Knauf Insulation

APPLICATION TO VARY ENVIRONMENTAL PERMIT EPR/BQ4335IC

Noise Impact Assessment

70116857-RP-AC-001 REV P03
FEBRUARY 2024

CONFIDENTIAL

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EXECUTIVE SUMMARY

PURPOSE OF THIS REPORT

Knauf Insulation is required to vary the Consolidated Environmental Permit (EPR/BQ4335IC), to accommodate changes to assets and infrastructure associated with a significant refurbishment project at the St Helens facility (“the Site”).

An assessment of the impact of noise emissions associated with the modifications is required to determine the impact of the anticipated noise emissions at the St Helens Site.

The impact assessment demonstrated that the proposed installation of new items of cooling plant is likely to have a low impact on the nearest noise sensitive receptors.

LIMITATIONS

Due to time constraints, it was not possible to carry out a full noise survey of the site and surrounding receptors, and noise data for existing and proposed operations and items of fixed and mobile plant was limited.

Background noise levels used in the assessment have been based on limited short-term measurements carried out in January 2024 and data from 3rd party noise impact assessments carried out in 2023, 2016 and 2002.

Due to the complexity of the existing operations and lack of detailed noise data for equipment and operations, the assessment has focused on the potential increase in noise due to new items of plant proposed for the site. In some cases, where a significant change in noise output from an activity is not expected to occur, a noise source has been scoped out.

It should be noted that a full and detailed noise impact assessment of the site is proposed to be carried out in conjunction with the site shutdown in 2024, when it will be possible to gather representative background sound levels (whilst the site is not operational) this will inform….

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1 INTRODUCTION

1.1 BACKGROUND, AIMS AND OBJECTIVES

Knauf Insulation (KI) is required to vary the Consolidated Environmental Permit (EPR/BQ4335IC/V007), to accommodate changes to assets and infrastructure associated with a significant refurbishment project at the St Helens facility ("the Site").

An assessment of the impact of noise emissions associated with the modifications is required to determine the variance between the current and anticipated noise emissions at the St Helens Site.

1.2 SITE DESCRIPTION

The Site is located at to grid reference SJ 50121 94365, to the southwest of St Helens, Lancashire, off the A58 Prescot Road. It is situated within a mixed light industrial and residential area. Small areas of open parkland, woodland and farmland are also present in the surrounding area. The site location is shown in Figure 1-1 and the site boundary in Figure 1-2. The site layout is presented in Figure 1-3.

