Noise Impact Assessment

HMP East Sutton

Reference: 50-899-R1-2

Date: September 2023

NOISE IMPACT ASSESSMENT

HMP East Sutton

Prepared for:

Ministry of Justice

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	HMP East Sutton, Church Lane, East Sutton, Maidstone, ME17 3DE
National Grid Reference	E 582646 , N 149483
Proposed Development	Retrospective planning for temporary Covid and Modular Units Decommissioning and Replacement (MUDR) within HMP East Sutton to provide additional capacity. These units are located on the northern edge of the site in a previously undeveloped area of land.
Report Objectives	The Noise Impact Assessment will assess the already constructed temporary Covid and MUDR units to check for compliance with the latest relevant British Standards.

ASSESSMENT

Surveys Completed	An unattended weekday and weekend background and ambient sound survey has been conducted in a position considered representative of the existing sound climate. A traffic count was conducted for Church Lane and it was found the flows fell well below the requirements for Calculation of Road Traffic Noise. Source measurements have been taken of the generator associated with the Modular Units.
Assessments	Existing sound sources impacting upon the development have been assessed in accordance with the criteria given in BS 4142. It was found that the rating level would exceed the background sound level at all receptors. Furthermore, unacceptable internal noise levels would be achieved at all on-site receptors.
Mitigation Requirements	Following discussions, a hybrid solution is proposed for the noise source. This involves the replacement of the generator for a quieter model, the deployment of a battery which will be used during the night-time period (assumed to be quiet running with no notable noise source) and the installation of an absorbative barrier around the new generator. This solution provides the necessary reduction during daytime periods to achieve the required criterion at on and off-site receptors. The use of the battery at night effectively removes any adverse impact during these periods. The assessment has shown that, no adverse impact is expected if the assumptions made by this report have been installed on site. As such, noise need not be a material consideration in the granting of planning permission.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Mace Group, on behalf of the Ministry of Justice, to undertake a Noise Impact Assessment for the retrospective planning of temporary Covid and Modular Units Decommissioning and Replacement (MUDR) within HMP East Sutton Park, to be referred to hereafter as '*the Site*'.

The Noise Impact Assessment will assess the already constructed temporary Covid and MUDR units to check for compliance with the latest relevant British Standards.

1.2. PROPOSED DEVELOPMENT

The units are located on the northern edge of the site in a previously undeveloped area of the prison.

The key sources of sound impacting upon the Site is sound from generator plant associated with the modular units and birdsong.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative, and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

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

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The "observed effect levels" are as follows:

- **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.

- **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable 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
Lowest Observed Adverse Effect Level			
Noticeable 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, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g., avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. 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 effect	Avoid
Noticeable 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 (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.

- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BRITISH STANDARD BS 8233:2014 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.3.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

> *It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted.*

BS 8233 goes on to say:

> *In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*

2.3.2. VENTILATION REQUIREMENTS

Where a partially open window cannot be relied upon to provide an adequate level of façade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS 8233 states:

> *The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.*
>
> *Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans.*

Section 7.7.2 states:

> *NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*

2.4. WORLD HEALTH ORGANISATION (WHO) – GUIDELINES FOR COMMUNITY NOISE

The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that *"general daytime outdoor noise levels of less than 55 dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance."* This level is an external free-field noise level. The 1980 document also stated in relation to internal levels, *"that night-time noise levels of 35 dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep"*.

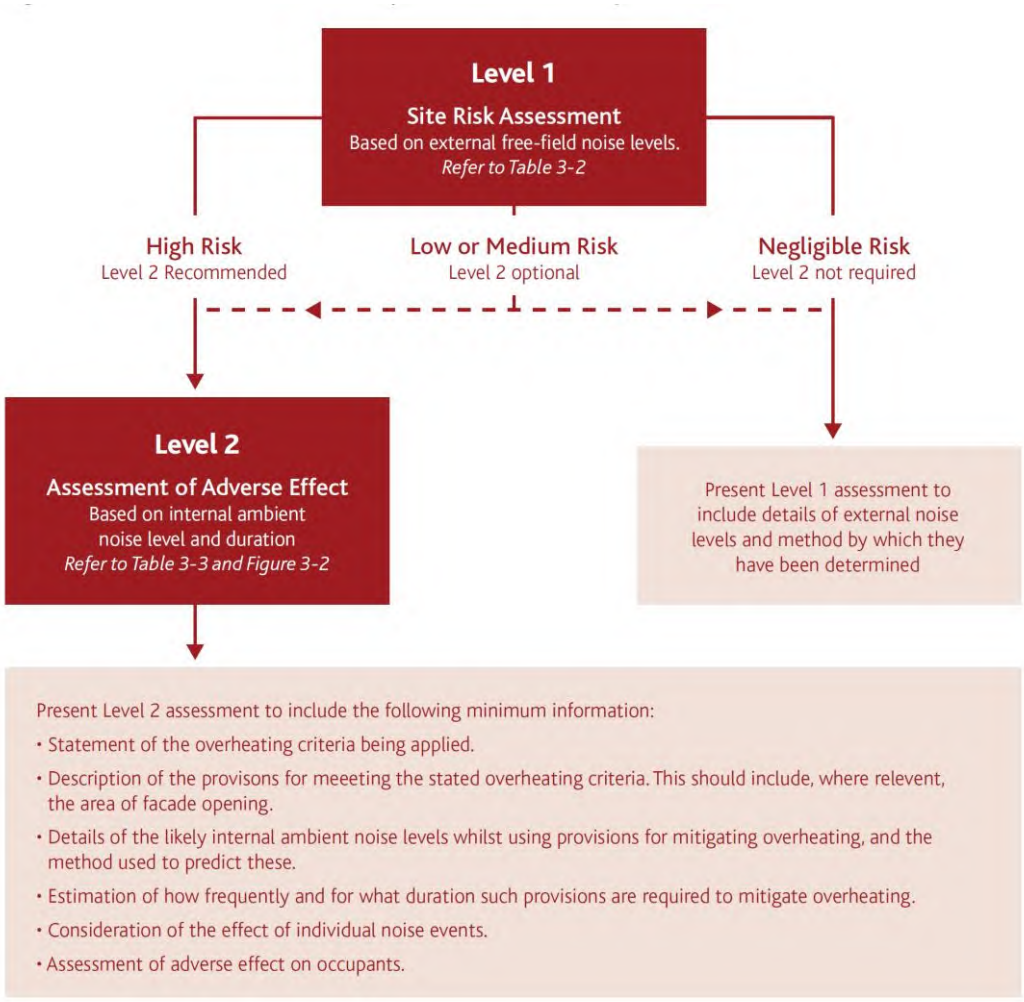
A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8\,hr}$ or an external level of 45 dB $L_{Aeq,8\,hr}$. It also recommends that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB should be limited where possible.

