



**Independent Acoustic
Consultancy Practice**

Noise Impact Assessment

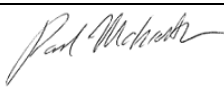
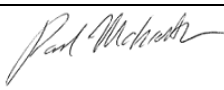
**Fire Training Facility
Earlswood Training Centre
Neath**

6514/NIA1

Noise Impact Assessment

Project:	Fire Training Facility
Site Address:	Earlswood Training Centre Neath SA10 6NG
HA Reference:	6514/NIA1
Date:	18/05/2023
Client:	Mid & West Fire Service c/o Lawray Architects 1 Cae Gwyrdd Tongwynlais Cardiff CF15 7AB
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ISSUE / REVISION

Rev	Date			
P1	04 April 2023	Filename	23.6514_NIA1_prelim	
		Description	Preliminary issue	
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0	19 May 2023	Filename	23.6514_NIA1	
		Description	First issue	
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TABLE OF CONTENTS

1. INTRODUCTION	4
2. CRITERIA.....	5
2.1 Planning Conditions.....	5
2.2 British Standard 4142:2014+A1:2019	5
3. SOUND SENSITIVE RECEIVERS	7
4. ENVIRONMENTAL NOISE SURVEY	8
5. PLANT NOISE LIMITS	8
6. NOISE MODELLING	9
6.1 Source Plant Noise Data	9
6.2 Plant Enclosures	10
6.3 Screening	11
6.4 Noise Model Results.....	11
7. ASSESSMENT OF INDUSTRIAL NOISE IMPACT	12
7.1 Rating Level over Background Assessment	12
8. CONCLUSION.....	13
 APPENDIX A - ACOUSTIC TERMINOLOGY	 14
APPENDIX B - DIAGRAMS, GRAPHS AND TABLES.....	15
APPENDIX C - NOISE MODELLING.....	16
C.1 Noise Model Input Data	16
C.2 Noise Model 3D Views	16
C.3 Noise Model Contour Plots	17
 APPENDIX D – BS 4142:2014+A1:2019 ASSESSMENTS	 18
APPENDIX E - DRAWING LISTS.....	20

1. INTRODUCTION

We understand a Carbonaceous Fire Behaviour Training Facility (CFBT) is proposed at Earlswood Training Centre, Neath, SA10 6NG.

The Local Planning Authority has requested a noise impact assessment is submitted to accompany the planning application.

A daytime background survey was undertaken under a previous report (6514/ENS1 dated 20/04/22). This report has therefore been commissioned to predict noise levels from proposed plant allowing an assessment of the impact to be made against the planning conditions.

The proposed operating hours of the facility are:

- Monday to Friday 0900-2200hrs
- Saturday and Sunday 0900-1700hrs

2. CRITERIA

2.1 Planning Conditions

Neath Port Talbot County Borough Council has included the following conditions on the planning consent:

3. Prior to commencement of the development, the applicant shall submit a scheme detailing how the specified sound rating levels within the noise impact assessment hereby approved will be achieved. The scheme, which shall be submitted to and approved in writing by the local planning authority, shall include specific details of any sound attenuation equipment that may be necessary to achieve the stipulated sound rating levels within the report. Development shall thereafter only proceed in accordance with the approved scheme and details contained therein.

9. The noise rating level of the extractor plant shall not be greater than the background sound level +5dB when measured at the nearest sensitive receptor, when assessed in accordance with the methodology and principles set out in 'BS4142:2014 Methods for rating and assessing industrial and commercial sound'.

2.2 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound", provides current guidance for the assessment of industrial noise affecting residential receivers.

This standard describes a rating method comparing L_{Aeq} noise levels from the industrial source with pre-existing background L_{A90} levels at the residential receiver. It advises at a difference (industrial noise - background) of:

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

A sliding scale of penalties can be applied to industrial/commercial sound levels which have acoustically distinguishing characteristics, including tonality, impulsivity and intermittency.

Tonality – A penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

Impulsivity – A penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied

Intermittency – If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

BS 4142:2014 states under section 11;

“Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.”