Figure 1-1 - Site location

Figure 1-2 - Site boundary

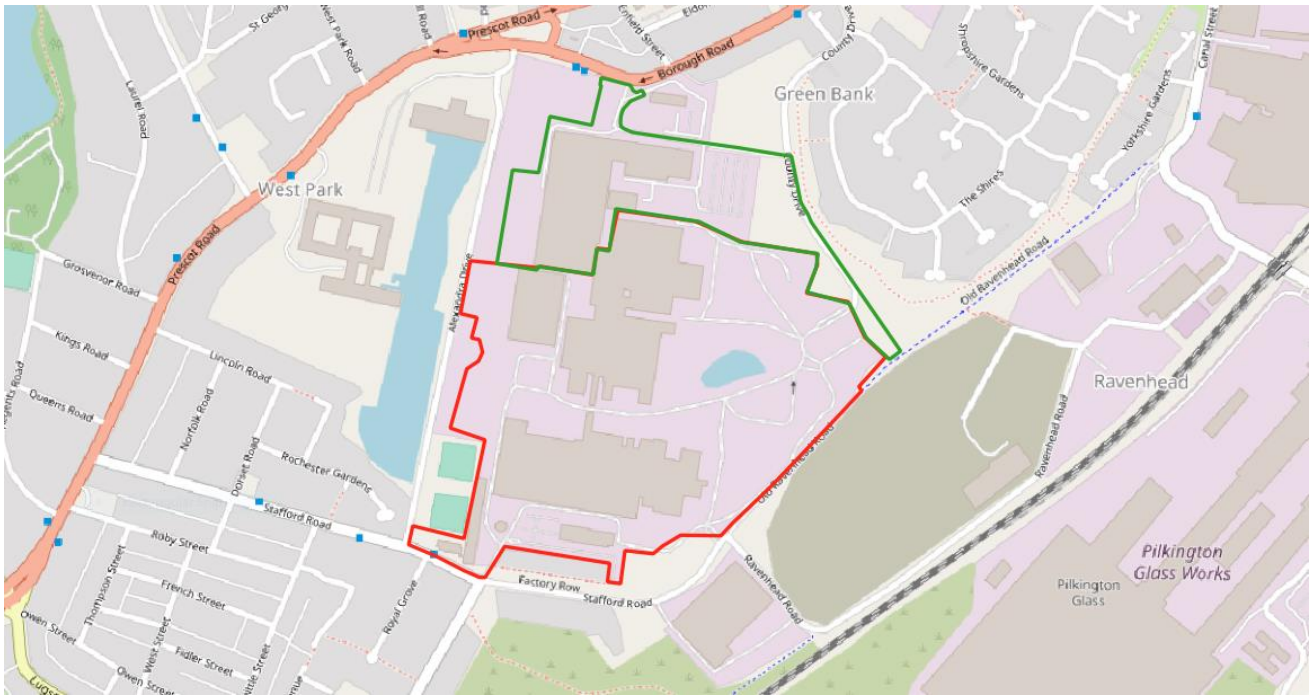
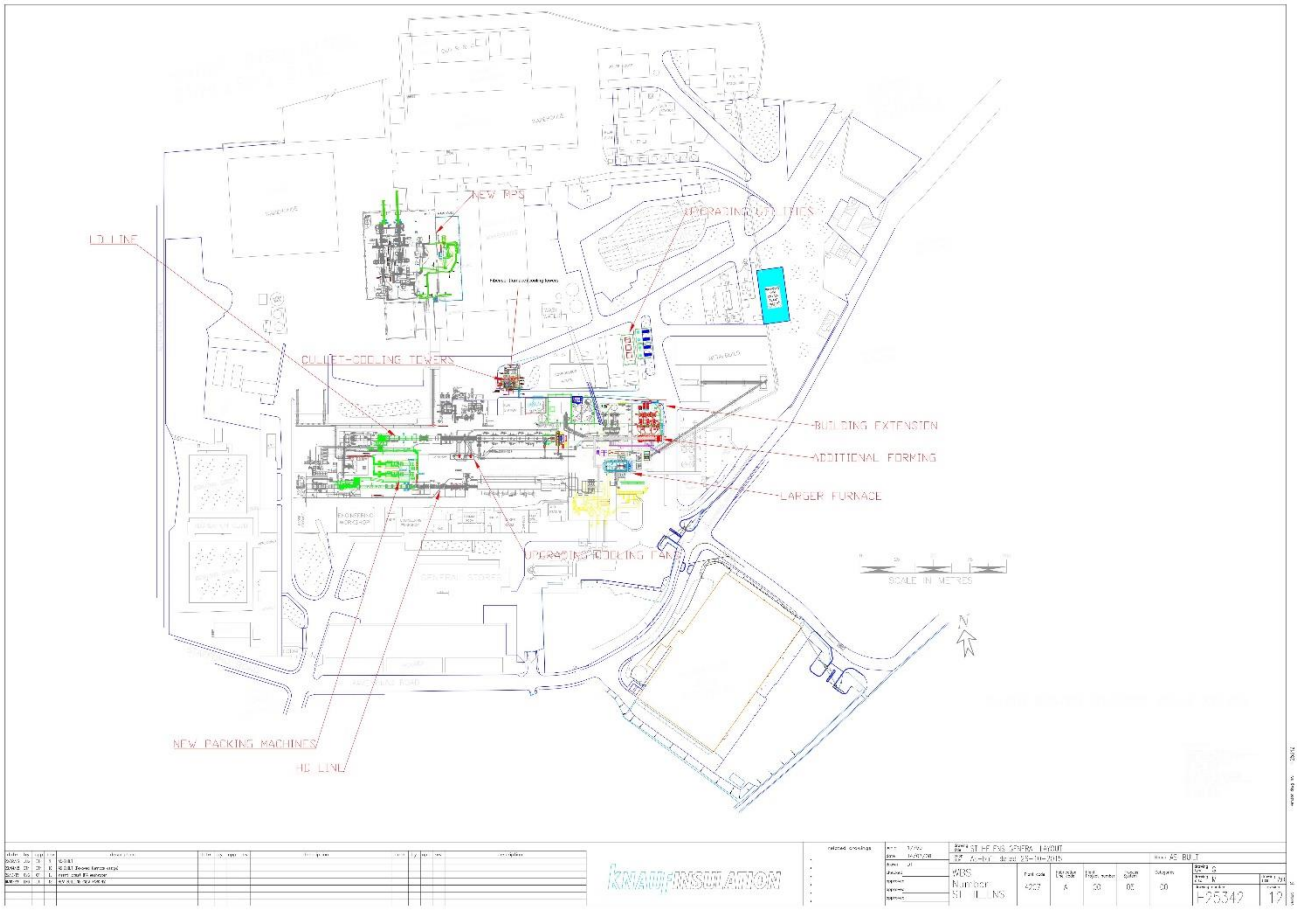


Figure 1-3 - Site layout



1.3 DESCRIPTION OF OPERATIONS

The Environmental Permit regulates activities undertaken at the Site associated with manufacture of glass wool insulation materials for use in domestic and commercial applications. These activities require a Glass Melting Furnace (Melting Furnace) and as with all refractory lined furnaces, these require periodic rebuild in addition to maintaining and replacing items of plant and equipment in accordance with the preventative maintenance regime.