2.5. INSTITUTE OF ACOUSTICS AND ASSOCIATION OF NOISE CONSULTANTS (2020) ACOUSTICS VENTILATION AND OVERHEATING: RESIDENTIAL DESIGN GUIDE

The Acoustics Ventilation and Overheating (AVO) Residential Design Guide provides an approach as to how the competing aspects of thermal and acoustic comfort can be managed. The AVO Guide aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements.

The AVO Guide provides a method for assessing the impact of opening windows and providing whole house ventilation due to the impact of noise via a two-level noise assessment procedure, as below:

DIAGRAM 2.1 TWO LEVEL NOISE ASSESSMENT PROCEDURE – OVERHEATING CONDITION



A level 1 risk assessment is based on external free-field noise levels with the assumption of a partially opened window in use for mitigation of overheating. A level 1 assessment is appropriate for scenarios where the risk to a development is deemed 'Negligible'. 'Low' and 'Medium' risk sites only require a level 2 assessment on an optional basis in order to give further confidence in the suitability of internal noise conditions.

The noise levels suggested in Table 2.3 and 2.4 assume a steady road traffic noise source but can be adapted for other transport sources.

TABLE 2.3 GUIDANCE FOR LEVEL 1 SITE RISK ASSESSMENT OF NOISE FROM TRANSPORT NOISE SOURCES RELATING TO OVERHEATING CONDITION

RISK CATEGORY FOR LEVEL 1 ASSESSMENT - EXTERNAL		RISK LEVEL	POTENTIAL EFFECT WITHOUT MITIGATION	RECOMMENDATION FOR LEVEL 2 ASSESSMENT
$L_{Aeq,T}$ during 07:00 - 23:00	$L_{Aeq,8hr}$ during 23:00 - 07:00			
≥65dB	≥55dB	**High**	Increasing risk of adverse effect	Recommended
>55 dB and <65 dB	>45 and <55 dB	**Medium**		Optional
>50dB and <55 dB		**Low**		
≤50 dB	≤45 dB	**Negligible**	Use of opening window as means of mitigating overheating is not likely to result in adverse effect	Not Required

A level 2 assessment will be carried out when the risk of adverse effect is 'High', or it is deemed appropriate for a 'low' or 'medium' risk site. An increase in internal ambient noise level can cause a change in human behaviour. At high levels this creates situations where occupants can no longer open windows for ventilation due to high external noise levels. A level 2 assessment identifies these situations and allows for appropriate alternative ventilation systems to be recommended.

TABLE 2.4 GUIDANCE FOR LEVEL 2 ASSESSMENT OF NOISE FROM TRANSPORT NOISE SOURCES RELATING TO OVERHEATING CONDITION

INTERNAL AMBIENT NOISE LEVEL AT FAÇADE LOCATIONS			EXAMPLE OF OUTCOMES
$L_{Aeq,T}$ during 07:00 - 23:00	$L_{Aeq,8hr}$ during 23:00 - 07:00	Individual noise events during 23:00 - 07:00	
>50 dB	>42 dB	Normally exceeds 65 dB $L_{AF,max}$	Noise causes a material change in behaviour e.g., having to keep windows closed most of the time
Increasing noise levels			Increasing the likelihood of impact on reliable speech communication during the day or sleep disturbance at night
≤35 dB	≤30 dB	Do not normally exceed $L_{AF,max}$ 45 dB more than 10 times a night	Noise can be heard but does not cause any change in behaviour

3. SURVEY RESULTS

The measurement positions are detailed in Figure 1 of Appendix II.

3.1. EXISTING SOUND CLIMATE

During the visits to site, the underlying noise source was relating to the generators associated with the modular units and birdsong.

A site walkover to determine if any fixed plant items from the existing prison buildings was undertaken. Generators associated with the new modular units are dominant across the soundscape.

3.2. TRAFFIC COUNT – CHURCH LANE

A traffic count was conducted on Church Lane to determine the requirement of a road noise survey. The count was conducted between:

- 10:00 – 11:00 on Thursday 15th June 2023

A count of higher than 50 car pass-bys per hour indicates a road is busy enough to require a full road noise survey. During the traffic count, one car pass-by was noted and therefore a full road noise survey has not been required.