3. SOUND SENSITIVE RECEIVERS

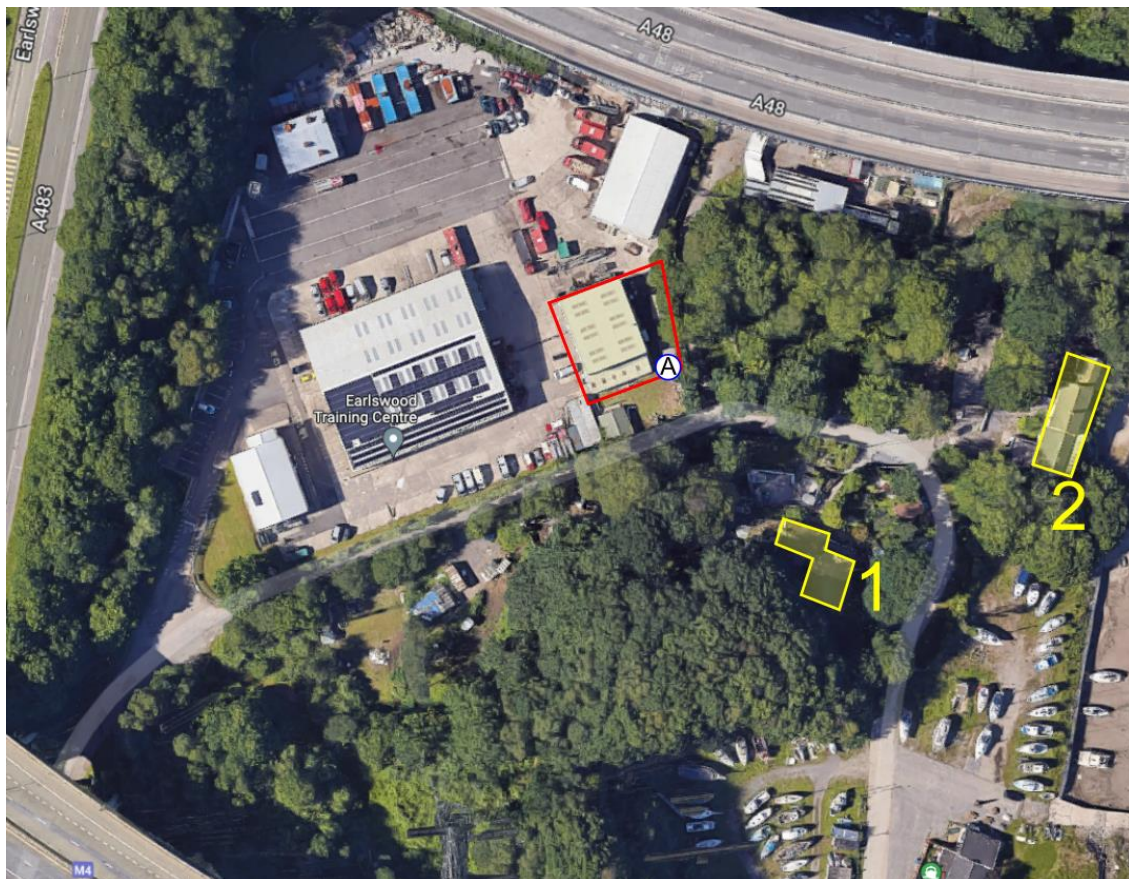
The nearest SSRs to the development site include:

The closest noise sensitive receivers are Earlswood Cottages (<50m south-east) and Ferryboat House (90m to the east).

1. Earlswood Cottages (<50m south-east)
2. Ferryboat House (90m to the east)

These are highlighted in Figure 3.1 below;

Figure 3.1 – Nearest Sound Sensitive Receivers (SSRs)



4. ENVIRONMENTAL NOISE SURVEY

An environmental noise has been carried out at site as detailed in our report 6514/ENS1_REV1 dated 19/5/23.

The following minimum consistent L_{A90} sound levels have been determined for the permitted CFBT operating hours (0900-2200hrs):

Table 4.1 – Minimum Consistent Daytime and Evening -time Background L_{A90} Results

Period	Position A
Daytime (0900-1800hrs) $L_{A90,1hr}$ (dB)	55
Evening (1800-2200hrs) $L_{A90,15min}$ (dB)	50

Background sound levels were controlled by the road traffic on the M4, A48 and A483.