The facility is scheduled to be shut-down in 2024 to enable:

- Scheduled rebuilding of the Melting Furnace.
- Preventative maintenance and the scheduled replacement of items of plant and equipment e.g., compressors and dewatering screws with more efficient units.

As part of this package of measures, KI will take the opportunity to modify the manufacturing process to increase the capacity of the Melting Furnace, to meet increased demand for products and to remove various bottlenecks that constrain production. This will require operation of additional items of plant for processes and activities downstream of the Melting Furnace, to enable the increased volume of product to be treated with binders, formed, cured, cooled, bagged and stored at the site.

KI has confirmed that the current arrangements for abatement of emissions to air, supply of on-site utilities, wastewater treatment and storage of raw materials and wastes will not require modification. In addition, rather than installing additional plant to meet the increased cooling requirement for manufacture of glass and melting cullet, KI is taking this opportunity to entirely replace the oxygen supply system, the existing cooling towers, and compressors associated with production of compressed air and the cooling systems outlined above. These units are specified to optimize energy efficient and reduce noise emissions.

KI has recently acquired a plot of land previously used for manufacturing activities at a neighbouring facility. KI will use this land to store finished goods and where required, cullet and heavy good vehicles tractors and trailers. These activities comprise associated activities for the purposes of the Environmental Permitting Regulations, therefore this land is required to be incorporated within the Site Boundary.

1.4 DESCRIPTION OF THE PROPOSED CHANGES

The operator proposes to make a number of changes associated with the refurbishment of plant and operational arrangements that will also support increased manufacturing capacity. These are summarised at Table 1-1.

Table 1-1 - Summary of proposed changes

Change	Description of proposed changes	Potential noise effects
Additional land for storage	Inclusion of additional land within the site boundary.	Increase in vehicle movements associated with increased storage capacity.
Glass Melting Furnace rebuild	Rebuilding of the glass melting furnace including replacement of the melter and oxy-gas burner system to facilitate greater throughput	Increase in vehicle movements associated with increased raw material delivery
Changes to downstream processes	Low Density production line will be expanded to increase the production throughput and allow production of products with higher thermal performance.	Increase in vehicle movements associated with increased raw material delivery.
Ancillary system upgrades	Replace slab baggers with alternative packaging machines and installing an additional fourth multi-pack machine. Installation of additional transformer within the transformer room to support electrical assist heating. Two additional batch chargers from the backwall to charger larger volume of raw material to furnace. Replace the cullet and furnace cooling towers and associated compressors.	Increase in noise levels within the main processing building. Increase in noise associated with cullet and furnace cooling towers and associated compressors.

PRODUCTION LINES

The site currently operates three production lines at the site, though throughput on only the following lines will be increased:

- The Low Density (LD) Line.
- The High Density (HD) Line.

The HD Line is currently constrained by glass availability but has sufficient spare capacity to produce the required throughput without any changes being required to the manufacturing processes.

The LD Line does not currently have sufficient spare capacity. On this basis, a number of modifications will be required. New plant will be installed on this line to:

- Mix the fibres produced from the molten glass with binders.
- Form the fibres and binders into glasswool mat.
- Cure the glasswool mat.
- Cool the mat to produce the finished product.

In addition, a new water tank and pipework will be installed, and new equipment will be installed to package the finished product.

The above production processes are contained within buildings and the replacement of old equipment and addition of more modern equipment is considered unlikely to result in any increase in internal noise levels. As such the potential risk of an increase in noise breaking out of the buildings is considered low and has not been assessed.

The existing cooling towers and associated compressors (see Cooling Systems section below) and the oxygen supply unit (see Oxygen Supply System section below) will be replaced with a more energy efficient units with improved environmental performance and capacity to meet the increased requirement for oxygen.

COOLING SYSTEMS

The closed circuit Cullet Quench Cooling System and the evaporative cooling circuit for the Furnace will be upgraded and replaced as part of the modifications. The existing cooling towers, and compressors associated with production of compressed air will be replaced with units specified to reduce noise emissions.

The following new items of external plant are to be installed and have been included in the noise assessment:

- Two Furnace cooling towers;
- One Cullet cooling tower (formed of two cells);
- Four compressors (situated in pairs within GRP enclosures); and
- Three cooling towers associated with the compressors.

Detailed information for the above equipment is included in Section 5.3.

OXYGEN SUPPLY SYSTEM

The oxygen supply unit currently installed at the Site will be replaced and upgraded to meet the increased demand arising from the modifications. The oxygen supply system is not regulated by the Environmental Permit though it is acknowledged this position may be subject to change.

HANDLING OF RAW MATERIALS AND FINISHED PRODUCT

The additional area of land to be incorporated into the Site boundary will be used for finished goods storage and may also be used for temporary storage of clean/washed cullet and parking of trailers and tractor units for loading. Finished goods will be deposited and removed from the installation by liquefied petroleum gas (LPG) powered forklift trucks.