3.3. FIXED PLANT SOUND MEASUREMENTS - GENERATORS

E3P has undertaken attended measurements of all fixed plant relating to the site. The surveys were carried out over the following time periods:

- Thursday 15th June 2023 between 08:58-09:08.

Table 3.1 below details the measured noise levels that will be used within the assessment.

TABLE 3.1 MEASURED SOURCE NOISE LEVELS

POSITION	TIME	SOURCE	MEASURED NOISE LEVEL, $L_{Aeq,T}$ (dB)
NMP1	08:58 – 09:08	Steady State fixed plant sound. Item is 1.5 m above ground level and measurement was from 1 m.	81.9

3.4. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

E3P has conducted a full weekday ambient Sound Survey in order to quantify the existing levels of background and ambient sound.
The survey was carried out over the following period:

- 10:00 Thursday 15th June to 08:00 Monday 24th June 2023.

The following noise measurement position was chosen for the Background and Ambient Sound Survey:

- Noise Measurement Position 1 (NMP1): Located south of the prison on a boundary near the stables, in free-field conditions. The microphone of the sound level meter was attached to a tripod at a height of 1.5 m above ground level.

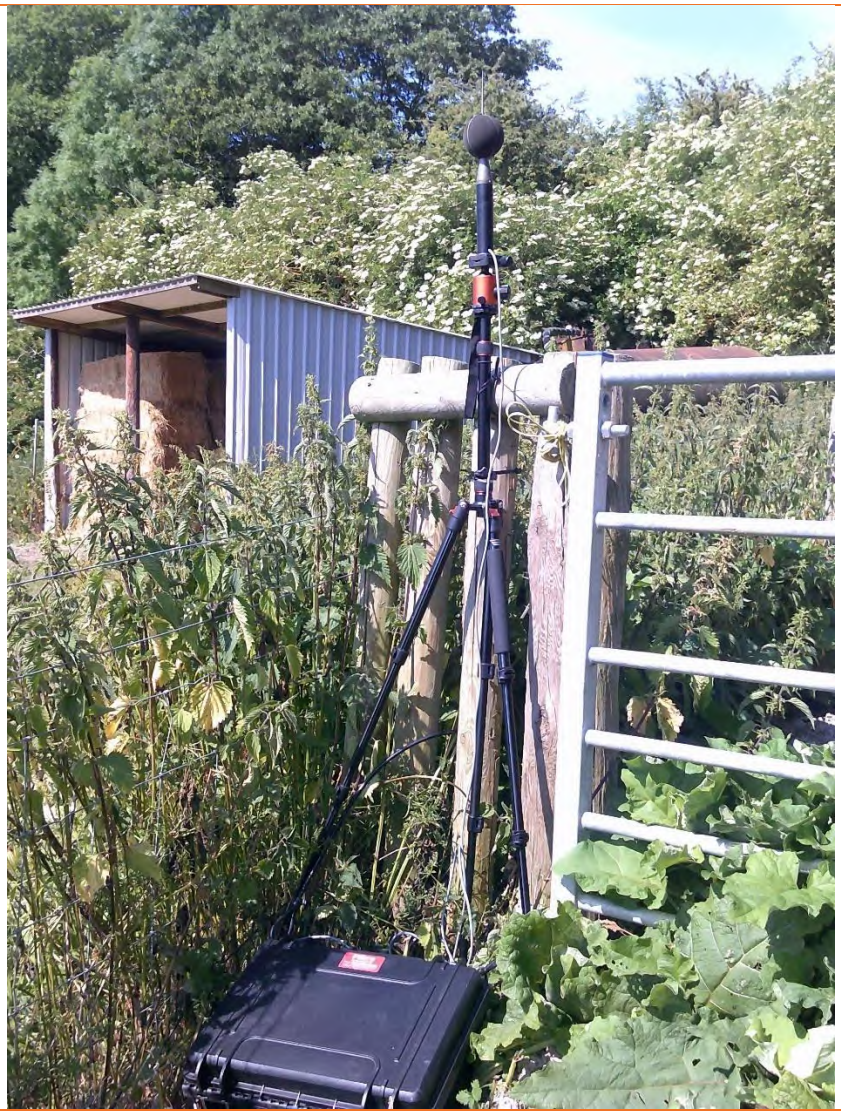
Table 3.2 details the range and median measured background sound levels. The daytime levels correspond to the $L_{A90,1hr}$ and the night-time levels to the $L_{A90,15mins}$.

TABLE 3.2 AVERAGE AND MEDIAN MEASURED BACKGROUND AND AMBIENT SOUND PRESSURE LEVELS

DATE	ASSESSMENT PERIOD	RANGE OF MEASURED BACKGROUND SOUND LEVELS, $L_{A90,T}$ (dB)	MEDIAN MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Thursday 15th June 2023	Day (10:00 – 23:00)	28.4 – 36.1	33
	Night (23:00 – 07:00)	20.9 – 35.2	30
Friday 16th June 2023	Day (07:00 – 23:00)	26.9 – 37.3	32
	Night (23:00 – 07:00)	22.5 – 35.4	28
Saturday 17th June 2023	Day (07:00 – 23:00)	28.5 – 34.6	**32**
	Night (23:00 – 07:00)	20.9 – 49.7	31
Sunday 18th June 2023	Day (07:00 – 23:00)	26.9 – 38.7	35
	Night (23:00 – 07:00)	20.8 – 35.8	**26**

During the survey, conditions were dry. Wind speeds rarely exceeded 5 m/s.