It is considered that the measured background sound levels measured during the evening should also represent a robust assessment of background sound levels during weekend daytime hours.

5. PLANT NOISE LIMITS

Based on results of noise monitoring at Position A, the following plant rating limits are proposed for CFBT plant at the nearest sound sensitive receivers (SSRs) in accordance with Condition 9 of the planning permission.

Table 5.1 – Proposed Plant Rating Limits at Nearest SSRs

Period	Plant Rating Limits $L_{Ar,Tr}$ (dB)
Daytime Operational Hours (0900-2200hrs)	55dB

6. NOISE MODELLING

Our analysis has used the proprietary Predictor (v2022.1) computer modelling software, in conjunction with procedures of ISO 9613.

This model allows noise levels from noise sources (including building facades) to be predicted over large distances and varying terrain. Attenuation is included accounting for distance, air absorption, ground absorption and screening losses from site topography/local structures.

Standard LiDAR DTM 1m data has been used for terrain modelling, along with site observations of specific features. Figure C.1 shows the 3D terrain model.

The analysis predicts resultant noise levels at the SSRs. As plant would run continuously, the daytime and night-time noise models are the same.

Drawings used in our assessment are referenced in Appendix E.

6.1 Source Plant Noise Data

Source noise data used in the model for the plant is listed in Table B.1

Octave-band frequency sound level data is not currently provided for the compressor or the dust collector. At this stage database spectra have been used for these plant – these should be validated by the manufacturer or by a site test.

It is understood that the main sound source from the Dust Collector is from the high level filters / pneumatic jetclean, which “pulse” (<0.5s) approximately every 20s. This to be confirmed with further measurements. There is understood to be no other noise elements (fans/cyclones etc) in the dust collector. A spectrum based on a ‘pressure release’ from similar equipment has been used.

Noise model input data is detailed in Appendix C.1

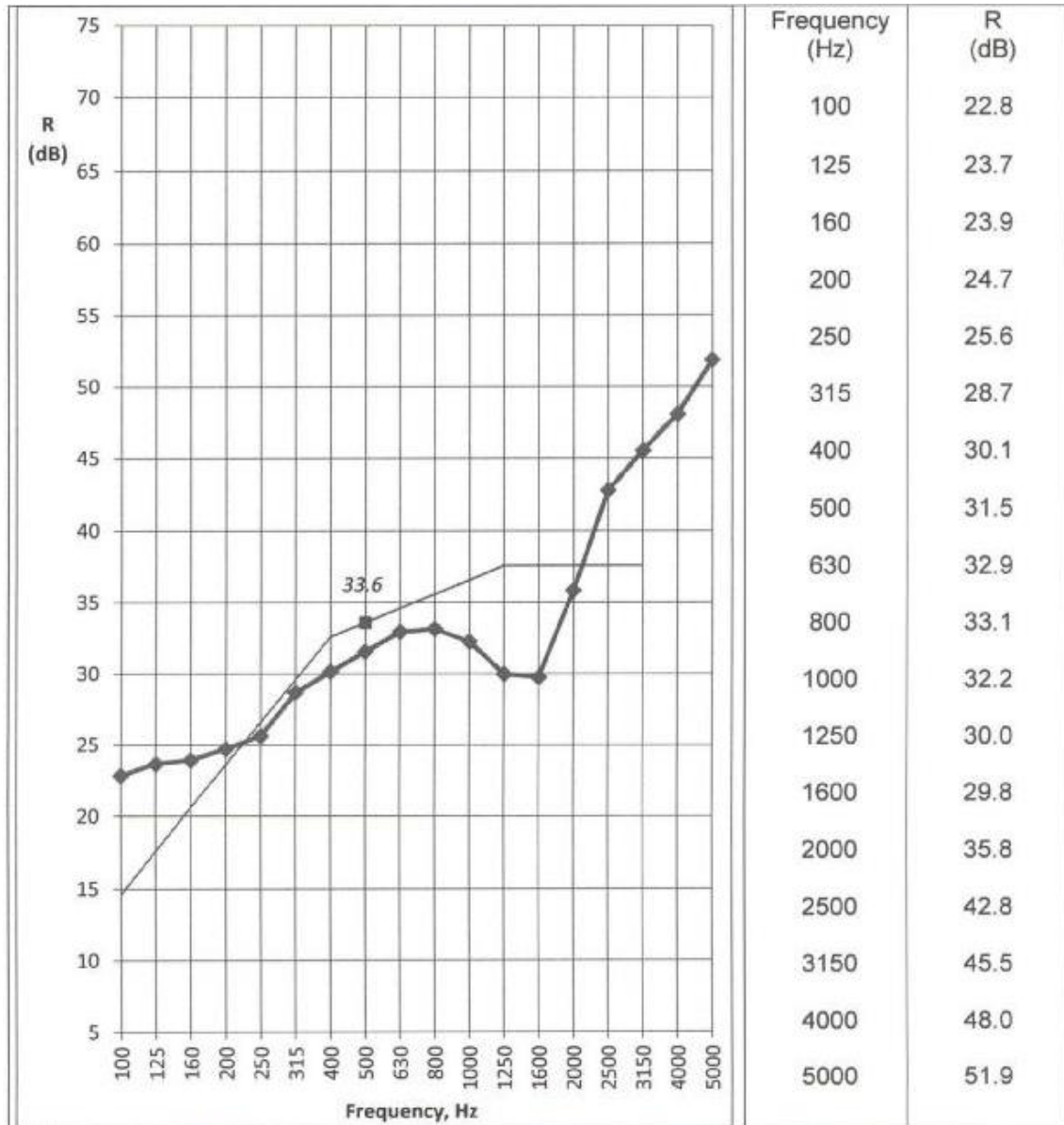
Main extraction fans and cooling fans are to operate continuously (100% on time). Compressor and dust collector are to run for approximately 10mins in any hour period (16.67% on-time).

