenuation as “N/A”, this is due to the room in question not being readily openable at the time of testing. [2] Due to the function of these windows, it was only possible to fully open the window. Partial opening was not possible due to the window function.			

Table 12 Window/façade Measured Attenuation



5 Noise Prediction Model

5.1 Methodology

The predicted noise levels likely to be generated from the site have been calculated using a noise prediction model. These predictions realise the noise propagation of any plant noise in isolation at the nearest sensitive receptors to the site taking terrain and local topographical features into consideration.

The noise predictions (specific sound levels at noise sensitive receptors) are based on International Standard ISO 9613-2:1996 '*Attenuation of sound during propagation outdoors – general method of calculation*'. ISO 9613 provides a method for the prediction of noise levels in the community from sources of known sound emission.

The ISO 9613-2 method predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

A computer noise model of the site has been produced using SoundPLAN v9.0 based on site layout information passed on by the client, with consideration of the positioning/orientation of all buildings and structures.

Input data in the form of noise emission levels has been assigned to the proposed plant, adjusted to the geometry and nature of the site operations for the site.

The noise prediction method described in ISO 9613 is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces, and
- Screening by obstacles, barriers and buildings.

5.2 Modelling Parameters

An overview of the modelling parameters is given in Table 13 overleaf:



Item	Setting
Algorithms	International Standard: ISO 9613-2
Façade Corrections	Predictions are at 1 m from a given façade
Ground Absorption	Ground Absorption had been set to reflect the terrain of the area. 0 = Soft Ground, 1 = Hard Ground
Meteorological Conditions	10 degrees Celsius; 70% humidity; and Wind from source to receiver.
Façade Corrections	Calculations are free field. No façade corrections have been applied.
Source Modelling	See Section 5.3.
Terrain	Terrain has been derived from NextMap Britain 2m_Contours and with consideration of the conditions observed by RSKA staff members in attendance.
Site Layout	Digitised based on site layout as per Appendix A.

Table 13 Detailed Modelling Parameters

5.3 Operational Source Noise Data (Unmitigated)

5.3.1 Plant Item Noise Data

At present, the specific ASHP to be installed at the waste compound site is yet to be confirmed. At the request of the client, the Mitsubishi Electric *Ecodan R32* (PUZ-HWM140VHA(-BS)) has been considered for the purpose of noise modelling. To account for a worst-case scenario, this version of the Ecodan R32 is the loudest in terms of noise emissions of the 3 possible model variations. Table 14 (below) details the noise specification data employed for the purpose of noise modelling:

ASHP model	Noise Level at 1m (dB L_{PA})	Sound Power Level (dB L_{WA})
Mitsubishi Electric Ecodan R32-PUZ-HWM140VHA(-BS)	53	67

Table 14 ASHP – Noise Specification

It has been confirmed that the existing Pakawaste Portakrush 2000 portable compactors will be replaced with KHD 3000 compactors within the waste compound.

At the time of completing this assessment, it was not possible to obtain noise levels in proximity to the existing units whilst in operation. Plant specifications for the units do not detail noise emission data and it has not been possible to obtain adequate noise emission data from the manufacturer.

As a result, representative data has been obtained from a similar model. To employ design conservatism in the assessment, the representative model selected (CP30 Hopper Waste Compactor) exceeds the KHD 3000 compactor in terms of motor rating and compaction force. Table 15 (overleaf) displays a comparison of the respective compactor specification data, and the noise level used for the purpose of assessment:

Specification Parameter	KHD 3000	CP30 Hopper Waste Compactor
Overall length (mm)	3250	6811
Overall width (mm)	2360	2360
Overall height (mm)	1230	2523
Normal operating compaction force (tonnes)	36	28
Normal Operating Pressure	137	138
Dry cycle time (Seconds)(a)	45	41
Motor rating (Kw)	11	7.5
Noise level at 3 m (dB)	-	67

Table 15 Compactor Specification Comparison

With consideration to the above information in Table 15, it is therefore considered that the CP30 Hopper Waste Compactor Plant specification is a reasonable assumption in the context of the assessment.

5.3.2 Waste Compound Operations Noise Data

To inform the assessment, attended noise monitoring of the collection of 770L bins by Stericycle was undertaken to allow for physical site activities to be considered. These were split into individual activities and were included in the calculation model as separate noise sources to appropriately identify their contribution to the specific sound level at the NSRs.

With respect to activities in which the sound source was moving, the measured data was first calculated as a Single Event Level (dB L_{AE}) to present a source level reflective of the wider operation as opposed to an average value. This includes the movement of bins around the compound and of the HGV's access and egress.

With respect to the loading and unloading operations, these were implemented into the calculation model as point sources to reflect the spatial position of the sound source.

5.4 Operational Assumptions

Computer noise modelling has considered the ASHP and compactors to be a consistent noise source throughout any given 1-hour or 15-minute reference period for this assessment.

Site operatives have confirmed that compactors are in use most of the day from 09:30-18:30; however, there are no instances where both compactors would be operational during any one time. To present a robust assessment, the calculation model therefore assumes that the compactors are in constant use in any given 1-hour reference period during the daytime, but with only one running at a time. It has been verified that the waste compactors are not used during the night-time period and therefore have been excluded from the hours of 23:00-07:00.

Following client discussions with site operatives, it has been concluded that use of the compactors will not coincide with collection of the bin collection process. As a result, the assessment considers two scenarios within the daytime period, assessing the noise impact of compactor use and bin collections separately. It is understood that the ASHP will be operational at all times and therefore has been included within both scenarios.

For the waste compound operations, moving point sources were time-corrected with the assumption of a single event taking place across a specified path in a given 1-hour or 15-minute period and are representative of the anticipated speed of the noise source: 10 km/h for the HGV whilst in the site and 5 km/h for pedestrian movements of the bins.

Similarly, point sources have been time-corrected against the timeframe in which the attended measurements took place; from discussions with the Stericycle operator on site, it is understood that these periods reflect the time taken to complete each task.



Following discussion with the client, it has been confirmed that the aforementioned compound activities (Stericycle HGV bin collection and associated activities) will not be undertaken during the night-time period and as such have been excluded between the hours of 23:00-07:00. Therefore, reflective of site operations, night-time activities only consider the operation of the ASHP during the night-time period.

5.5 Planned Mitigation Methods

The following mitigation methods have been incorporated into the computer noise model as agreed with the client:

5.5.1 Noise Barriers

It has been confirmed that ECOSound Blok noise barriers will be installed at the compound boundary. Current plans are for these to be installed in the southern half of the site with installation beginning at the gated entrance on western boundary, and to run uninterrupted to the storage container area on the eastern boundary.

There is the potential for further noise barriers to be installed at the western boundary adjacent to the hospital façade. Consequently, both scenarios have been considered as part of the noise modelling exercise to inform the decision at a later stage.

5.5.2 Compactor Shelter

At present, it is understood that a Broxap Bescot Utility Shelter is to be installed to house the compactors. Whilst the finalised design is yet to be confirmed, noise modelling has been undertaken with the assumption that the shelter will have no gaps between the ground and façades, and between the façades and roof (with the exception of the front opening). Following discussions with the client, noise modelling assumes the inclusion of a single plasterboard layer within the structure.

5.5.3 Management Plan

Night-time operations (23:00-07:00) have been limited so that operations are restricted to the operation of the ASHP. Daytime operations (07:00-23:00) consider compactor use and bin collection activities, although these will not overlap.

5.6 Predicted Noise Levels at NSRs

The following noise levels are predicted at the NSRs as a result of the site activities described above. Note that, due to the fact that NSR1 consists of a large area (and, subsequently, a large number of noise-sensitive façades), the highest predicted value has been displayed in the interests of brevity.

NSR	Specific Sound Level, dB $L_{AS,T}$	
	Scenario 1- Bin Collection and ASHP	Scenario 2- Waste Compactors and ASHP
Current Site Layout		
NSR1	51	43
NSR2	31	16
Current Site Layout with Additional Noise Barriers at Western Boundary		
NSR1	49	43
NSR2	31	16

Table 16 Predicted Noise Levels at site NSRs – Daytime Scenarios 1 & 2



NSR	Specific Sound Level, dB $L_{AS, T}$
	Night-time- Heat Source Pump Only
Current Site Layout	
NSR1	23
NSR2	16
Current Site Layout with Additional Noise Barriers at Western Boundary	
NSR1	23
NSR2	16

Table 17 Predicted Noise Levels at site NSRs – Night-Time



6 Operational Noise Impact

The specific sound level from site activity has been predicted as the contribution (energetic sum) of the site activities and the installed ASHP within the proposed development. Resultant of the nature of site activities, daytime operations have been split into two scenarios, separating bin collection activities and compactor operation. It has been assumed that the ASHP will be operational throughout both daytime and night-time periods.

6.1 Acoustic Correction

According to BS 4142, where certain features of the specific sound level can increase the significance of impact of a sound level, a character correction is applied to provide a rated noise level. The characteristics of a sound that are likely to cause an increase in the significance of impact are tonality, impulsivity, intermittency or other characteristic features such as an identifiable 'hiss'.

6.1.1 Tonality

From observations of on-site activities and prior RSKA experience of ASHPs, it is considered that these elements of the development do not present characteristics deemed 'tonal' in the context of BS 4142 and, therefore, a character correction is not required.

However, there is some concern regarding the potential tonality from the operation of the waste compactors and from HGV reversing alarms during the bin collection. This is considered to be less pronounced at NSR2 than at NSR1 due to the additional attenuation afforded by greater distances, resulting in a quieter specific sound level compared to the residual levels at the NSR, thereby diminishing the prominence of its characteristic. Consequently, character corrections of 4 dB and 2 dB have been applied at NSR1 and NSR2, respectively.

As it has been confirmed that the compactors will only be operational during the daytime period, no correction has been applied during the night-time period with regard to tonality.

6.1.2 Impulsivity

The character of the sound from on site activities has the potential to be impulsive when in proximity to the operations, with concerns as to movement of bins, and the impulsive nature of the operation of the waste compactors. This is expected to be perceptible at NSR1 but not NSR2, where the reduced distance is more likely to result in any impulsive characteristics being more distinctive against the prevailing residual environment. Therefore, a character correction of 3 dB has been applied at NSR1 for the daytime period only.

No impulsive characteristics are anticipated from operation of the ASHP, which is understood to be the only plant item in use during the night-time period. As such, no character corrections for impulsivity have been applied for this period.

6.1.3 Intermittency

As multiple on/off conditions within a given 1-hour (daytime) or 15-minute (night-time) reference periods are not considered to be identifiable amongst the residual environment, intermittency character corrections have not been applied.