PICTURE 1 NOISE MEASUREMENT POSITION 1



The equipment outlined in Table 3.2 was used for the noise survey.

TABLE 3.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	LAST CALIBRATION DATE
NMP1	Sound Level Meter	Norsonic Nor145	14529152	13th June 2023
	Pre-amplifier	Norsonic Nor1209	22293	
	Microphone	Norsonic Nor1227	332220	
	Calibrator	Norsonic Nor1255	125525208	13th June 2023
NMP2	Sound Level Meter	Cirrus CR:171A	G303884	20/09/2022
	Pre-amplifier	Cirrus MV:200F	12731F	
	Microphone	Cirrus MK:224	215899D	
	Calibrator	Cirrus CR:515	99403	20/09/2022

The sound level meter was field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are appended to the rear of the report.

4. NOISE IMPACT ASSESSMENT

This assessment has used measured on-site levels relating to the installed fixed plant, to predict the noise level impact on the existing closest residential dwellings inside and outside of prison boundaries during the daytime and night-time periods.

With regard to assumptions for the assessment, the following has been considered for the full planning application aspects:

- Ground elevations have been taken as existing.
- The daytime period has been assessed between the hours of 07:00 to 23:00. For the assessment, BS 4142:2014+A1:2019 has been used to determine the likelihood of adverse impact within the garden areas over a reference time period of 1 hour.
- The night-time period has been assessed between the hours of 23:00 to 07:00. For the assessment, BS 4142:2014+A1:2019 has been used to determine the likelihood of adverse impact within the garden areas over a reference time period of 15 minutes.
- Noise from the generator has been input as point sources at the on-site measured heights.
- Ground absorption is set at 0 and a reflection order of 1 selected.

It is understood, following consultee comments from Tunbridge Wells Borough Council, the Environmental Health Departments have requested:

> *Comments from nearby residents indicates the use of diesel generators for power for the residential units. If these generators are to remain, their noise emissions should be at least 5dB under the background noise at noise sensitive receptors to ensure residents are not adversely affected.*

For the BS 4142:2014+A1:2019 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following objective features have been accounted for in the assessment, in accordance with the objective method detailed in BS 4142:2014+A1:2019, for the units as a whole operation.

TABLE 4.1 ACOUSTIC PENALTIES

SOURCE	CHARACTERISTIC	ATTRIBUTABLE PENALTY	COMMENT
Fixed plant items	Tonality	**+6**	Objective analysis of the measured data found tonality present
	Impulsivity	-	No impulsivity was detected
	Intermittency	-	No intermittency was detected
	Other Sound Characteristics	-	Fixed plant sound readily discernible against the existing sound climate.

4.1. DAYTIME ASSESSMENT

Table 4.2 details the resultant rating level at each receptor, output from the model. The grid noise map can be seen in Figure 2 of Appendix II and details the locations of the assessed receptors.

The lowest median measured background sound level during the daytime periods have been used. This informs a worst-case assessment. Levels correspond to worst case façade noise levels.

With regards the criterion, it is assumed that the BS 4142 assessment of -5 dB would apply to off-site receptors with on-site receptors more applicable to the assessment of internal BS 8233 criterion, especially considering the proximity of the generators and that receptors are indoors. As such, a criterion of 48 dB (35 dB + 13 dB for open window) is applied. Due to the proximity of these windows to the generator and the very low background sound levels, this is considered appropriate and will achieve levels of less than 35 dB in habitable rooms.

TABLE 4.2 BS 4142:2014+A1:2019 ASSESSMENT – DAYTIME

RECEPTOR	CALCULATED RATING LEVEL AT FAÇADE, $L_{A,r}$ (dB)	LOWEST MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	CRITERION, $L_{A90} = L_{A,r} – 5$ dB (dB)	DIFFERENCE +/- (dB)
Flats (Inside HMP East Sutton Park)	71	-	48	**+23**
MUDR	66	-	48	**+18**
E Sutton Road	43	32	27	**+16**

Table 4.2 indicates that the predicted rating level exceeds the background sound level during daytime periods at the closest receptors and exceeds the internal criterion at the on-site receptors.

As such, mitigation measures are required.

4.2. NIGHT-TIME ASSESSMENT

Table 4.3 details the resultant rating level at each receptor, output from the model. The grid noise map can be seen in Figure 2 of Appendix II and details the locations of the assessed receptors.

The lowest measured background sound level during the night-time periods have been used. This informs a worst-case assessment. Levels correspond to worst case first floor/second floor window external noise levels.

With regards the criterion, it is assumed that the BS 4142 assessment of -5 dB would apply to off-site receptors with on-site receptors more applicable to the assessment of internal BS 8233 criterion, especially considering the proximity of the generators and that receptors are indoors. As such, a criterion of 43 dB (30 dB + 13 dB for open window) is applied. Due to the proximity of these windows to the generator and the very low background sound levels, this is considered appropriate and will achieve levels of less than 30 dB in habitable rooms.

TABLE 4.3 BS 4142:2014+A1:2019 ASSESSMENT – NIGHT-TIME

RECEPTOR	CALCULATED RATING LEVEL AT FACADE, $L_{A,r}$ (dB)	LOWEST MEASURED BACKGROUND SOUND LEVEL, $L_{A90,15mins}$ (dB)	CRITERION, $L_{A90} = L_{A,r} – 5$ dB (dB)	DIFFERENCE +/- (dB)
Flats (Inside HMP East Sutton Park)	71	-	43	**+28**
MUDR	66	-	43	**+23**
E Sutton Road	43	26	21	**+22**

Table 4.3 indicates that the predicted rating level exceed the applicable criteria during night-time period at the closest receptors.