The overall ‘on-time’ for the dust collector filter noise is estimated at 1.5s every minute, so 15-seconds on-time in an hour.

6.2 Plant Enclosures

Compressor and extraction housing is proposed to be an Isolpack *Ecoline Fibermet EVO* (50mm) panel with an overall panel, with an overall performance of $R_w33.6$:

Figure 6.1 - Plant Enclosure Sound Reduction Performance



Internal sound pressure level measured within the buildings, along with octave band sound reduction performance figures for each building element are included in Table C.2 and Table C.3 of Appendix C respectively.

6.3 Screening

Local steel panel fencing is proposed around the compressor and extract fan enclosures to remove line-of-sight from the cooling fans. These are indicated on *Proposed Acoustic Screening* drawing. A 1.8m high screen is to be located near to compressor enclosure, and a 2.5m high screen is to be located close to the extract fan enclosure. The proposed barrier shall be a solid structure with no gaps, shall have a minimum mass per unit area of 10kg/m².

Acoustic louvre panel section is to be included in the extract fan enclosure fence panel section to allow air flow. This shall meet the following minimum sound reduction performance:

Table 6.1 – External Façade Elements Sound Reduction Performance

	Sound Reduction <i>R</i> dB, Octave-Band Centre Frequency, Hz							
	63	125	250k	500k	1k	2k	4k	8k
Acoustic Louvre	5	7	11	12	13	14	12	9

Based on IAC Acoustic Louvre 'Model R'

6.4 Noise Model Results

The noise map model in Figure C.2 of Appendix C shows the predicted noise contour plot across the surrounding area to critical SSRs at 4.5m above local ground height. Local screens are shown in **BLUE**.

Predicted levels at critical plots are shown below;

Table 6.2 - Noise Map Predicted levels at Critical SSR

Sound Sensitive Receiver (SSR)	Level Above Ground	Predicted <i>L</i> _{Aeq,1hr} (dB)
Earlswood Cottages	1.5	46.9
	4.5	47.1
Ferryboat House	1.5	41.6
	4.5	45.7

7. ASSESSMENT OF INDUSTRIAL NOISE IMPACT

7.1 Rating Level over Background Assessment

7.1.1 Acoustic Character Correction

Cooling fans and dust collector are indicated to be the controlling sound sources:

Cooling fans: specific noise levels from the cooling fans are indicated at 46dB $L_{Aeq,1hr}$, at least 3dB below the lowest daytime background sound level, and 5dB below the lowest ambient sound level at 2200hrs latest operating times. Although cooling fans are likely to exhibit a tone at source, a tone is considered unlikely to be perceptible at the Earlswood Cottage. No character correction for tonality is therefore applied.