Taking the above acoustic features into consideration, the application of rating penalties is as follows:



NSR	Specific Sound Level, dB $L_{AS,T}$	Character Corrections, dB				Rating Level, dB $L_{Ar,Tr}$
		Tonality	Impulsivity	Intermittency	Total	
Daytime Scenario 1 (Bin Collection Activities and ASHP)						
NSR1	51	+4	+3	0	+7	58
NSR2	31	+2	0	0	+2	33
Daytime Scenario 2 (Waste Compactors and ASHP)						
NSR1	43	+4	+3	0	+7	50
NSR2	16	+2	0	0	+2	18
Night-time (ASHP)						
NSR1	23	0	0	0	0	23
NSR2	16	0	0	0	0	16

Table 18 Applied Character Corrections – Current Site Layout

NSR	Specific Sound Level, dB $L_{AS,T}$	Character Corrections, dB				Rating Level, dB $L_{Ar,Tr}$
		Tonality	Impulsivity	Intermittency	Total	
Daytime Scenario 1 (Bin Collection Activities and ASHP)						
NSR1	49	+4	+3	0	+7	56
NSR2	31	+2	0	0	+2	33
Daytime Scenario 2 (Waste Compactors and ASHP)						
NSR1	43	+4	+3	0	+7	50
NSR2	16	+2	0	0	+2	18
Night-time (ASHP)						
NSR1	23	0	0	0	0	23
NSR2	16	0	0	0	0	16

Table 19 Applied Character Corrections – with Additional Noise Barriers at Western Boundary

6.2 Comparison between Rating Level and Background Sound Level

The derived Rating Levels at each NSR and excess over background noise levels for the daytime and night-time periods, are as follows:

NSR	Background Sound Level, dB $L_{A90,1h}$	Rating Level, dB $L_{Ar,Tr}$	Difference, dB
Current Site Layout			
NSR1	42	58	+16
NSR2	45	33	-12
Current Site Layout with Additional Noise Barriers at Western Boundary			
NSR1	42	56	+14
NSR2	45	33	-12

Table 20 Scenario 1 – Comparison between Rating Level and Background Sound Level – Daytime



NSR	Background Sound Level, dB $L_{A90,1h}$	Rating Level, dB $L_{Ar, Tr}$	Difference, dB
Current Site Layout			
NSR1	42	50	+8
NSR2	45	18	-27
Current Site Layout with Additional Noise Barriers at Western Boundary			
NSR1	42	50	+8
NSR2	45	18	-27

Table 21 Scenario 2 – Comparison between Rating Level and Background Sound Level – Daytime

NSR	Background Sound Level, dB $L_{A90,1h}$	Rating Level, dB $L_{Ar, Tr}$	Difference, dB
Current Site Layout			
NSR1	37	23	-14
NSR2	37	16	-21
Current Site Layout with Additional Noise Barriers at Western Boundary			
NSR1	37	23	-14
NSR2	37	16	-21

Table 22 Comparison between Rating Level and Background Sound Level – Night-time

In all operating scenarios, the Rating Level is shown to fall below the representative background noise level by a margin of at least 5 dB(A) at NSR2. Additionally, the Rating Level falls below this threshold at NSR1 during both night-time scenarios.

With consideration to Scenario 1 (bin collection activities and ASHP operation), the Rating Level exceeds the representative background noise level at NSR1 by a margin of 16 dB(A); with the additional barrier in place, it is anticipated that this noise level would reduce by 2 dB(A).

With consideration to Scenario 2 (waste compactors and ASHP operation) the Rating Level exceeds the representative background noise level at NSR1 by a margin of 9 dB(A). Due to the location of the waste compactors to the nearest hospital façade, no significant noise attenuation is predicted at NSR1 during compactor operations, should the proposed additional noise barriers be installed.

6.3 Context Evaluation of Significance Criteria

The Rating Level (inclusive of penalty corrections) from site activity has been predicted as the contribution (energetic sum) of all active sources within the proposed development. This scenario provides a conservative interpretation of the resulting noise levels at receptor.

BS 4142 states:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the Rating Level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

In isolation, i.e., without taking contextual factors into account, the initial assessment suggests that noise levels would be unlikely to generate an adverse impact at either NSR during the night-time period, or at NSR2 during the daytime. However, potential for significant adverse impact is predicted at NSR1 during the daytime period.



Notwithstanding, BS 4142 states that:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context".

6.3.1 Consideration of Absolute Noise Levels within Hospital Rooms

Following the outcomes of the sound insulation testing detailed in Section 6, it is worth noting the attenuation provided by the hospital façade and the subsequent internal ambient noise level when considering the likely degree of impact for occupants. WHO *Guidelines for Community Noise* states that, during daytime periods, to allow for speech intelligibility and avoid moderate annoyance, interior dwelling noise levels should not exceed 35dB $L_{Aeq,T}$. To provide an indication as to the contribution the proposals will make to internal ambient noise levels within rooms, Tables 23 and 24 (overleaf) show the predicted specific sound levels for each operating scenario during the daytime period whilst accounting for the inherent sound reduction of the external façade.

Room Type	Windows Closed	Windows Half Open	Windows Fully Open
Current Site Layout			
Accessible Bedroom	9	N/A	N/A
Corridor/Reception Area	11	N/A	31
Staff Room	12	33	35
Standard Bedroom	12	35	39
TV Room	0	N/A	33
Current Site Layout with Additional Noise Barriers at Western Boundary			
Accessible Bedroom	7	N/A	N/A
Corridor/Reception Area	9	N/A	29
Staff Room	10	31	33
Standard Bedroom	10	33	37
TV Room	-2	N/A	31
Key Green text indicates WHO criteria met Amber text indicated WHO criteria exceeded			

Table 23 WHO Guidelines for Community Noise Comparison – Daytime – Scenario 1



Room Type	Windows Closed	Windows Half Open	Windows Fully Open
Current Site Layout			
Accessible Bedroom	1	N/A	N/A
Corridor/Reception Area	3	N/A	23
Staff Room	4	25	27
Standard Bedroom	4	27	31
TV Room	-8	N/A	25
Current Site Layout with Additional Noise Barriers at Western Boundary			
Accessible Bedroom	1	N/A	N/A
Corridor/Reception Area	3	N/A	23
Staff Room	4	25	27
Standard Bedroom	4	27	31
TV Room	-8	N/A	25
Key Green text indicates WHO Criteria met			

Table 24 WHO Guidelines for Community Noise Comparison – Daytime – Scenario 2

It is predicted that, when windows are closed, noise levels from the bin collection would fall below the thresholds set out in the WHO Guidelines. When opened, it is predicted that WHO criteria will be exceeded during Scenario 1.

During Waste Compactors and ASHP operation (Scenario 2), noise levels are predicted to fall below the thresholds set out in the WHO Guidelines in all rooms, irrespective of whether windows are opened or closed.

6.3.2 Consideration of Existing Acoustic Environment

Further to the above, it is important to consider the predicted Rating Level in context against the residual acoustic environment (i.e., the ambient sound level without the proposals) when determining the likely degree of impact.

Figure 2 and Figure 3 show how the existing ambient sound level taken from the baseline survey, the specific sound level from the proposed activities at NSR1 and the 'new ambient' level; the secondary axis of each graph highlights the predicted change in ambient level as a result of the proposed activities.



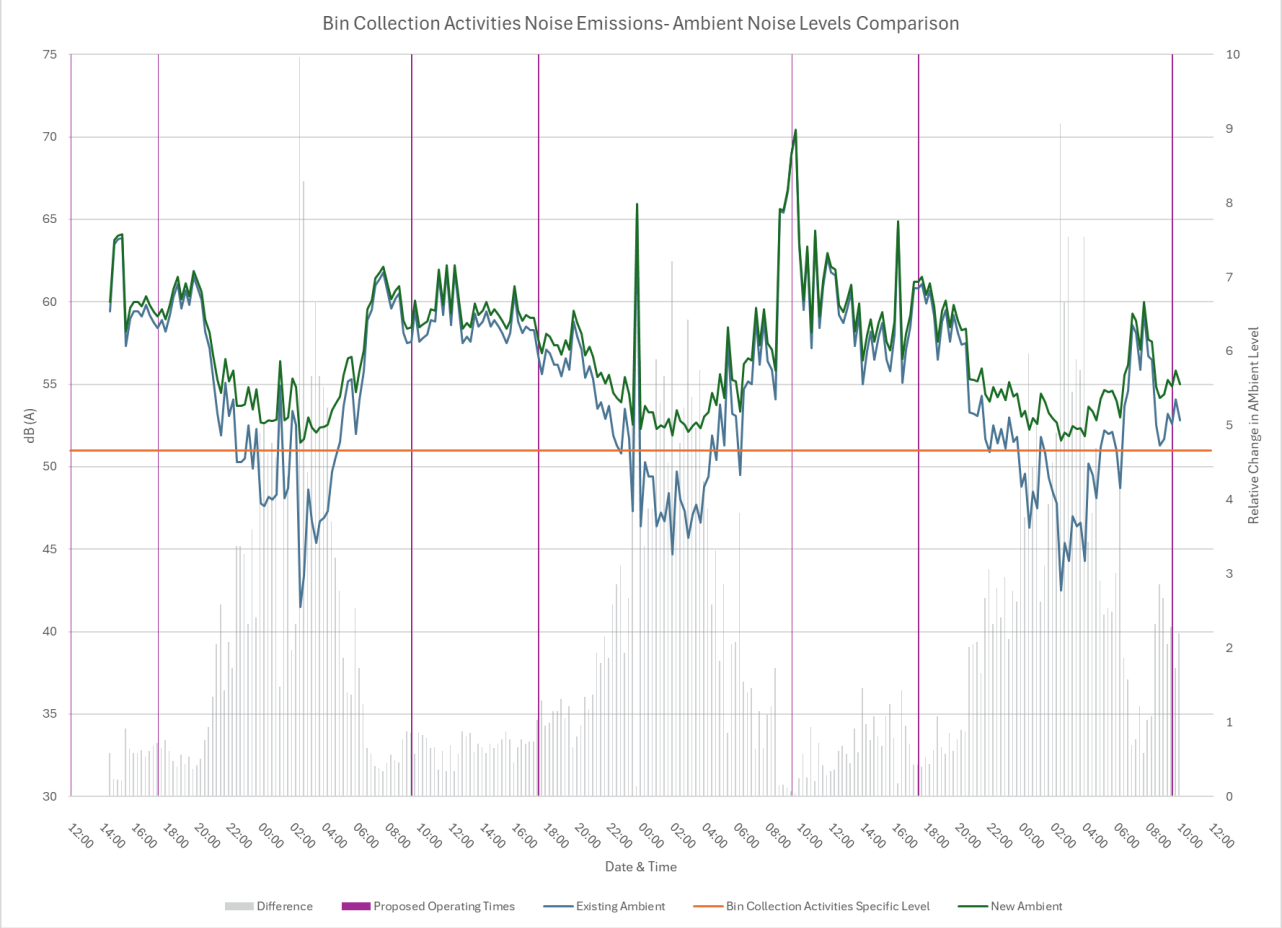


Figure 2 Comparison of Ambient Sound Level – Scenario 1

The specific sound level during Scenario 2 is predicted to be 51dB $L_{AS,T}$ at the most affected area of the hospital façade. This is below the ambient level during the periods in which these operations would occur.