5. MITIGATION

The assessment has shown that mitigation measures are required as during the daytime and night-time periods, the resultant rating level would far exceed the background sound levels at noise-sensitive receptors.

The maximum exceedance of the criterion was 28 dB. As such, a reduction of 28 dB is needed, however, this level of reduction will not be possible on site. Therefore, the client proposes to implement the use of a battery solution on site that will be used to store power during daytime periods and then be used to power systems during the night, allowing for the generator to be switched off completely between the hours of 23:00 and 07:00. As such, this solution alone will remedy the night-time adverse impact. It is assumed that there would be no to very little noise output based on the information available.

The proposed battery is detailed below:

- 45kVA Battery Storage System supplied by Green Power Hire.

During daytime periods, however, the generator is required. As such, the client proposes to replace the generator with the below model:

- 200kVA Soundproof Generator with a noise level of 75 dBA at 1 m.

The above is approximately 7 dB lower than the current model. Furthermore, the following enclosure will be installed:

- Soundex Generator Enclosure – 24 dB R_w. This will be installed around the generator at a height of 3 m.

In order to determine the reduction provided by the enclosure, an additional noise model has been run for the daytime period with the new generator installed and an enclosure around it. This grid can be seen in Figure 3. It is assumed the generator would be in the same position as the existing.

With regards the BS 4142 assessment, as the new generator is lower in noise level and assumed to be tonal free, a correction of +3 dB is applied to account for other sound characteristics.

As can be seen in Figure 3, the below resultant rating levels and assessments are updated:

TABLE 5.1 BS 4142:2014+A1:2019 ASSESSMENT – DAYTIME WITH MITIGATION

RECEPTOR	CALCULATED RATING LEVEL AT FAÇADE, $L_{A,r}$ (dB)	LOWEST MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	CRITERION, $L_{A90} = L_{A,r} – 5$ dB (dB)	DIFFERENCE +/- (dB)
Flats (Inside HMP East Sutton Park)	48	-	48	0
MUDR	43	-	48	-5
E Sutton Road	20	32	27	-7

As shown above, the implementation of the measures would remove the night-time adverse impact and lessen the daytime impact to an acceptable level at on-site receptors and achieve the LPA criterion at off-site receptors.

Details of the solutions are appended to the rear of the report.

6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Mace Group, on behalf of Ministry of Justice to undertake a Noise Impact Assessment for the retrospective planning application for temporary Covid and Modular Units at HMP East Sutton Park.

An unattended ambient and background sound survey has been undertaken in a position considered representative of the existing sound climate. A site walkover was undertaken to determine if there were any existing plant items impacting upon the temporary units or existing dwellings. Measurements were obtained of generators associated with the temporary units.

The assessment has shown that with the proposed hybrid mitigation solution, noise levels can be suitably controlled to acceptable levels at on and off-site receptors.

Following discussions, a hybrid solution is proposed for the noise source. This involves the replacement of the generator for a quieter model, the deployment of a battery which will be used during the night-time period (assumed to be quiet running with no notable noise source) and the installation of an absorbative barrier around the new generator.

The assessment has shown that, no adverse impact is expected if the assumptions made by this report have been installed on site. As such, noise need not be a material consideration in the granting of planning permission

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
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 (2E-05 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} is defined as the notional steady sound level which, 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.
L_{Amax}	L_{Amax} 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.
L_{10} and L_{90}	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.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
MEASURED SOUND PRESSURE LEVELS

TABLE A1: HOURLY AMBIENT AND BACKGROUND SOUND LEVEL DATA – NMP1

MEASUREMENT PERIOD	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
15/06/2023 10:00:00	55.4	36.1
15/06/2023 11:00:00	43.1	33.0
15/06/2023 12:00:00	40.8	33.8
15/06/2023 13:00:00	44.5	33.4
15/06/2023 14:00:00	39.8	33.2
15/06/2023 15:00:00	42.4	33.1
15/06/2023 16:00:00	43.1	33.3
15/06/2023 17:00:00	43.0	33.3
15/06/2023 18:00:00	52.1	33.6
15/06/2023 19:00:00	40.8	32.7
15/06/2023 20:00:00	43.9	31.5
15/06/2023 21:00:00	41.6	29.3
15/06/2023 22:00:00	33.3	28.4
15/06/2023 23:00:00	33.0	27.3
16/06/2023 00:00:00	32.0	29.1
16/06/2023 01:00:00	27.4	21.6
16/06/2023 02:00:00	24.0	21.6
16/06/2023 03:00:00	47.5	22.8
16/06/2023 04:00:00	59.7	34.2
16/06/2023 05:00:00	58.0	33.9
16/06/2023 06:00:00	53.6	33.8
16/06/2023 07:00:00	54.0	37.3
16/06/2023 08:00:00	53.3	35.4
16/06/2023 09:00:00	51.5	33.9
16/06/2023 10:00:00	48.1	34.0
16/06/2023 11:00:00	44.4	33.6
16/06/2023 12:00:00	50.2	33.1
16/06/2023 13:00:00	41.2	32.0
16/06/2023 14:00:00	43.2	32.2
16/06/2023 15:00:00	44.2	31.7
16/06/2023 16:00:00	44.9	30.5
16/06/2023 17:00:00	48.1	30.1