Dust Collector: A noise map model has been used to estimate the likely absolute noise levels from the Dust Collector filters. Based on noise map shown in Figure C.3 specific noise levels from the dust collector filters are indicated at 60-65dB L_{Amax} ; this is >10dB above the lowest daytime background and ambient sound levels, although well below L_{max} levels caused by vehicle pass-bys. Dust collector filters are likely to be highly impulsive at source, an impulse is likely to be clearly 'perceptible' at the Earlswood Cottage and Ferryboat House. A 6dB character correction for impulsivity is therefore applied.

7.1.2 BS 4142:2014+A1:2019 Assessments

BS 4142 assessments have been carried out for the SSRs. BS 4142 assessments for the daytime and night-time scenarios are included in Appendix D.

Results of these are summarised in Table 7.1 below;

Table 7.1 – Predicted Daytime Rating Levels at SSRs

Sound Sensitive Receiver (SSR)	Predicted Specific Level $L_{Aeq,1hr}$ (dB)	Predicted Rating Level $L_{Ar,1hr}$ (dB)	Proposed rating Noise Limit $L_{Ar,1hr}$ (dB)
Earlswood Cottages	47	53	55
Ferryboat House	46	52	55

Overall rating levels are indicated to meet the planning condition requirement of rating level not exceeding background by more than 5dB.

8. CONCLUSION

A noise impact assessment has been carried out for the proposed Carbonaceous Fire Behaviour Training Facility (CFBT) at Earlswood Training Centre, Neath, SA10 6NG.

Noise impact assessments have been carried out for the proposed daytime periods. With proposed local screening included to control cooling fan noise levels overall plant noise rating level is indicated to meet the planning condition requirement of rating level not exceeding background by more than 5dB.

The model is based on initial noise data provided by Coral/Dräger. Octave-band frequency sound level data is not currently provided for the compressor or the dust collector. At this stage database spectra have been used for these plant – these should be validated by the manufacturer or by a site test.

APPENDIX A - ACOUSTIC TERMINOLOGY

Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

The following units have been used in this report:

dB(A)	The sound pressure level A-weighted to correspond with the frequency response of the human ear and therefore a persons' subjective response to frequency content.
L_{eq}	The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period.
L_{max}	The highest instantaneous sound level recorded during the measurement period.
L_{10}	The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6 minutes of a 1 hour measurement - used as a measure of background noise.
L_{90}	The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement - used as a measure of background noise.
$L_{Ar,Tr}$	The 'rating' level, as described in BS 4142:2014 – the specific noise plus any adjustment for the characteristic features of the noise.
SSR	Sound sensitive receiver

APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

Table B.1 – Plant Noise Schedule

Unit Ref	Make	Model	No	Duty m ³ @ Pa	Mfr L _p /L _w	Octave Band Centre Frequency (Hz)								dB(A)
						63	125	250	500	1K	2K	4K	8K	
Extraction Fan	Drager	TBC	1	TBC	L _p @ 2m	87	89	89	83	85	80	73	66	83
Dust Collector	Dustolex	TBC	1	TBC	L _p @ 1m	77	67	85	92	87	86	78	77	90
Compressor	ABAC	PRO B7000 270 FT10 YD	1	1.21m ³ /min	L _p @ 4m	71	71	68	73	73	69	70	68	78
Cooling Fans	S&P	HXBR/4-500	2	TBC	L _p @ 1.5m	69	76	78	78	78	73	67	65	81

Notes:

- 1) 90dB(A) @1m SPL value for Dust Collector is based on the initial quoted figure. Octave-band spectra are based on an extraction unit with pressure release measurement with the values corrected for the overall dB(A) level. *The final noise levels are to be confirmed with Dustolex, with a site measurement if needed.*
- 2) Octave-band spectra are based on a similar compressor measurement with the values corrected for the overall dB(A) level.