The subsequent increase in ambient sound is noted to not exceed 3 dB(A) during the proposed operating periods. According to the IEMA effect descriptors shown in Section 2, this degree of change equates to a magnitude of impact categorised as “none / not significant”.

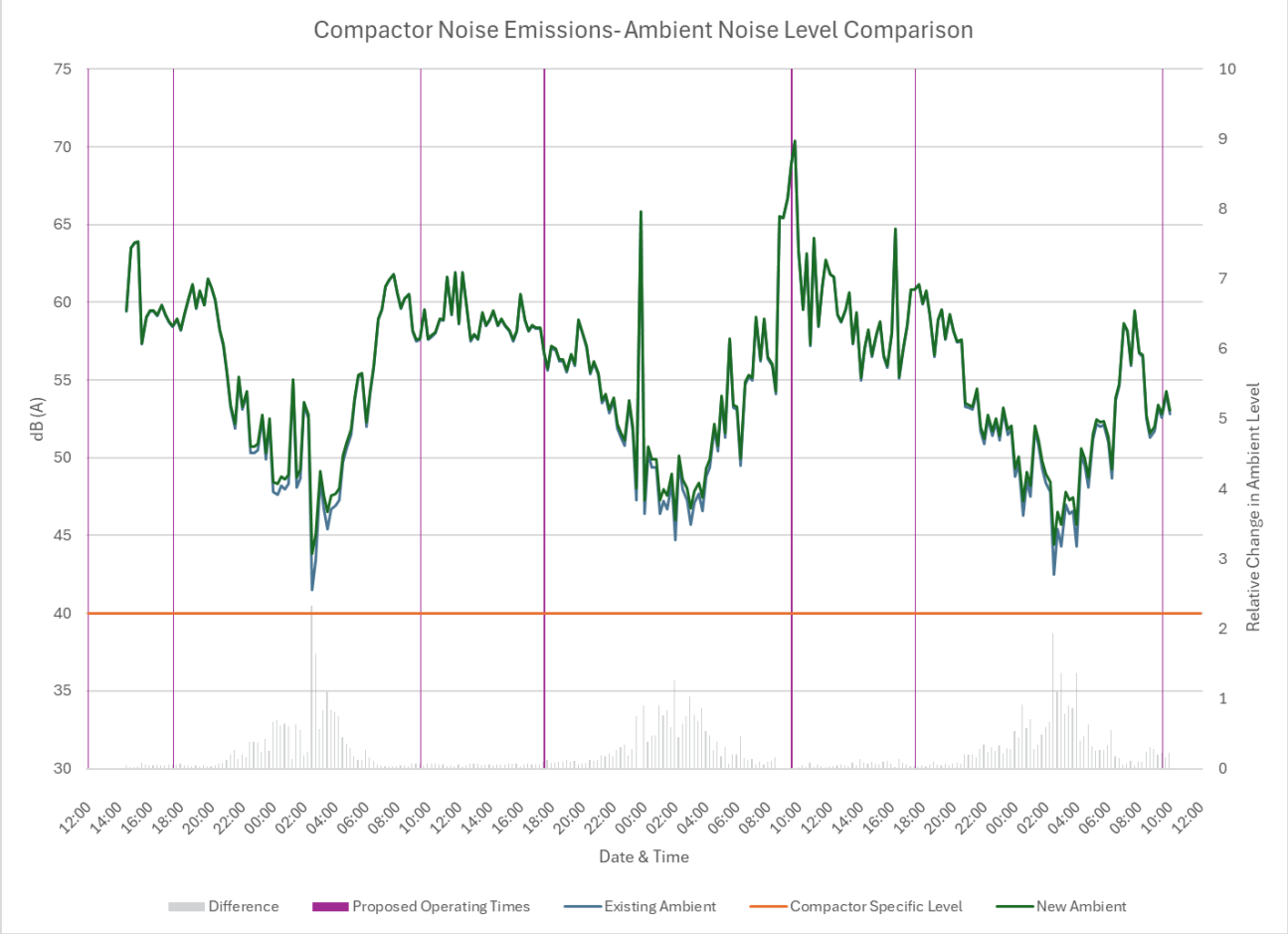


Figure 3 Comparison of Ambient Sound Level – Scenario 2

The specific sound level during Scenario 2 is predicted to be 40dB $L_{AS,T}$ at the most affected area of the hospital façade. This is below all ambient noise levels measured during the baseline monitoring and is significantly lower (>10 dB) than the ambient level during the periods in which these operations would occur.

The subsequent increase in ambient sound is noted to not exceed 3 dB(A) during the proposed operating periods. According to the IEMA effect descriptors shown in Section 2, this degree of change equates to a magnitude of impact categorised as “none / not significant”.

6.3.3 Other Points of Note

The following should also be noted when determining the noise impact of the proposed development:

Currently, significant character corrections for tonality have been imposed against the waste compactors’ operation. In the absence of on-site measured data, this assertion has been made from anecdotal evidence for typical waste compactors with various materials inside.

While this allows for a robust assessment, it is RSKA's understanding that the compactors will primarily be used for the compaction of cardboard waste. Therefore, consideration should be given to the possibility of this characteristic being overestimated in the assessment. In practice, the tonality is expected to be of less significance when compacting cardboard compared to more solid waste.

Following conversations with the client, it has been confirmed that the bin collections for the associated hospital wing are to be undertaken consecutively on the same route as the proposed Waste Compound. As a result, it is of contextual significance that Stericycle bin collections will be undertaken at a location close to the hospital façade irrespective of the proposed waste compound relocation. Furthermore, both Stericycle waste collections are expected to occur in succession, reducing the overall duration/instances of noise impact.

6.3.4 Summary

Taking the above contextual factors into account, it is considered that the likelihood of significant adverse impact is **low**.

7 Further Action

The following provides an indicative overview of further potential mitigation options for a development site such as this:

7.1 Mitigation Options

When choosing attenuation measures or implementing an effective noise reduction program, there are two possible approaches for treatment:

- At source – modify the source to reduce noise levels; and
- In the path – deflect or block the acoustic path of noise.

7.1.1 Mitigation at Source

When considering the noise impact of the waste compound, it is evident that the biggest area of concern is the bin collection and associated activities. Attention to the operation can have a major effect on controlling noise emissions at the site:

- Management planning – the instigation of a management plan where bin collections are undertaken efficiently and therefore over a reduced period could reduce noise impact. Management planning could also be employed with regard to employing best practice when filling the bins and moving around the yard to reduce the noise generated could reduce the overall noise impact.
- Location – Positioning the operations further away from NSR1 could reduce noise impact. However, due to the size constraints of the development site, care would have to be given as to ensure this does not inherently cause a detrimental impact at NSR2.

7.1.2 Mitigation Through Transmission

At present, the proposed Broxap Bescot Utility Shelter to be placed around the compactors is to be constructed out of a single layer of sheet metal with an inner plasterboard layer. Potential further noise attenuation could be added via the addition of further density in the structure design.

Consideration of the external façade mitigation afforded by the hospital may also be a factor when determining the significance of impact and the efficacy of any mitigation strategies. By adopting alternate measures at the hospital with respect to ventilation schemes (i.e., via means other than opening windows), the reduced requirements for opening windows and therefore reduce the noise impact of the compound within the hospital rooms.

7.2 Post Completion Noise Monitoring

Following completion, it is recommended that post completion noise monitoring is undertaken to ensure compliance with regulatory requirements and satisfy the planning conditions set by Manchester City Council.



8 Uncertainty

It is accepted that uncertainty may arise from all levels of measurement and assessment and reasonably practicable steps have been made at all stages with the aim of reducing uncertainty.

The following measures have been taken into consideration when determining the uncertainty of this assessment:

- Background sound level measurements have been obtained at representative assessment locations over a duration of four days to appropriately characterise the existing residual environment during the intended operational hours of the proposed development;
- Representative background levels obtained during the daytime and night-time have been utilised to inform the assessment;
- Use of monitoring equipment in accordance with section 5 of BS 4142: 2014+A1: 2019, using Class 1 instrumentation;
- Measurement procedures followed in accordance with section 6 of BS 4142: 2014+A1: 2019 with all precautions taken to minimise interference; and
- Specific sound levels have been calculated to the requirements of ISO 9613-2: 1996 which is the widely accepted procedure for the calculation of sound propagation (including favourable wind conditions from source to receiver). The assessment is informed by comparison of the predicted Rating Levels against the representative background sound levels at each receptor in accordance with section 7 of BS 4142: 2014+A1: 2019.



9 Conclusions

A noise impact assessment has been undertaken to consider the noise impact of a proposed waste compound at NMGH. The assessment focuses on the operational impact of the development at the nearest hospital façade and residential receptors to the requirements of BS 4142: 2014+A1: 2019.

A baseline noise survey has been utilised to determine representative background noise levels at those closest existing receptors to the site, through statistical analysis.

A computer noise model has been developed which incorporates the expected site activities, waste compactors and ASHP. Predictions account for three distinct operating scenarios:

- Daytime (07:00-23:00):
    - Scenario 1 – Bin Collection Activities and ASHP; and
    - Scenario 2 – Waste Compactors and ASHP.
- Night-time (23:00-07:00):
    - ASHP only.

Following the previous iteration of this report, further mitigation measures have been planned and are to be put in place:

- Alterations made to site activities, limiting site operations to the daytime period (07:00-23:00);
- Installation of smaller waste compactors at the site, with operations limited so that only one compactor will be in use at any one time;
- Installation of a shelter housing the waste compactors;
- Noise barriers installed at the sites south-western, southern and eastern boundaries.

9.1 Assessment Summary

Rating Levels are predicted to fall below the representative background noise level by a margin of at least 5 dB(A) at NSR2 for all scenarios assessed and at NSR1 for the night-time period. This is considered to demonstrate compliance with the extant planning condition for this site.

At NSR1, Rating Levels are predicted to exceed the representative background sound level during both daytime operating scenarios. In isolation, this would demonstrate non-compliance with the extant planning condition for this site.