There is also the potential for an increase in noise emissions associated with the handling of increased volumes of raw materials including cullet and finished product. With the exception of storage of finished product, these activities will be undertaken within buildings/covered structures. Finished Goods will be stored in weatherproof packaging within the adjacent new area of the Site.

There will be an increase in frequency of vehicle movements and unloading of cullet associated with delivering bulk consignments of raw materials.

The unloading of cullet takes place within an enclosed structure and was observed on site during the noise survey. Noise from this activity was found to be indistinguishable from the ambient noise climate and has not been assessed further.

The number of vehicles visiting the site is set to increase from 74 HGVs daily to 100, an increase of 35% over the daytime period. This is not considered a significant change in vehicle activity within the site and has not been considered further within the noise impact assessment.

2 ASSESSMENT LOCATION

2.1 2024 Assessment Location

As shown in Figure 1-2, the location of the Site is within a largely suburban setting, with residential receptors on the Site boundary to the North-East, North, North-West, South-West and South of the Site.

The area to the west of the facility has the Alexandra Lake followed by office blocks with residential populations beyond that at approximately 250m from the Site boundary.

The area to the east is predominantly industrial with Pilkington Glass and the railway.

Table 2-1 - Noise sensitive receptors

Receptor	Type/Description	Approximate distance from receptor to site boundary
NSR 1	Residential properties on Henley Court	180 m
NSR 2	Residential properties on Rochester Gardens	75 m
NSR 3	Residential properties on Factory Row, Ravenhead Road	0 m
NSR 4	Residential properties on Ravenhead Road	0 m
NSR 5	Residential properties on The Shires	80 m

Other sensitive receptors (primarily residential) located to the north and east of the site have not been included in the assessment as they are significantly further from the noise sources included in the assessment and/or are provided with greater screening from noise by buildings and structures. Should noise emission levels from the identified sources at the Site be adequately controlled at the receptors detailed above it is considered that they will be adequately controlled at more distant receptors.

It should be noted that other receptors around the site may be subject to noise from the Site, however, these noise levels are not expected to change in future as a result of the proposed alterations to the Site. Therefore, they have not been considered within the noise impact assessment in this report.

Figure 2-1Figure 2-1 and Table 2-1 show the identified noise sensitive receptors closest to the Proposed Development that have been used when assessing the potential noise impact from the Site. The noise sensitive receptors are indicated in green, noise survey measurement positions are indicated in yellow and the new external noise sources considered in the assessment are indicated in pink.

Table 2-1 - Noise sensitive receptors

Receptor	Type/Description	Approximate distance from receptor to site boundary
NSR 1	Residential properties on Henley Court	180 m
NSR 2	Residential properties on Rochester Gardens	75 m
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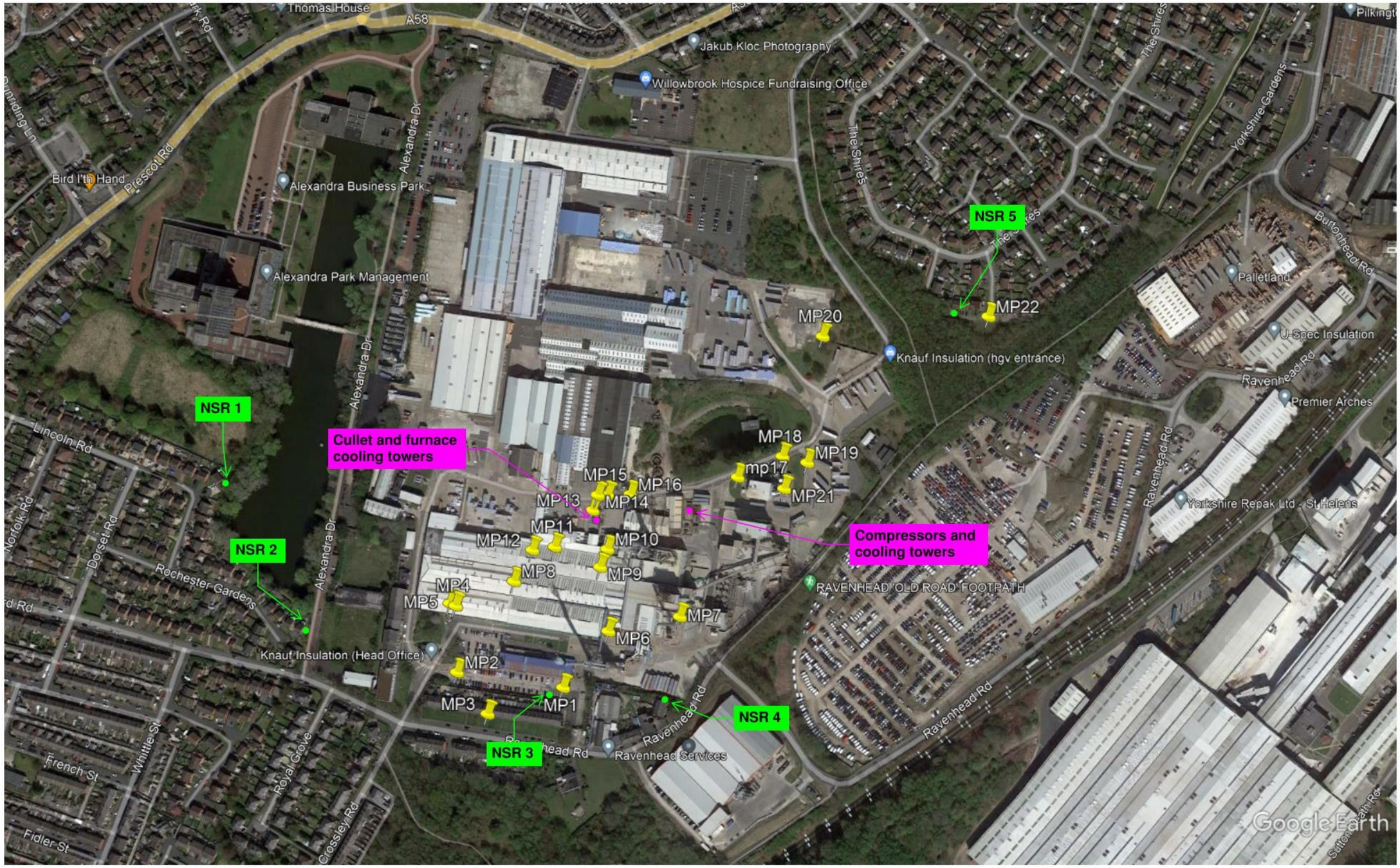
It should be noted that other receptors around the site may be subject to noise from the Site, however, these noise levels are not expected to change in future as a result of the proposed alterations to the Site. Therefore, they have not been considered within the noise impact assessment in this report.