MEASUREMENT PERIOD	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
16/06/2023 18:00:00	50.9	30.7
16/06/2023 19:00:00	51.2	30.1
16/06/2023 20:00:00	38.9	31.5
16/06/2023 21:00:00	41.1	28.0
16/06/2023 22:00:00	32.3	26.9
16/06/2023 23:00:00	29.7	26.6
17/06/2023 00:00:00	28.8	25.8
17/06/2023 01:00:00	29.8	26.2
17/06/2023 02:00:00	26.5	23.2
17/06/2023 03:00:00	43.5	27.1
17/06/2023 04:00:00	59.7	33.2
17/06/2023 05:00:00	56.2	32.4
17/06/2023 06:00:00	55.1	33.4
17/06/2023 07:00:00	55.3	33.6
17/06/2023 08:00:00	59.6	32.7
17/06/2023 09:00:00	52.6	32.1
17/06/2023 10:00:00	52.1	33.3
17/06/2023 11:00:00	50.4	33.9
17/06/2023 12:00:00	48.5	32.1
17/06/2023 13:00:00	44.3	34.2
17/06/2023 14:00:00	48.1	34.2
17/06/2023 15:00:00	49.9	34.6
17/06/2023 16:00:00	48.3	32.9
17/06/2023 17:00:00	50.5	31.5
17/06/2023 18:00:00	44.8	31.6
17/06/2023 19:00:00	42.9	29.7
17/06/2023 20:00:00	41.6	28.6
17/06/2023 21:00:00	40.8	31.1
17/06/2023 22:00:00	40.6	28.5
17/06/2023 23:00:00	35.4	27.3
18/06/2023 00:00:00	33.3	23.1
18/06/2023 01:00:00	53.9	30.9

MEASUREMENT PERIOD	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
18/06/2023 02:00:00	30	24.7
18/06/2023 03:00:00	36.2	24.8
18/06/2023 04:00:00	58	32.9
18/06/2023 05:00:00	52.8	32.2
18/06/2023 06:00:00	53.7	31.8
18/06/2023 07:00:00	53.6	32.3
18/06/2023 08:00:00	48.1	32.7
18/06/2023 09:00:00	48.9	32.5
18/06/2023 10:00:00	46.3	35.4
18/06/2023 11:00:00	45	34.7
18/06/2023 12:00:00	50.5	37.1
18/06/2023 13:00:00	50.2	37.2
18/06/2023 14:00:00	46.5	34.8
18/06/2023 15:00:00	52.1	36.9
18/06/2023 16:00:00	52	38
18/06/2023 17:00:00	49.3	38.1
18/06/2023 18:00:00	48.4	38.7
18/06/2023 19:00:00	44.2	33.8
18/06/2023 20:00:00	41.7	29.3
18/06/2023 21:00:00	52.2	33.6
18/06/2023 22:00:00	34.7	26.9
18/06/2023 23:00:00	33.6	25.6
19/06/2023 00:00:00	29.3	21.7
19/06/2023 01:00:00	26.7	21.2

MEASUREMENT PERIOD	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
19/06/2023 02:00:00	29.3	24.8
19/06/2023 03:00:00	45.9	22.6
19/06/2023 04:00:00	56	33.5
19/06/2023 05:00:00	46.3	31.9
19/06/2023 06:00:00	51	32
19/06/2023 07:00:00	47.3	32.2