However, following consideration of contextual factors regarding the site and surrounding area, it is concluded that a significant adverse impact is not anticipated.

It is recommended that additional mitigation be sought when addressing the impact of the proposals, particularly upon the hospital occupants. This may include:

- Implementation of a noise management plan associated with the bin collection process;
- Consideration as to the installation of acoustic barriers at the sites western boundary, as previously discussed with the client and considered as part of this noise impact assessment;
- Adding further density to the walls and roof of the compactor shelter.



References

- British Standard 4142: 2014+A1:2019, '*Methods of rating industrial and commercial sound'.* British Standards Institution.
- British Standard 7445-1: 2003, *'Description and measurement of environmental noise – Part 1: Guide to quantities and procedures'.* British Standards Institution.
- ISO 9613-2:1996 *'Attenuation of sound during propagation outdoors – general method of calculation'.* International Organization for Standardization.
- National Planning Policy Framework – Department for Communities and Local Government. March 2012 (as amended February 2019)
- Noise Policy Statement for England (NPSE). DEFRA, 2010.
- World Health Organization (WHO), *'Guidelines for Community Noise – 1999'.*



Glossary of Acoustic Terminology

Term	Definition
Ambient sound	The total sound at a given place, usually a composite of sounds from many sources near and far.
Background sound, $L_{A90,\,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval.
dB	Decibel. Scale for expressing sound pressure level. 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 i.e. $2x10^{-5}$ Pascal.
dB(A)	A-weighted decibel. This provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies. Example sound levels include: 140 dB(A) Threshold of pain 120 dB(A) Threshold of feeling 100 dB(A) Loud nightclub 80 dB(A) Traffic at busy roadside 60 dB(A) Normal speech level at 1m 40 dB(A) Quiet office 20 dB(A) Broadcasting studio 0 dB(A) Median hearing threshold (1000 Hz)
Frequency	The repetition rate of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted as kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20kHz.
$L_{Aeq,\,T}$	This is defined as the notional steady sound level over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
NR	Noise rating. A set of curves based on the sensitivity of the human ear. They are used to give a single-figure rating for a range of frequencies.
Rating level	Specific sound level of a source plus any adjustment for the characteristic features of the sound.
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Sound absorption	Process whereby sound energy is converted in to heat. Sound absorption properties is expressed as the sound absorption coefficient α or the sound absorption class (A-E).
Sound insulation	The reduction or attenuation of airborne sound by a solid element between source and receiver.
Specific sound	Sound pressure level produced by the source being assessed at the assessment location.



Appendix A: Proposed Site Layout

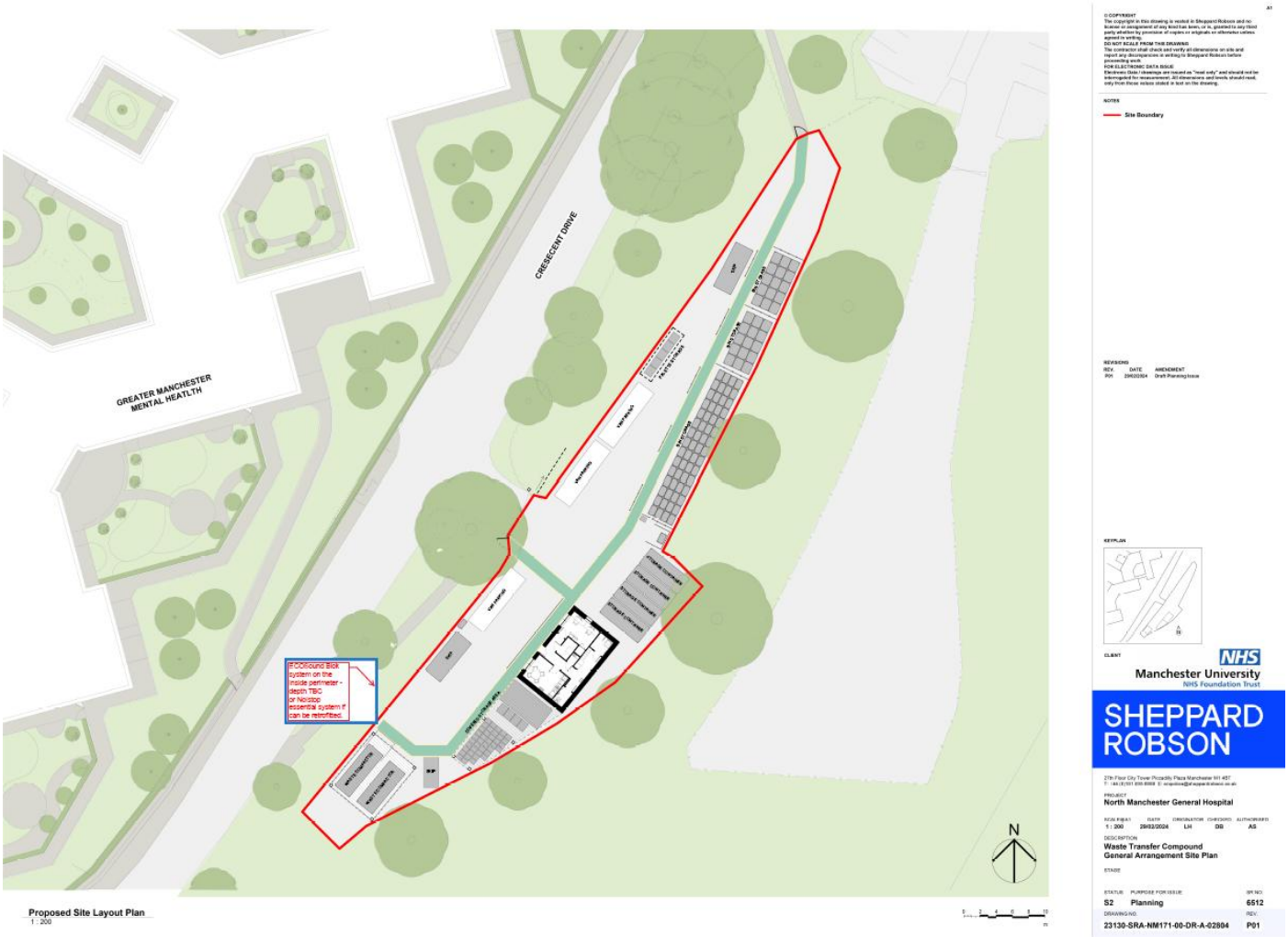


Figure 4 Site Layout Plan

Appendix B: Monitoring Location Photographs

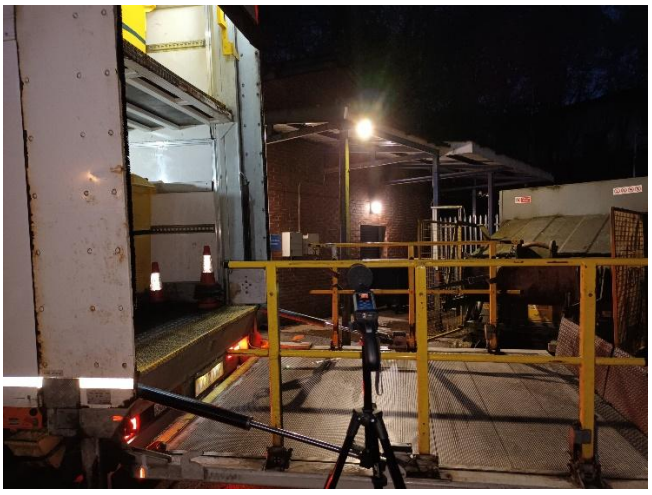
Measurement Location	Location Coordinates	Photographs
MP1	53.515383, -2.2276306	
MP2	53.515300, -2.2267500	
MP3	53.518879, -2.225816	

Table B.1 Measurement Location Coordinates and Photographs

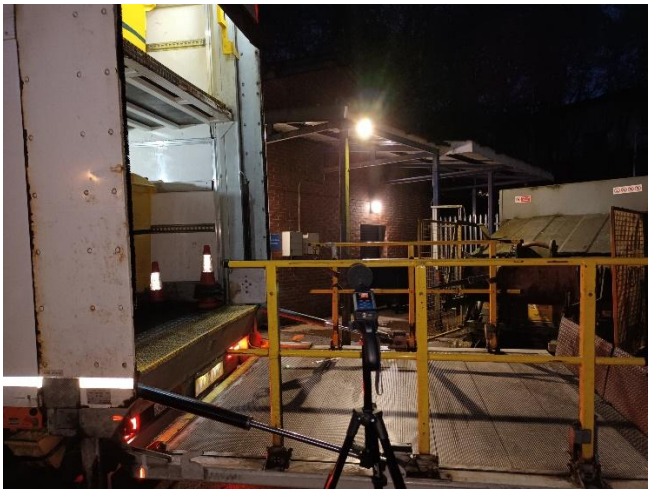
Measurement Location	Location Coordinates	Photographs
MP1	53.515383, -2.2276306	
MP2	53.515300, -2.2267500	
MP3	53.518879, -2.225816	

Table B.1 Measurement Location Coordinates and Photographs

Room Type	Sound Insulation Testing Photographs
Large Accessible Bedroom	 
Communal/Reception Area	 