Figure 2-1 - Noise sensitive receptors (NSR), measurement positions (MP) and noise sources



2.2 PREVIOUS ASSESSMENT LOCATIONS

The short-term measurement data collected in January 2024 was supported with data taken from the following 3rd party reports.

VEOLIA NOISE ASSESSMENT 2016

NVC Ltd (07 July 2016) Environmental Noise Assessment Relating to Proposed Glass Recycling Facility at Ravenhead Road St Helens Merseyside for Veolia Environmental Services (UK). Provided in full in Appendix A. Noise measurement locations used within this assessment are shown in Figure 2-2 below.

Figure 2-2 – Veolia 2016 noise impact assessment noise measurement locations

CARE HOME NOISE ASSESSMENT 2023

ENS Ltd (07 October 2023) Proposed New Care Home. Land to the East of Alexandra Drive, Former Ravenhead Social Club, St Helens, WA10 3UJ. Noise Impact Assessment for: ADG Architects. Provided in full in Appendix B.

Noise measurement locations used within this assessment are shown in Figure 2-3 below.

Figure 2-3 - Care Home noise impact assessment noise measurement locations

KNAUF NOISE ASSESSMENT 2002

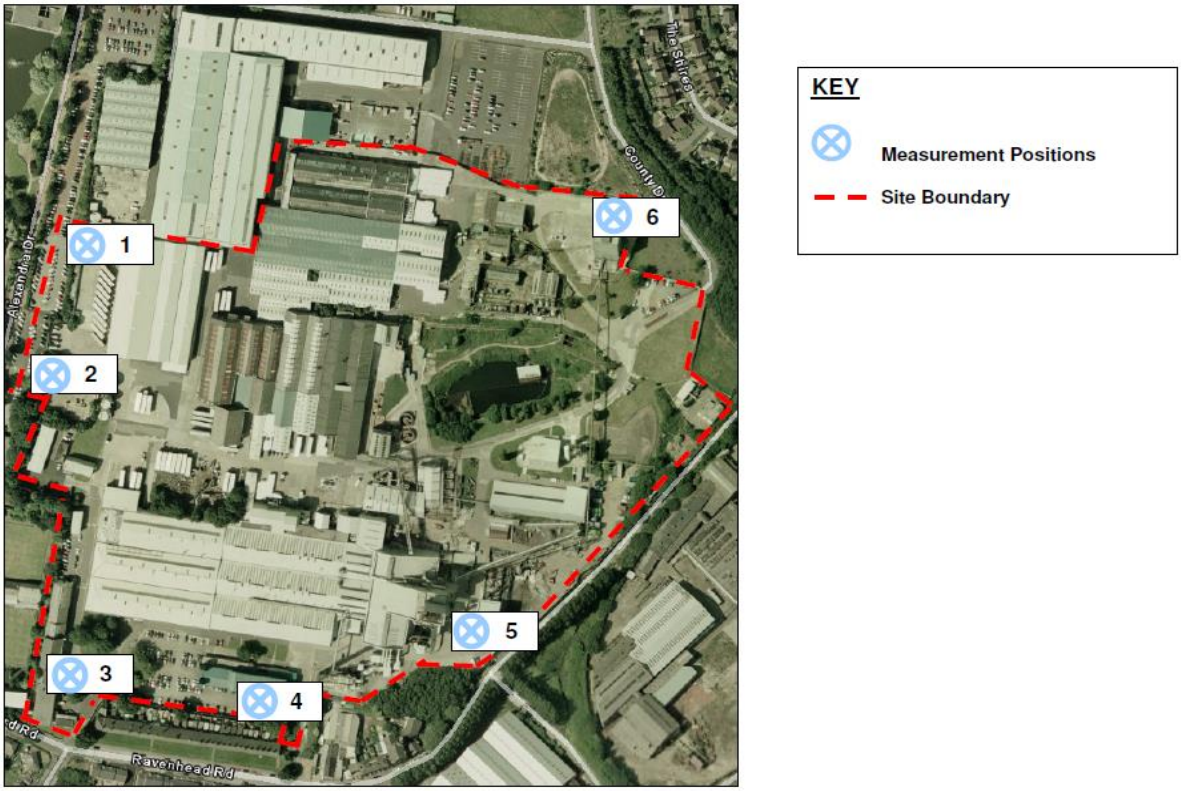
Diamond Environmental Ltd (January 2002) Environmental Noise Survey. KnaufAlcopor Ltd. Ravenhead. Provided in full in Appendix C.