APPENDIX III
FIGURES

Figure 1 - Noise Measurement Positions

Project:
HMP East Sutton Park

Project-No:
50-899

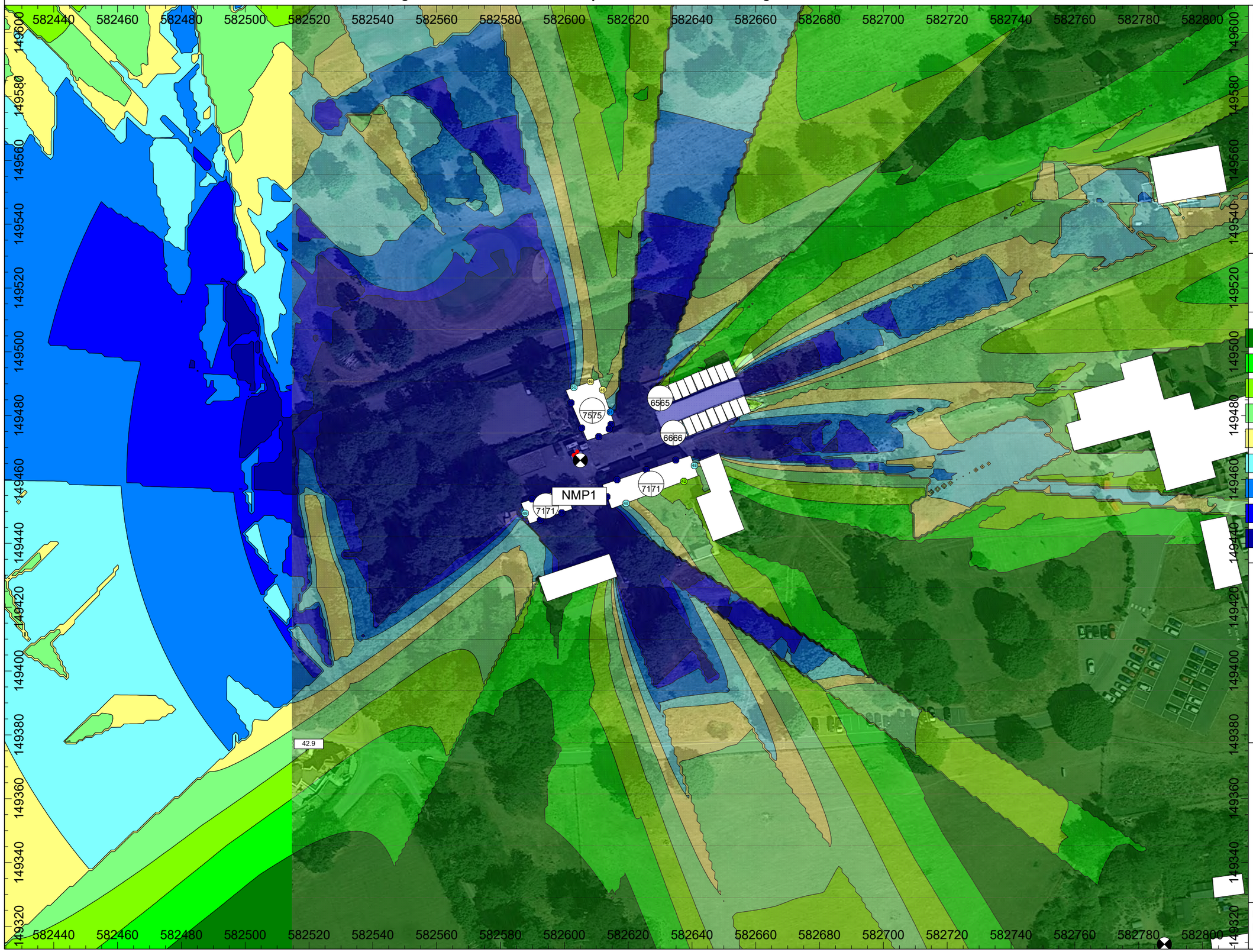
Client:
Ministry of Justice

N

e3p

Project Engineer: Melissa Bailey
Date: 21/06/2023

Figure 2 - Generator Grid Noise Map - Calculation at 1.5m above ground level with Facade Levels at 1st Floor



Project:
HMP East Sutton

Project-No:
50-899

Client:
Ministry of Justice

Rating Level, LA,r (dB)

- ... <= 38
- 38 < ... <= 40
- 40 < ... <= 42
- 42 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ...

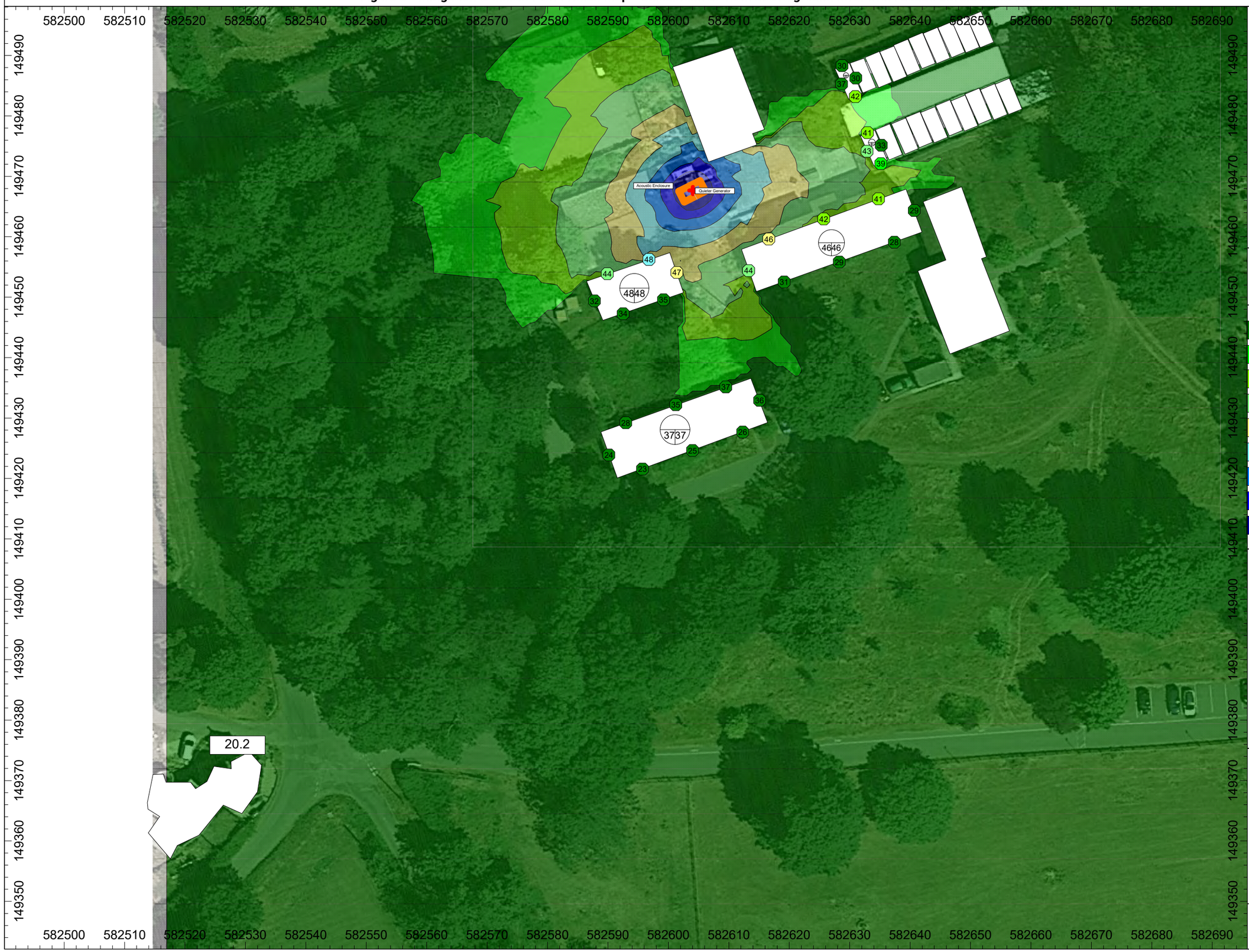
Noise Map Objects

- Point Source
- Building
- Receiver
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 22/06/2023