Room Type	Sound Insulation Testing Photographs
Staff Area	 
Standard Room 1	 

Room Type	Sound Insulation Testing Photographs
Standard Room 2	 
TV Room	 

Table B.2 Window Sound Insulation Testing Photographs

Appendix C: Measured Noise Levels and Background Noise Level Graphs

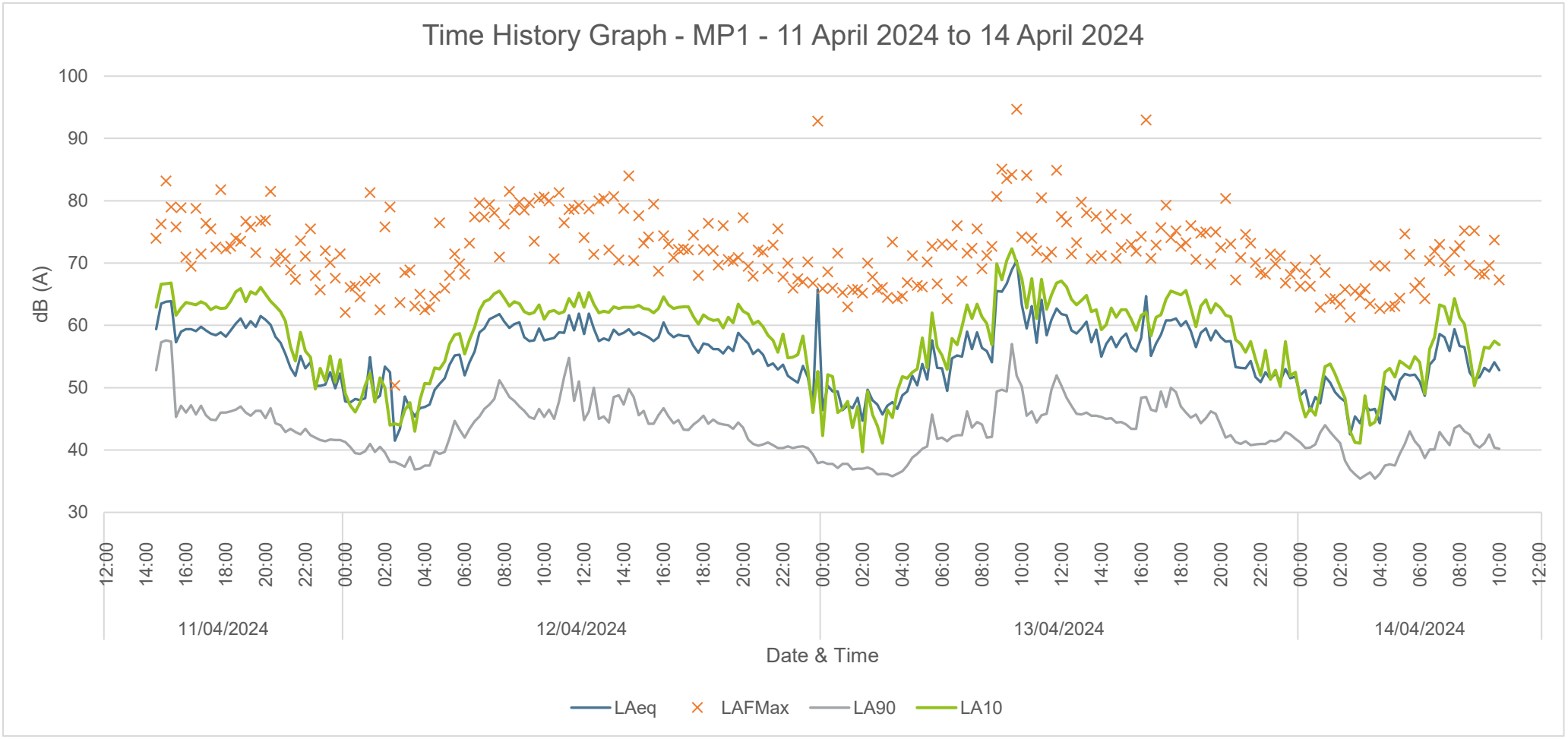


Table B.1 Time History - MP1 – 11/04/24 to 14/04/24

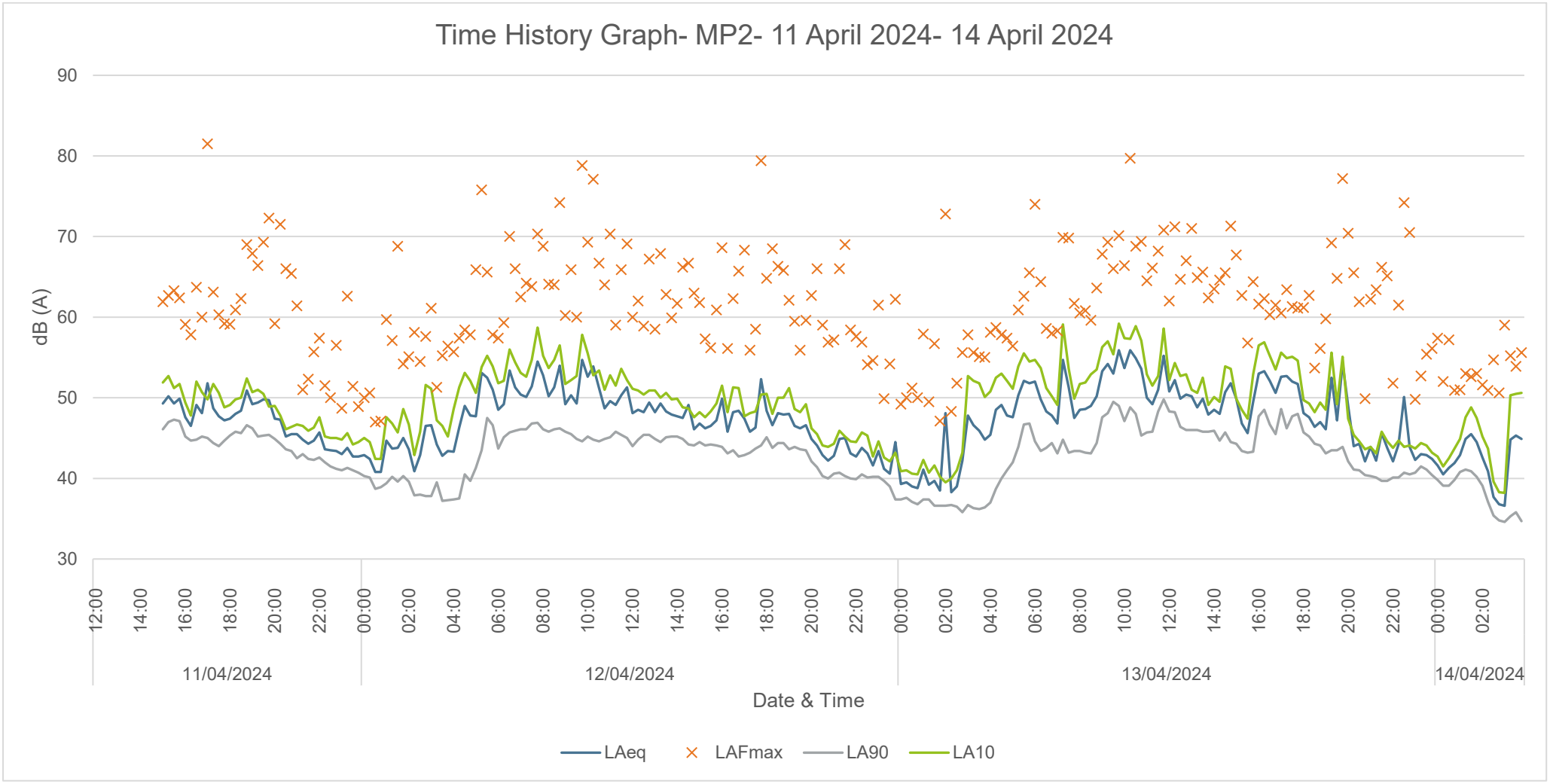


Table B.2 Time History - MP2 – 11/04/24-14/04/24

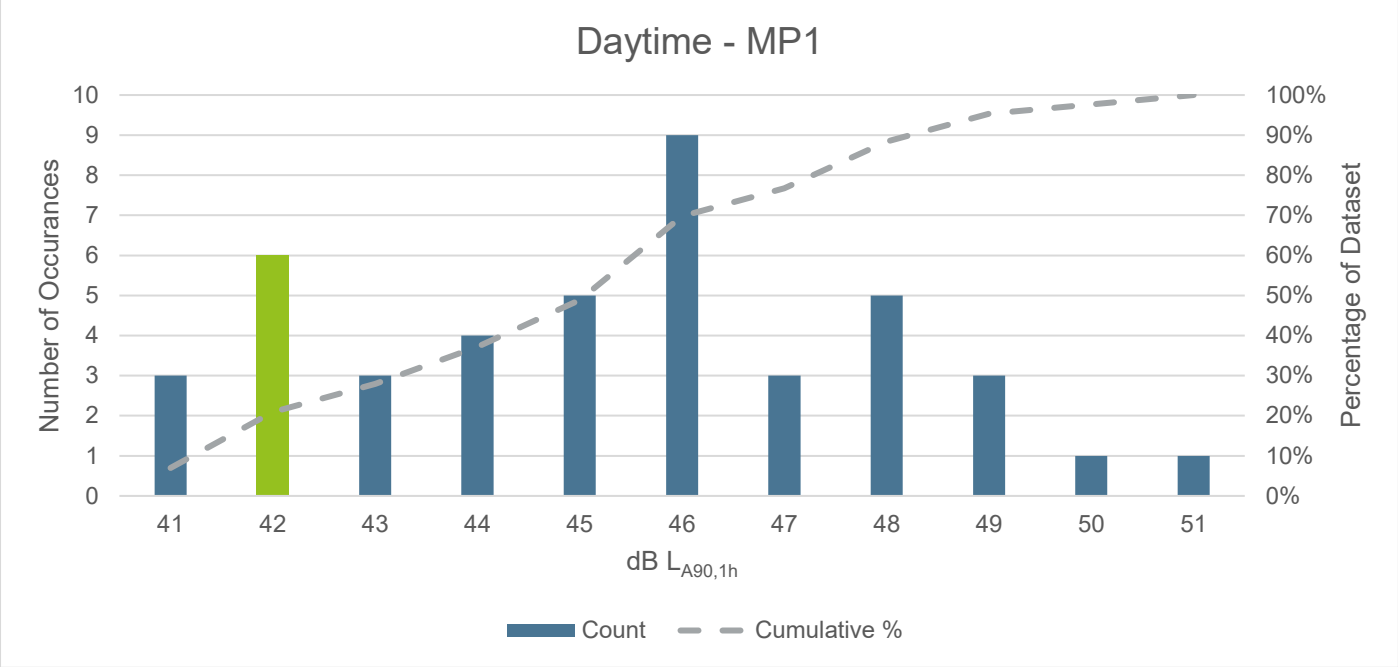