Noise measurement locations used within this assessment are shown in

Figure 2-4 below.

Figure 2-4 – Knauf 2002 noise impact assessment noise measurement locations

APPENDIX A: NOISE MEASUREMENT POSITIONS



3 ASSESSMENT METHODOLOGY

3.1 BS 4142

BS 4142:2014+A1:2019[1] provides methods for rating and assessing sound arising from commercial sources, including external plant and on-site vehicle movements and unloading etc. at residential receptors. It uses a relative assessment approach; whereby the predicted commercial sound level (suitably penalised for acoustic character if appropriate) is compared with the prevailing background sound level.

A summary of the BS 4142 approach is set out as follows:

- Establish the specific sound level of the source(s).
- Measure the representative background sound level.
- Correct the specific sound level for on-time and interferences if necessary.
- Rate the specific sound level to account for distinguishing characteristics.
- Estimate the impact by subtracting the background sound level from the rating level.
- Consider the initial impact estimate in the context of the sound and its environs.

The representative background sound level should be established from data measured at the receptor locations.

The specific sound level is rated using the following penalties:

- Tonality up to 6 dB
- Impulsivity up to 9 dB
- Other sound characteristics up to 3 dB
- Intermittency 3 dB

An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level as described in Section 11 of BS 4142. The results of this comparison are assessed based on the following:

Typically, the greater the difference, the greater the magnitude of the impact.

- 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 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.

[1] BS 4142:2014 +A1:2019 Methods for rating and assessing industrial and commercial sound.

All pertinent contextual factors should then be considered e.g. the character and level of the prevailing noise climate.

3.2 ADOPTED METHODOLOGY

Typically, in an application for a permit variation the noise impact assessment would consider the existing noise at the Site and the variation together and compare against the background sound level (which excludes the noise from the Site) in accordance with BS 4142. However, due to time constraints the noise assessment in this report has deviated from this methodology.

BACKGROUND SOUND LEVELS

- A full background sound survey over all operational time periods and at all receptors was not carried out. Short term noise measurements were carried out at two of the closest receptors to the Site, during the day and at night. It was not possible to exclude the existing noise generated by the Site from the measurements. The short-term measurement data was supported with data taken from the following 3rd party reports:
  - NVC Ltd (07 July 2016) Environmental Noise Assessment Relating to Proposed Glass Recycling Facility at Ravenhead Road St Helens Merseyside for Veolia Environmental Services (UK). Provided in full in Appendix A.
  - ENS Ltd (07 October 2023) Proposed New Care Home. Land to the East of Alexandra Drive, Former Ravenhead Social Club, St Helens, WA10 3UJ. Noise Impact Assessment for: ADG Architects. Provided in full in Appendix B.
  - Diamond Environmental Ltd (January 2002) Environmental Noise Survey. KnaufAlcopor Ltd. Ravenhead. Provided in full in Appendix C.

EXISTING NOISE SOURCES

On-site measurements of existing noise sources were carried out in various locations, as shown in Figure 2-1. However, it was not possible to determine the individual contribution from all sources and therefore the specific noise level produced by the existing plant at surrounding receptors is not known. In addition, the noise produced by the existing plant is constant and so specific noise levels cannot be determined from the ambient noise level measurements undertaken at the nearby receptors.

NEW NOISE SOURCES

Octave band sound power data was provided by the equipment manufacturers for the proposed furnace and compressor cooling towers.