Figure 3 - Mitigation Generator Grid Noise Map - Calculation at 1.5m above ground level with Facade Levels at 1st Floor



Project:
HMP East Sutton

Project-No:
50-899

Client:
Ministry of Justice

Rating Level, LA,r (dB)

- ... <= 38
- 38 < ... <= 40
- 40 < ... <= 42
- 42 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ...

Noise Map Objects

- Point Source
- Building
- Barrier
- Receiver
- Building Evaluation
- Calculation Area

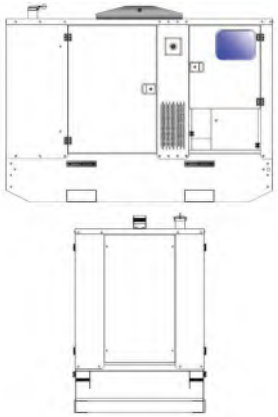
e3p

Project Engineer: L Faulkner
Date: 05/09/2023

200kVA Soundproof Generator

Features

- Noise Level @ 1m, 75dBA (@7m, 63dBA)
- Autostart DSE CP with MCCB
- VELCB
- Micro Switch Protection over Buss Bar Door
- Oil Extraction Pump
- 3 Way Fuel Valve
- Battery Isolator
- Water Separator Std
- Cental Lifting Hook
- Fork Lift Pockets
- Fully Bunded



Options

- Bulk Fuel Tank
- Battery Charger
- Deep Sea 7510 Loadshare

Generating Set	50 Hz	60 Hz
Continuous Power	200 kVA	230 kVA
Standby Power	220 kVA	253 kVA
Noise Level @ 1m / 7m	75 dBA / 63 dBA	
Power Factor	cos □ 0.8	
Continuous Power	160 kWe	191 kWe
Standby Power	176 kWe	210 kWe
Amps 3 Phase	278 A	
Fuel consumption 70% load	29.5 l/h	34 l/h
Engine	**1500 rpm**	
Model	John Deere 6068HFU74	
Continuous Power	178 kWm	
Standby Power	197 kWm	
Aspiration	Turbocharged	
Cooling System	Water	
Speed Governor	Electronic	
Cylinder Number	6	
Displacement	6,800 cm^3	
Logistic Information	**GX221JDE**	
Fuel Tank	400 ltr	
Weight (Wet)	2,940 kg	
Dimensions (L x W x H)	335 x 110 x 217 cm	
Control Panel	**Deep Sea 7310**	
Auto Start	Standard	

Deep Sea 7310 Control Panel

ABIRD has a policy of continuous improvement and therefore reserve the right to change the specification without prior notice.

SOUNDEX®

Soundex Generator Enclosure

Soundex Generator Enclosure

This Soundex Generator Enclosure has been specifically designed to attenuate the low-frequency noise associated with generators and includes an access door for maintenance and refuelling.

Incorporating two layers of Soundex high-performance acoustic material, the Soundex Generator enclosure is specifically designed to handle the low frequency sound from generators and other static plant.

The enclosure is designed to allow air space around most common generators and includes an access door for ease of maintenance and refuelling. The aluminium frame is assembled in two sections and once folded, the whole enclosure can be transported on two standard pallets

Features & Benefits

- PLF-Tech® low frequency technology
- Up to 59.9 dB reduction in noise
- Industrial robust aluminium construction
- Outstanding sound absorption

Key Applications

- Enclosing generators
- Containing noisy site operations

Product Testing and Certification

- PMDA Windload Calculations BS EN 19911-4
- Bureau Veritas Fire Test BS 476 Part 12 1991
- Exova/BTTG Fire Test BS 7837:1995 (2015)
- PVC Containment Sheets BS 7955:1999 Clause 4.3: tensile Strength, Clause 4.4: Attachment Point Strength, Related Specification: BS 2576:1996.
- Laboratory Acoustic Test BS EN ISO 10140-2:2010

RVTGROUP™
Protecting people and our environment

SOUNDEX®

Soundex Generator Enclosure

Technical Specifications	
Size	3000 x 4875 x 3000mm
Maximum Sound Absorption	79% @ 250 Hz 111% @ 1000 Hz 104% @ 5000 Hz
Maximum Sound Attenuation	12.0 dB @ 250 Hz 27.8 dB @ 1000 Hz 59.9 dB @ 5000 Hz

Test Data							
Hz.	50	100	160	250	500	5000	Rw Value
Reduction dB	14.9	12.2	10.2	12.0	20.4	59.9	24 dB
Absorption as	0.07	0.15	0.45	0.79	1.03	1.01	1.00

Product Testing and Certification: BS EN ISO 717-1: 1997: BS EN ISO 345: 2003; EN ISO 11654: 1997

Fire Ratings	
Acoustic Vinyl Membrane	M2 / B1 / BS / B-s2-d0 / NFPA701
Acoustic Core	Class 0
Acoustic Mesh Membrane	M2
Printing	Water Based Ink

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