Table B.3 Background Analysis - MP1 Daytime

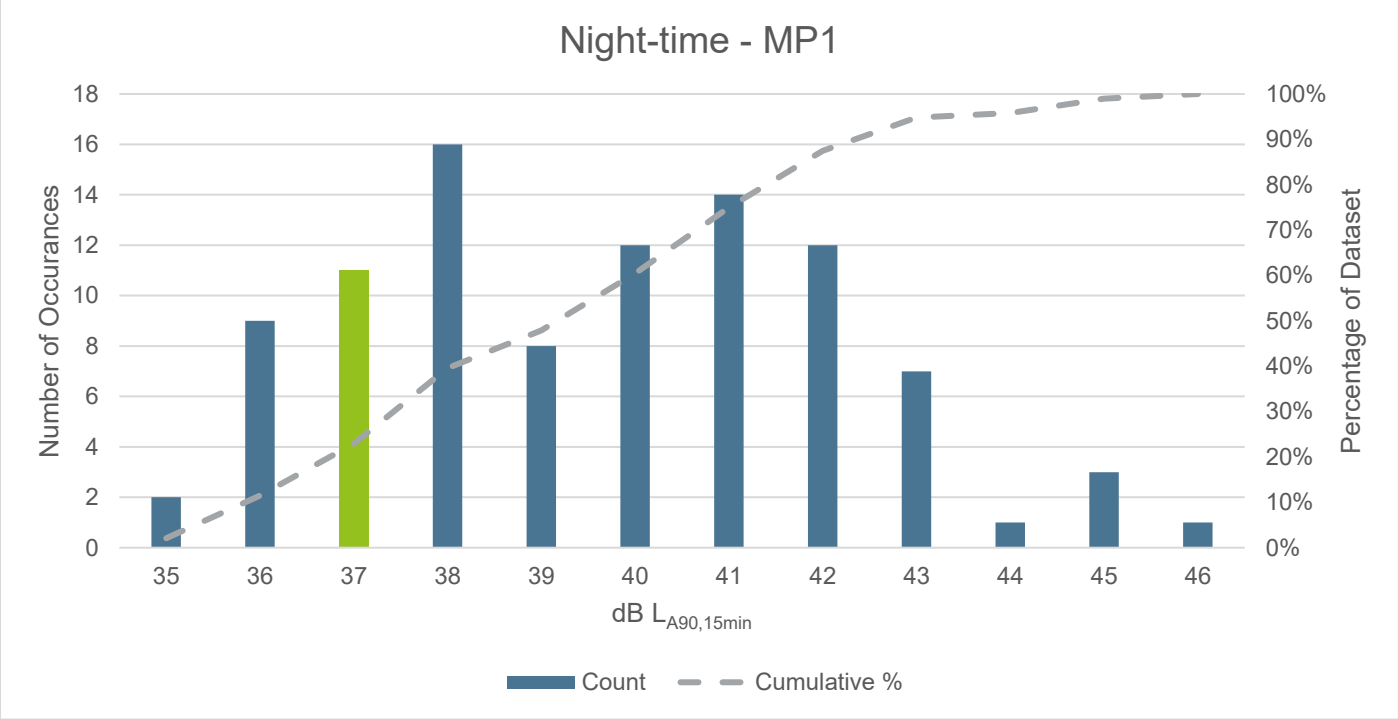


Table B.4 Background Analysis - MP1 Night-time

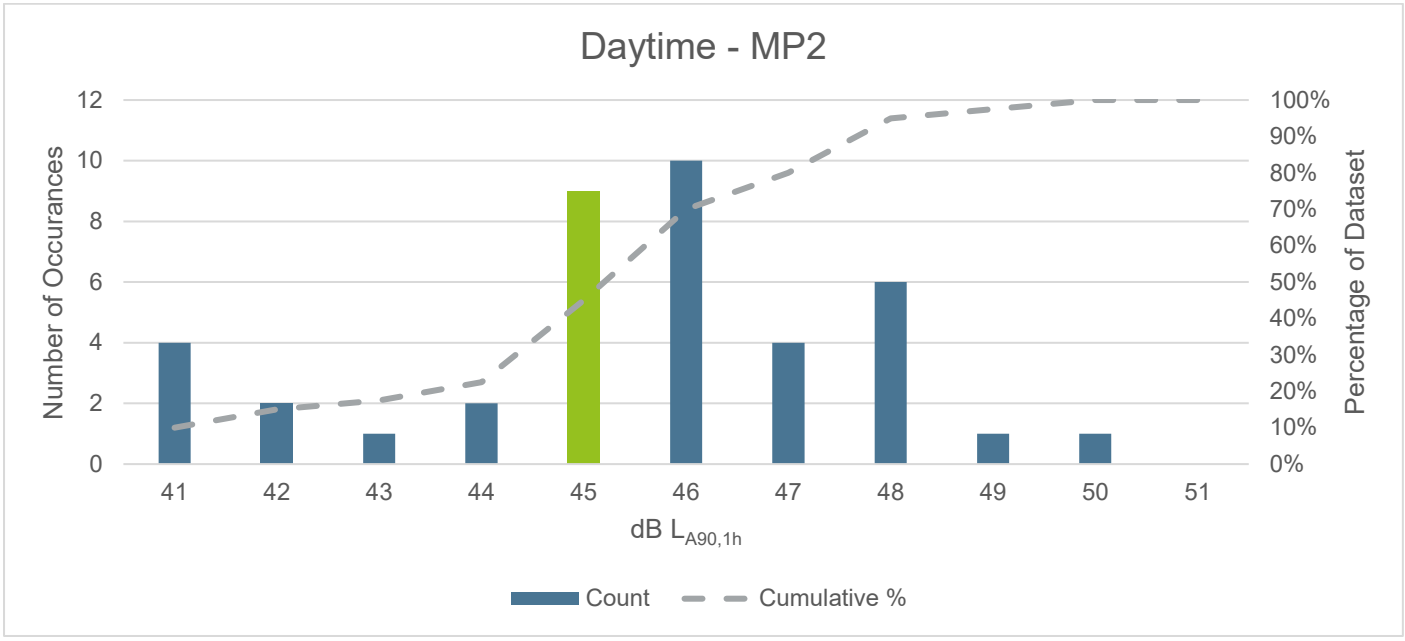


Table B.5 Background Analysis - MP2 Daytime

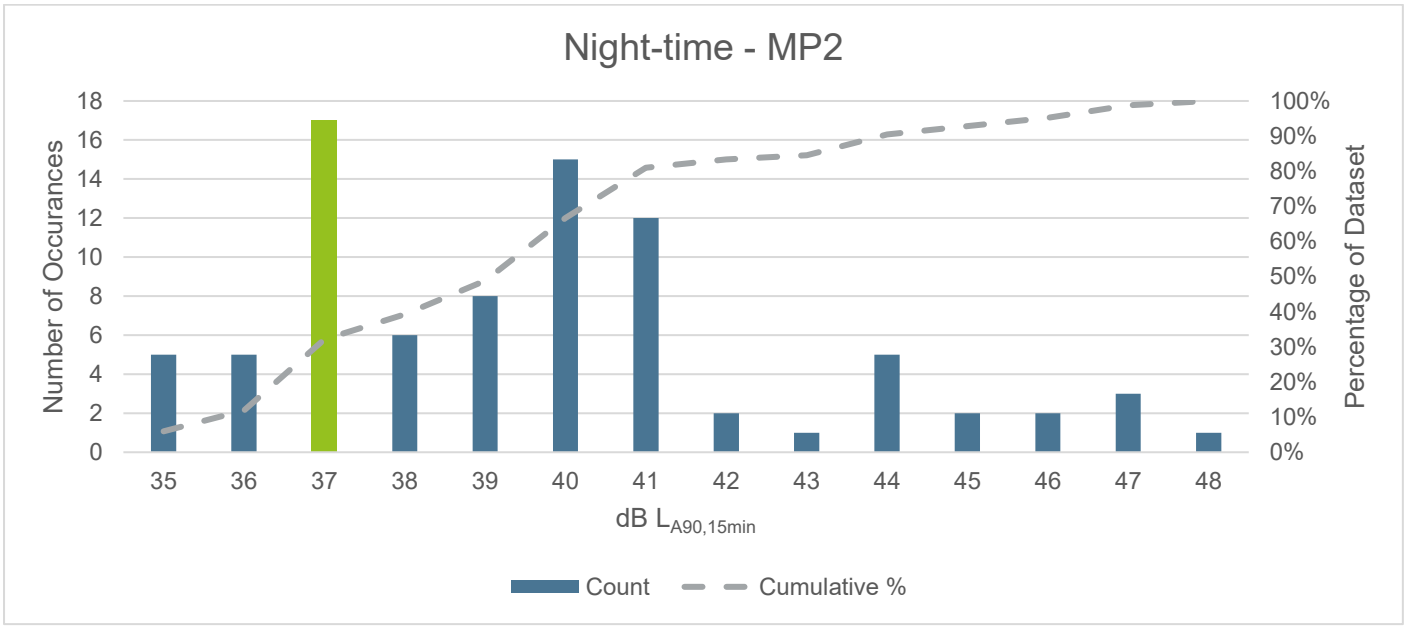


Table B.6 Background Analysis - MP2 Night-time

Appendix B: Operational Façade Noise Maps

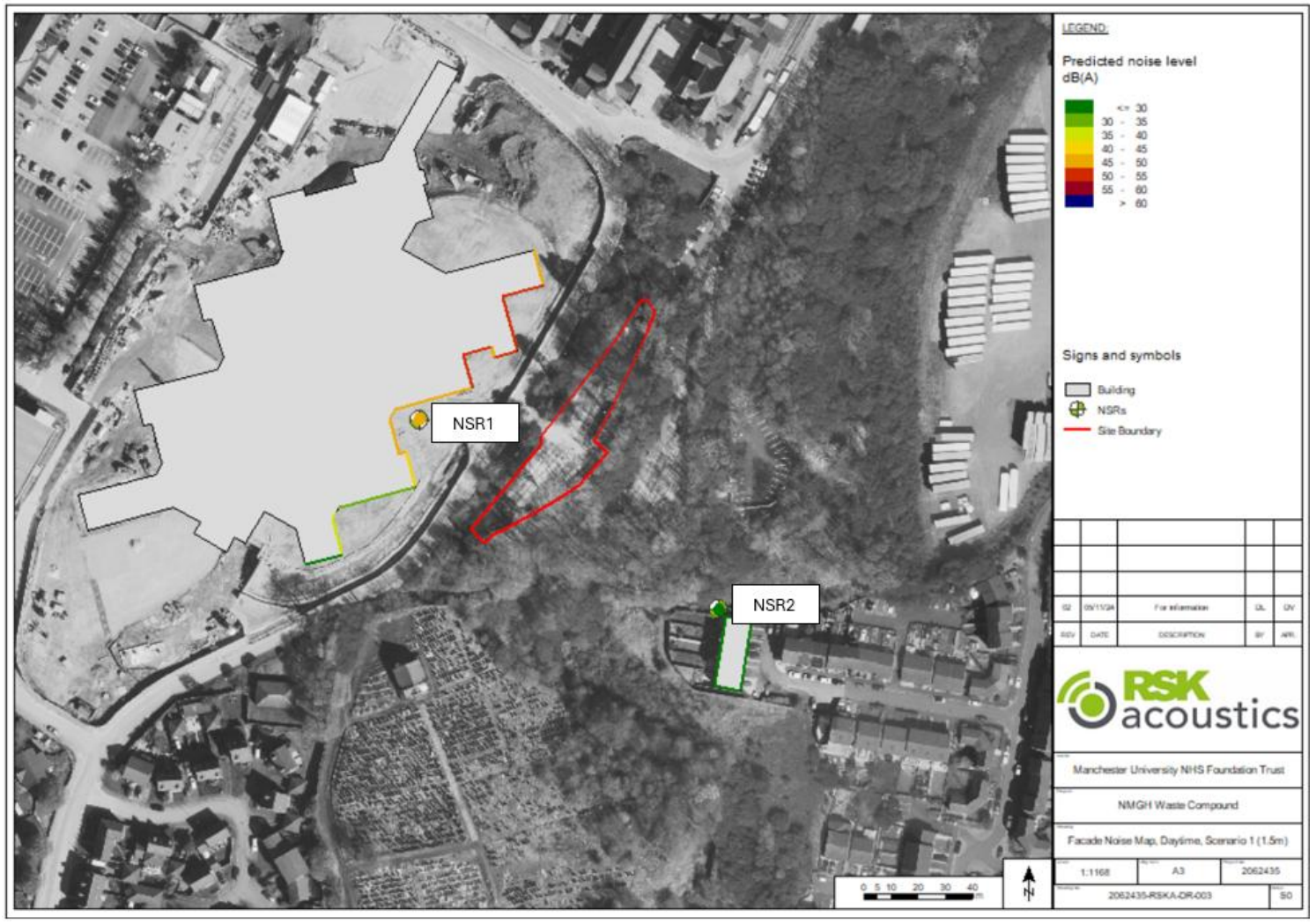


Figure D.1 Scenario 1- Façade Noise Map at 1.5m Above Ground Level – Daytime, dB $L_{AS,T}$