APPENDIX C - NOISE MODELLING

C.1 Noise Model Input Data

Table C.1 – Fixed Plant Noise Data Used in Model

Plant Item / Activity	L_w at Octave Band Centre Frequencies, Hz (dB)								L_{WA} (dB)
	63	125	250	500	1000	2000	4000	8000	
Cooling Fans	80	89	90	90	90	85	79	77	93
Extraction Stack Discharge	81	87	88	87	85	79	73	65	89
Dust Extractor	85	75	93	100	95	94	86	85	101

Table C.2 – Internal Sound Pressure Level in Enclosures / Ducts

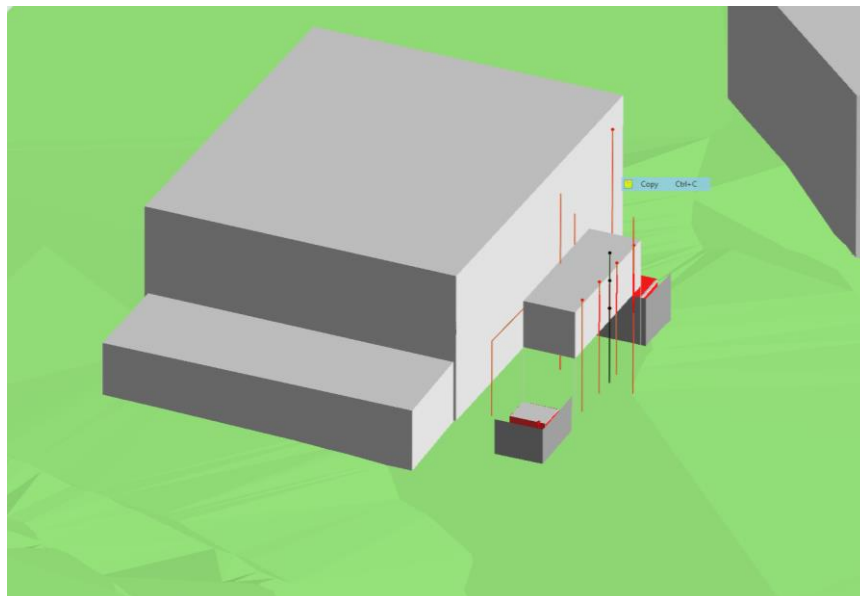
Building	L_p at Octave Band Centre Frequencies, Hz (dB)								L_{pA} (dB)
	63	125	250	500	1000	2000	4000	8000	
Extraction Fan	89	91	91	90	88	82	76	68	92
Compressors	92	92	89	94	94	90	91	89	99
Extraction in-duct	87	89	89	87	85	80	73	66	89

Table C.3 – Sound Reduction Performance of Building Elements

Façade	Sound Reduction Index at Octave Band Centre Frequency (dB)							
	63	125	250	500	1000	2000	4000	8000
Enclosure wall / Roof	23.7	27.7	32.4	30.5	39.4	40.0	(40.0)	(40.0)
Ductwork / Stack	10	15	23	28	35	38	40	40
Acoustic Louvre (in fence panel)	5	7	11	12	13	14	12	9

C.2 Noise Model 3D Views

Figure C.1 – 3D Model of Site (looking North)