Broadband A-weighted sound power data was provided by the equipment manufacturers for the proposed cullet compressor cooling towers. Therefore, the sound power spectrum provided for the furnace cooling towers was used to approximate the spectral content of the proposed cullet cooling tower noise for use in the noise model calculations. The data used in the noise model for the various cooling towers is shown in Section 5.3.

Broadband A-weighted sound levels and an indicative unweighted octave band sound spectrum were provided for the compressors. The data used in the noise model for the compressors is shown in Section 5.3.

The new noise sources are assumed to operate constantly 24 hours per day. However, the expected operating duty for the cullet and furnace cooling towers is lower during the night; therefore, the specific noise level from the new noise sources is different during the 1-hour daytime and 15-minute night-time assessment time intervals.

NOISE MODELLING

A 3D noise model of the Site and the surrounding area has been produced using the CadnaA noise prediction software (version 2023), which implements the ISO 9613-2[2] calculation methodology to predict the effects on noise propagation of geometric spreading, topography, screening, meteorological conditions, and information provided regarding the sources of noise.

The noise model was used to predict the specific noise level (as per BS 4142) at the noise sensitive receptors identified previously, generated by the following new items of equipment:

- Two Furnace cooling towers;
- One Cullet cooling tower (formed of two cells);
- Four compressors (situated in pairs within GRP enclosures); and
- Three cooling towers associated with the compressors.

Details of the settings used in the model are summarised as follows:

- Default ground absorption: G=0.8 (soft ground) except for large expanses of hardstanding which were set to G=0 (hard ground).
- Three orders of reflection (buildings are reflective).
- ISO 9613 propagation model.
- Topography data was included in the model.
- Off-site receptor locations derived from satellite imagery.
- Building heights determined using Google Earth Pro.
- Receptors have heights of 4.0 m.
- Predicted specific sound levels are free-field.
- Sound power level data are based on information received from, as summarised below.
- Reverberant indoor sound levels within the compressor GRP enclosures have been calculated using empirical methods based on the data received from Knauf, and the results used as source data in the CadnaA model.

Directivity data for fans on the cooling towers was not available, and instead of modelling these as directional sources, spherical propagation has been assumed. This is likely to have overpredicted the sound levels from fans at receptors close to the Site.

It was not possible to model all structures and buildings on the Site. In addition, a substantial amount of screening to some receptors will be provided by stored finished goods (which are stacked outside) and large numbers of parked HGV trailers. Therefore, the specific sound levels calculated at receptors from the new plant are likely to be higher than would be expected in reality.

2

Screenshots of the noise model are provided below. The noise sources are shown in pink.