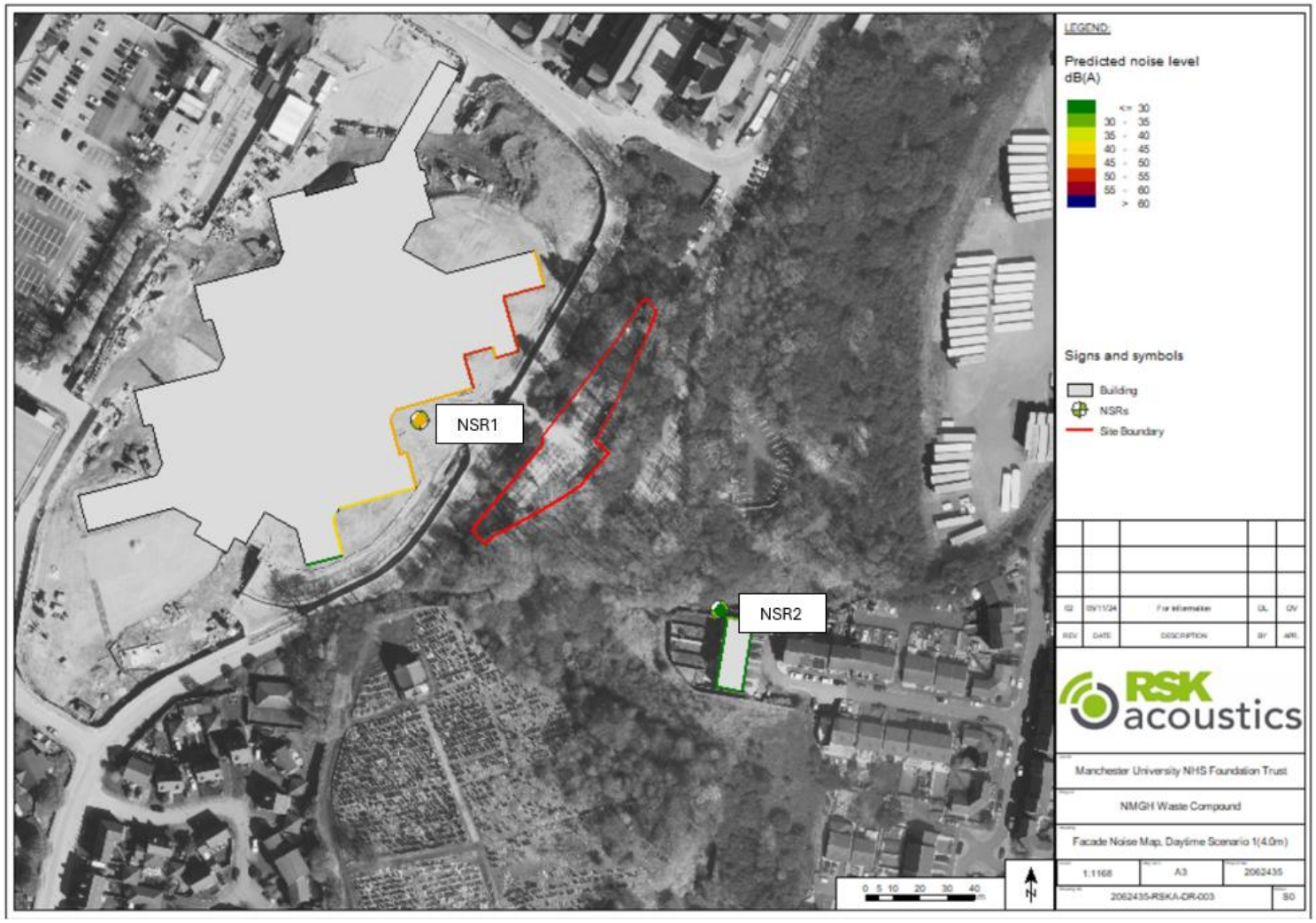


Figure D.2 Scenario 1- Façade Noise Map 4.0m Above Ground Level – Daytime, dB $L_{AS,T}$

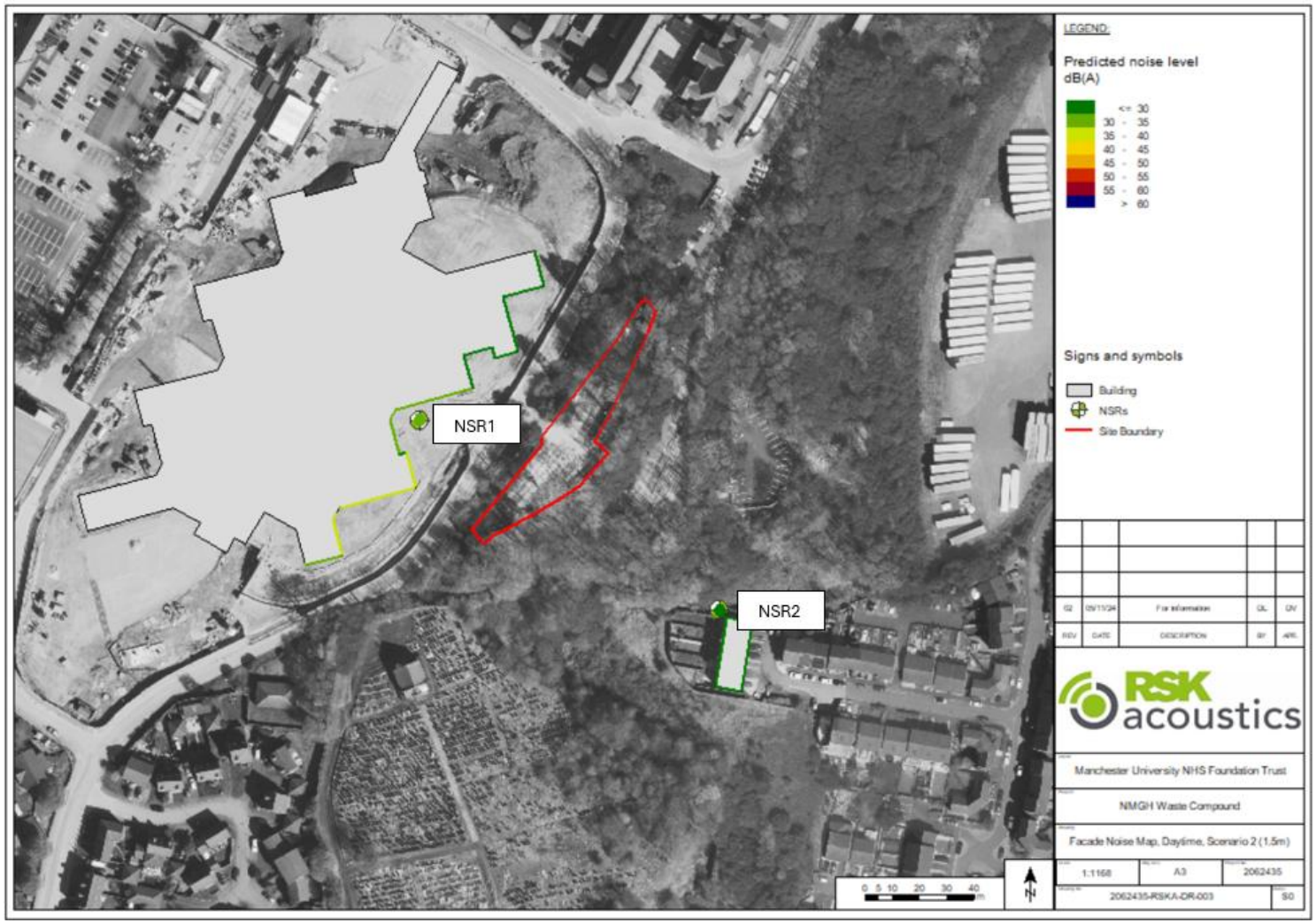


Figure D.3 Scenario 2- Façade Noise Map 1.5m Above Ground Level – Daytime, dB $L_{AS,T}$