C.3 Noise Model Contour Plots

Figure C.2 – Noise Model $L_{Aeq,1hr}$ Contours at 4.5m Height

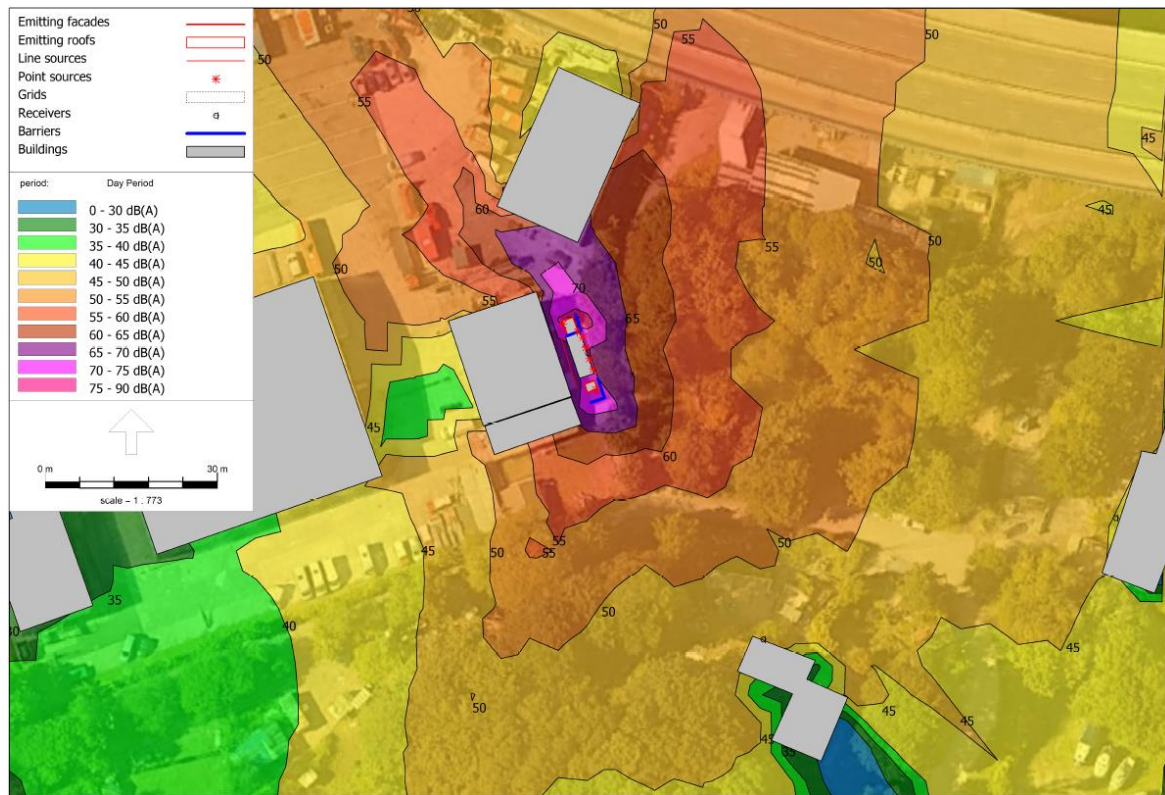
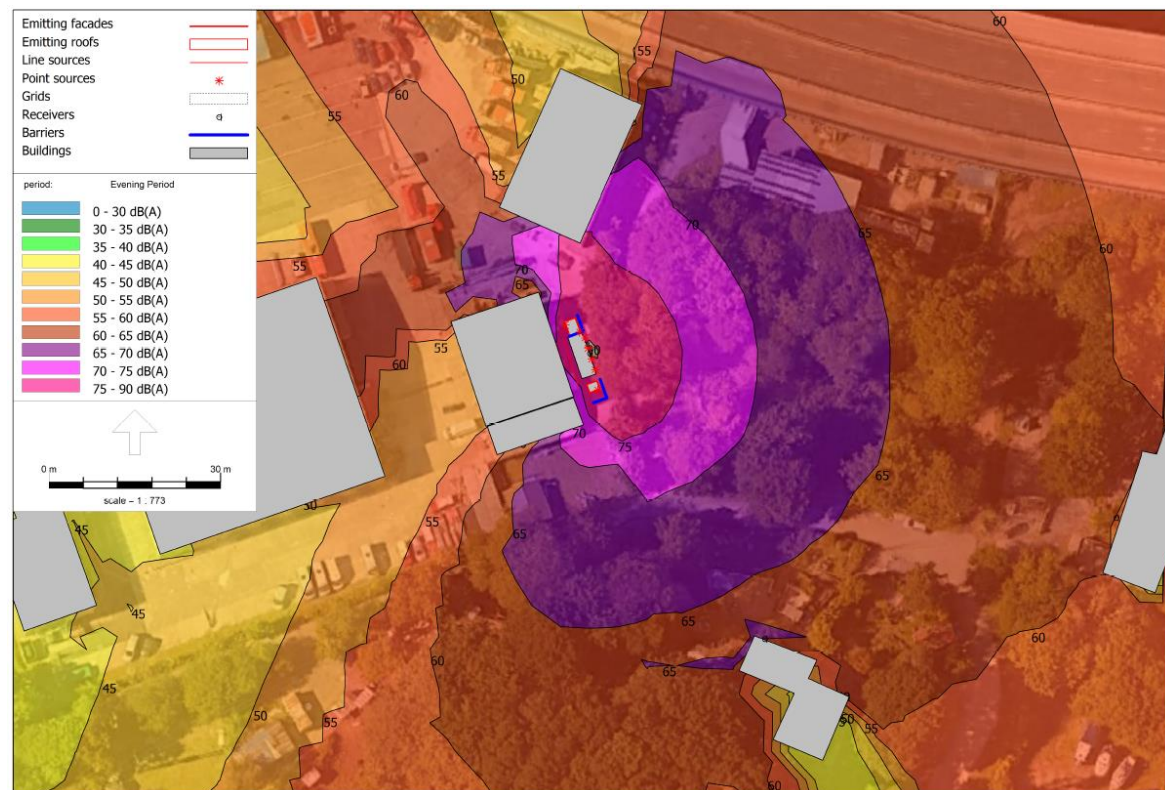