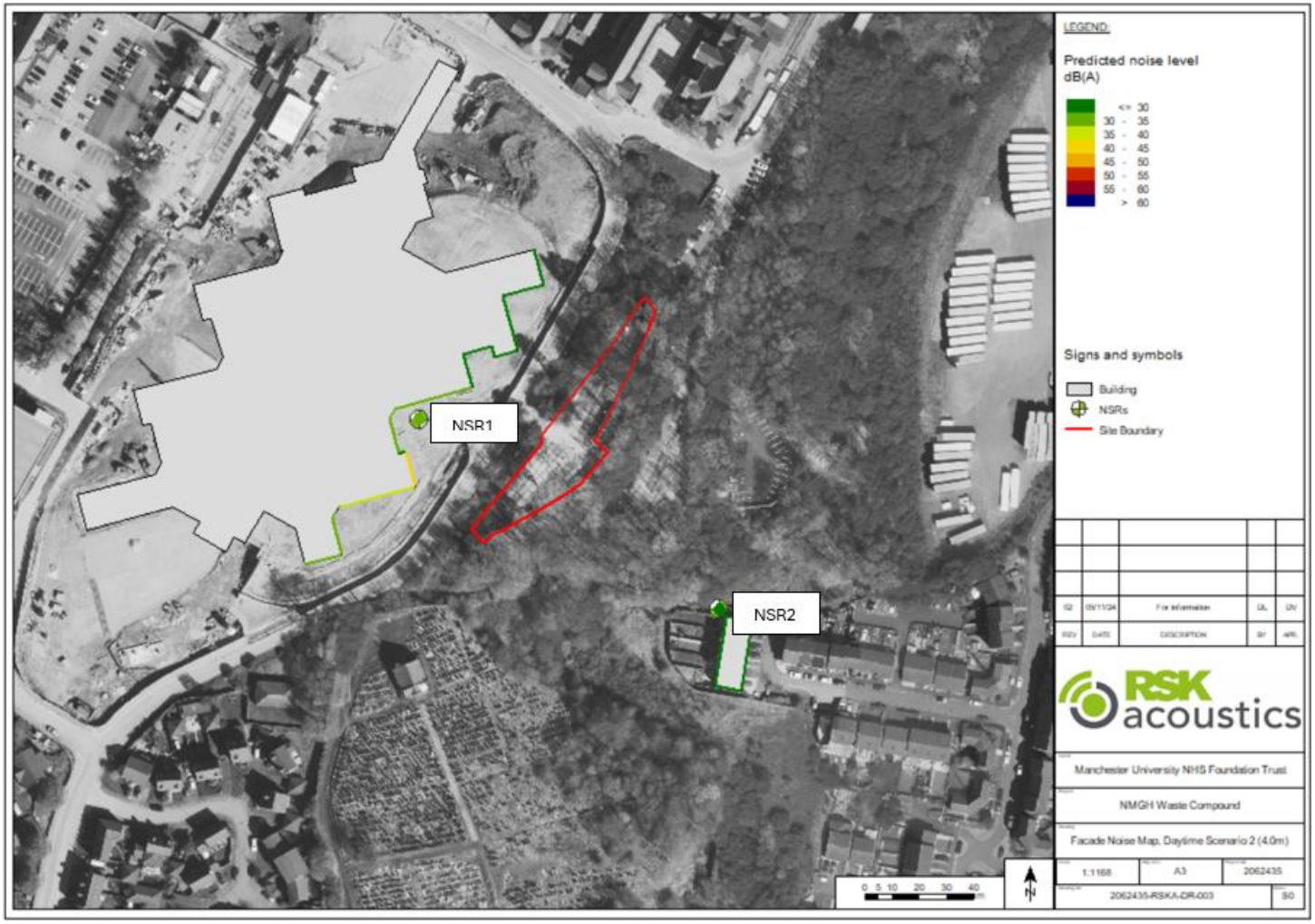


Figure D.4 Scenario 2- Façade Noise Map 4.0m Above Ground Level – Daytime, dB $L_{AS,T}$

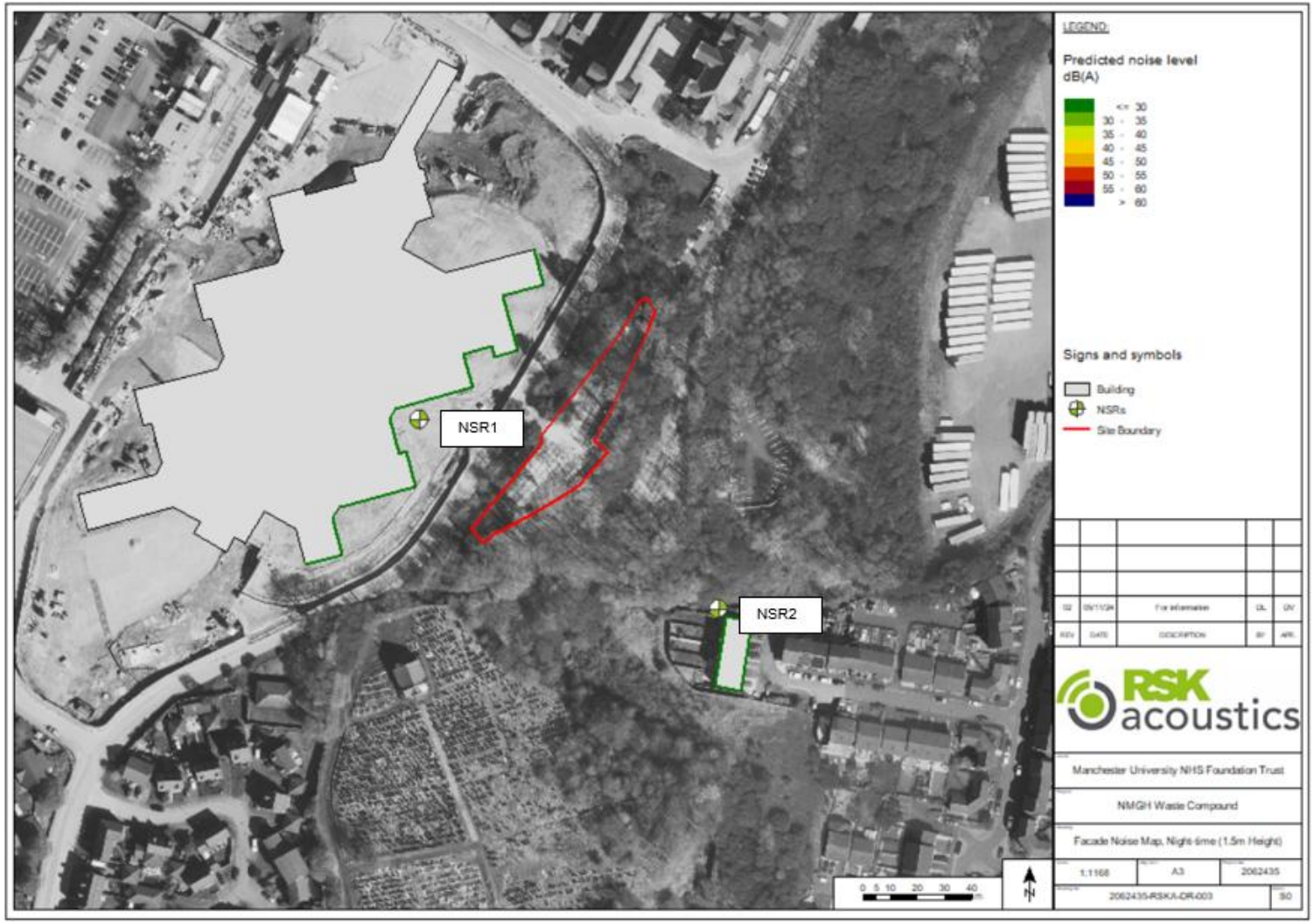


Figure D.5 Façade Noise Map at 1.5m Above Ground Level – Night-time, dB $L_{AS,T}$

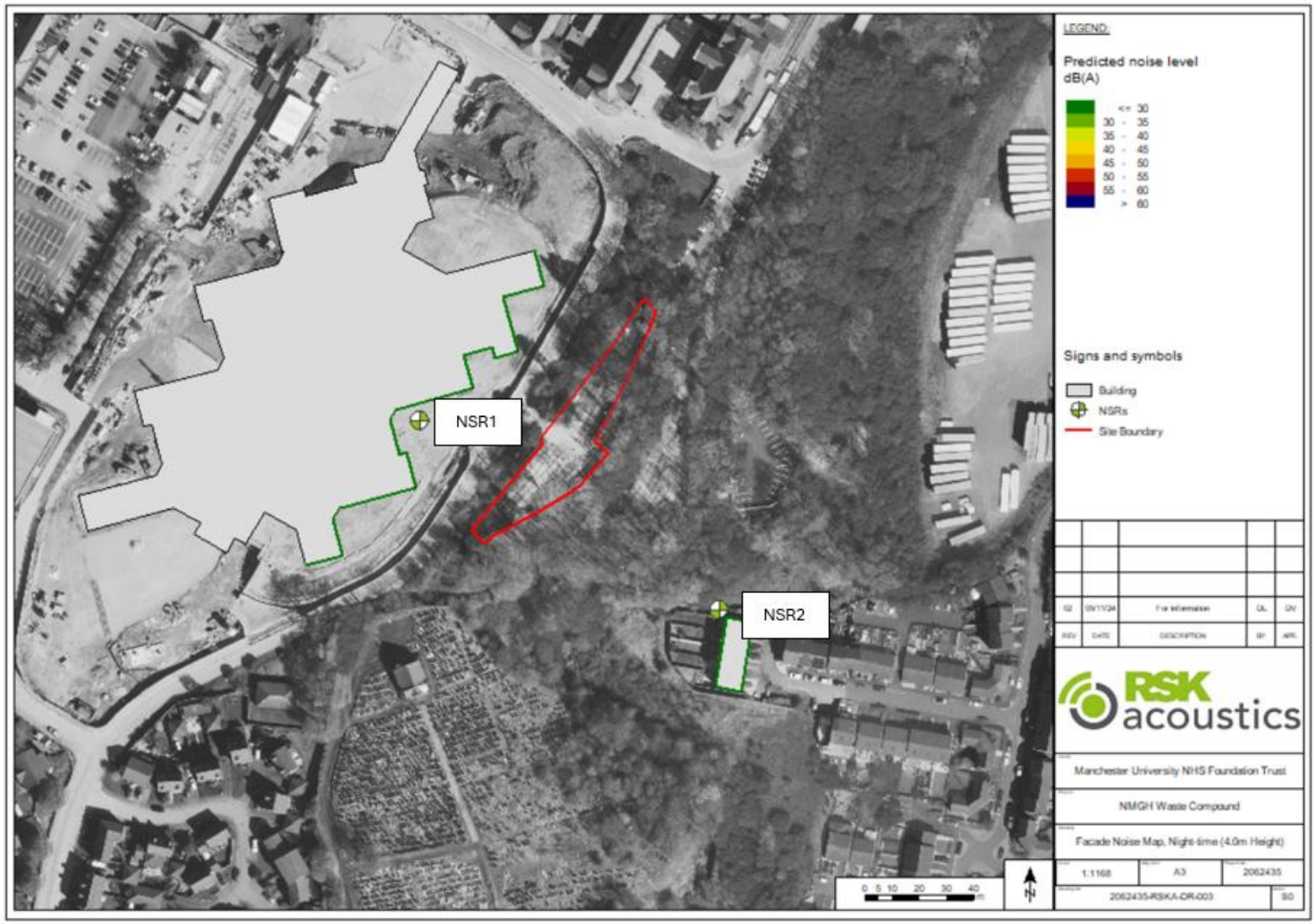


Figure D.6 Façade Noise Map at 4.0m Above Ground Level – Night-time, dB $L_{AS,T}$

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