Figure C.3 – Noise Model Dust Collector L_{Amax} Contours at 4.5m Height



APPENDIX D – BS 4142:2014+A1:2019 ASSESSMENTS

Table D.1 – BS 4142 Daytime Assessment at Earlswood Cottages

Results		Relevant Clause	Commentary
Predicted Plant Noise Level	$L_{Aeq} = 47\text{dB}$	7.3.2	Predicted Plant Noise Level at SSR from Noise Model
Residual sound level		7.3.3	Not Applicable
Background sound level (evening)	$L_{A90(1800-2200\text{hrs})} = 50\text{dB}$	8.1.1 8.1.3 8.3	Background sound level measured at Position A
Assessment made during the daytime so the reference time interval is 1hr.		7.2	
Specific sound level calculated by correcting the ambient sound level to remove the contribution of the residual sound level.	$L_{Aeq,1hr} = 47\text{dB}$	7.3.4	
Acoustic feature correction	6dB	9.2	+6dB applied for 'clearly perceptible' impulse
Rating Level	$(47 + 6) = 53\text{dB}$		
Background sound level (daytime)	$L_{A90(0700-2300\text{hrs})} = 50\text{dB}$	8.3	
Excess of rating over background sound level	$(53 - 50) \text{ dB} = +3\text{dB}$	11	
Assessment indicates adverse impact less likely depending on context		11	At +3dB above background BS 4142:2014 advises: "is less likely to be an indication of an adverse impact, depending on the context"
Uncertainty of assessment		10	Uncertainty in background noise measurements is considered low.

Table D.2 – BS 4142 Daytime Assessment at Ferryboat House

Results		Relevant Clause	Commentary
Predicted Plant Noise Level	$L_{Aeq} = 46\text{dB}$	7.3.2	Predicted Plant Noise Level at SSR from Noise Model
Residual sound level		7.3.3	Not Applicable
Background sound level (evening)	$L_{A90(1800-2200\text{hrs})} = 50\text{dB}$	8.1.1 8.1.3 8.3	Background sound level measured at Position A
Assessment made during the daytime so the reference time interval is 1hr.		7.2	
Specific sound level calculated by correcting the ambient sound level to remove the contribution of the residual sound level.	$L_{Aeq,1hr} = 46\text{dB}$	7.3.4	
Acoustic feature correction	6dB	9.2	+6dB applied for 'just perceptible' impulse
Rating Level	$(46 + 6) = 52\text{dB}$		
Background sound level (daytime)	$L_{A90(0700-2300\text{hrs})} = 50\text{dB}$	8.3	
Excess of rating over background sound level	$(52 - 50) \text{ dB} = 2\text{dB}$	11	
Assessment indicates adverse impact less likely depending on context		11	At 2dB above background BS 4142:2014 advises: "is less likely to be an indication of an adverse impact, depending on the context"
Uncertainty of assessment		10	Uncertainty in background noise measurements is considered low.

APPENDIX E - DRAWING LISTS

The following drawings have been used in our assessment;

Table E.1 – Lawray Drawing List

Drawing Number	Rev	Date	Drawing Title
EFT-LAW-X-X-DR-A-061001	C3	09/02/23	Proposed Ground Floor Plan and Roof Plan
EFT-LAW-X-X-DR-A-062001	P0	22/02/22	Proposed Elevations and Sections
SK10	P1	17/5/2023	Proposed Acoustic Screening

Table E.2 – Dräger Drawing List

Drawing Number	Rev	Date	Drawing Title
11098167-16	-	-	Layout Fire Training Unit