Figure 3-1 - CadnaA noise model screenshot - wide angle view from southwest

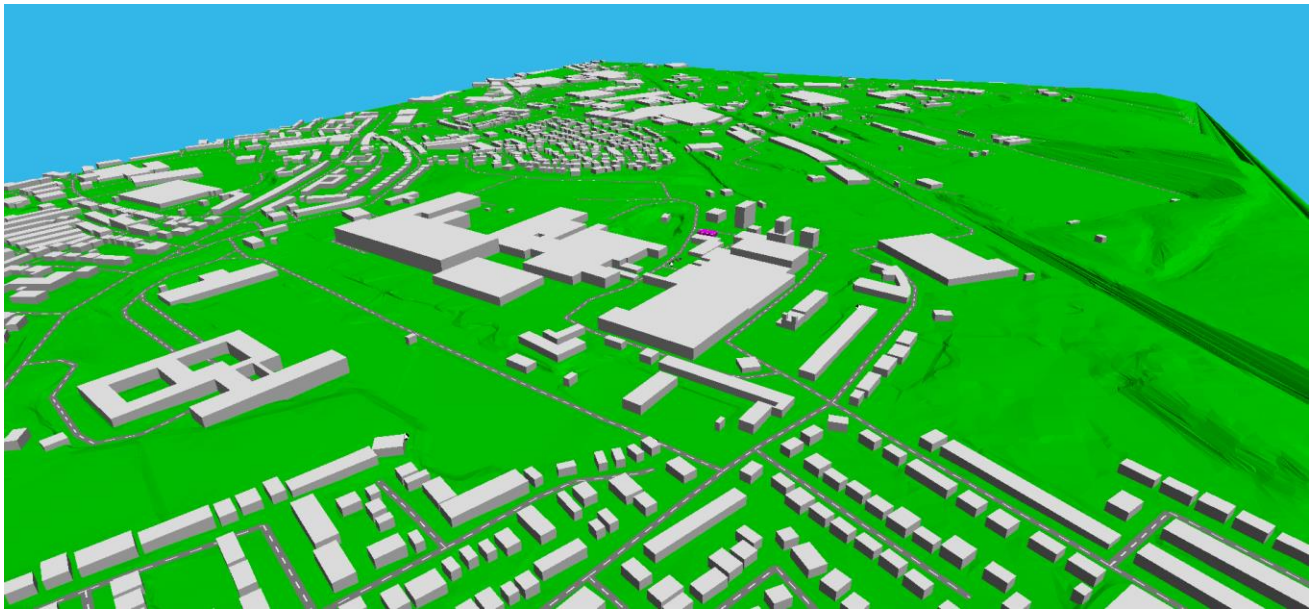
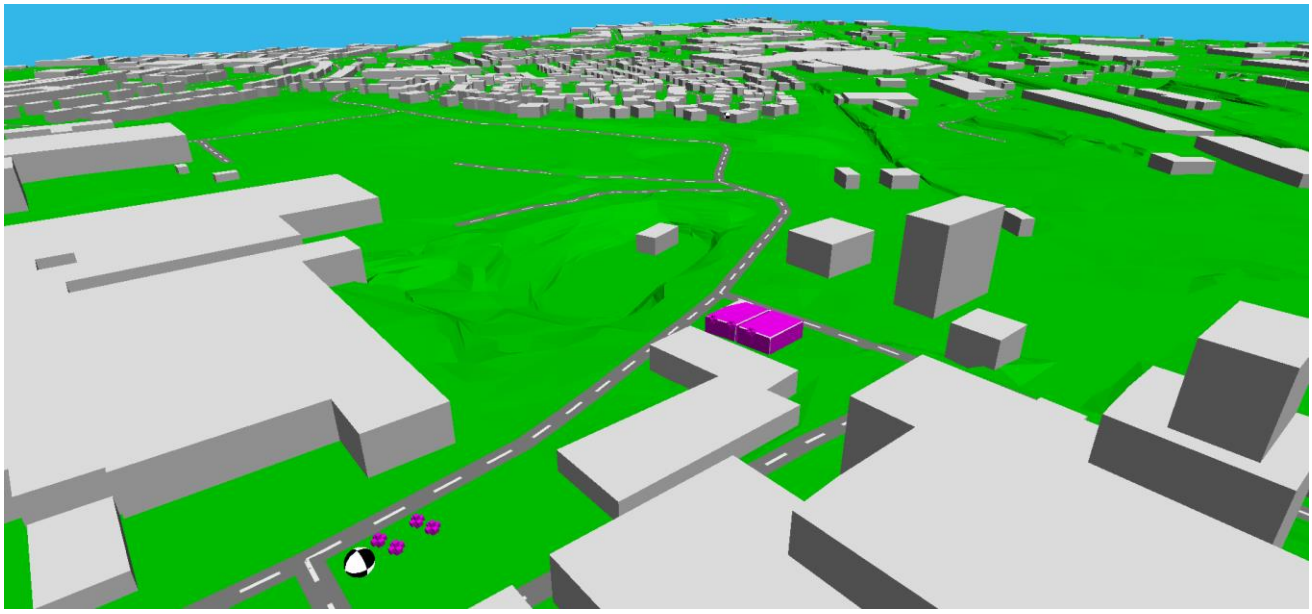


Figure 3-2 - CadnaA noise model screenshot – close view from southwest



Furnace cooling tower noise model sources

Cooling tower details are as follows:

- Manufacturer - Kelvion B.V.
- Model – Polacel CMC9-DHS-90.19-PS/3
- Number – 2
- Each cooling tower unit modelled as a point sound source set to the height of unit
- Stated cooling capacity - 989 kW
- Unit dimensions:
  - Length - 2.56 m
  - Width - 2.56 m
  - Height - 3.72 m
- Operating duty assumed to be as follows:
  - Daytime – 100%
  - Night-time – 66%
- Noise reduction measures adopted:
  - Lowered fan speed to reduce fan noise and extra fan blade added to compensate.
  - Noise attenuators added to the water basin to reduce noise from falling water.

The operating duties assumed in the noise impact assessment are worst-case as the cooling towers will only run at 100% duty during the hottest days of the year. Operation at 66% is more typical for the daytime and 50% at night.

Furnace cooling tower source sound levels used in the model were as follows:

Table 3-1 – Furnace cooling tower noise levels

Description	Octave band (Hz) dB_{lin}								dBA
	63	125	250	500	1k	2k	4k	8k	
100% duty									
Total sound power level for 2no. units (stated)	96.7	96.7	92.8	90.3	87.6	82.8	78.9	77.4	92.7
Total sound power level per unit (calculated)	93.7	93.7	89.8	87.3	84.6	79.8	75.9	74.4	89.7
66% duty									
Total sound power level for 2no. units (stated)	89.2	89.4	85.9	84.8	82.9	81.1	77.3	76.6	88.4
Total sound power level per unit (calculated)	86.2	86.4	82.9	81.8	79.9	78.1	74.3	73.6	85.4

Figure 3-3 - Kelvion Polacel cooling tower photograph

Cullet cooling tower noise model sources

Cooling tower details are as follows:

- Manufacturer - Truwater
- Model – ECX 1212F3-2GM
- Stated heat rejection capacity – 6,250,000 kcal/h / 7269 kW
- Number of cells – 2
- Each cooling tower cell modelled as a point sound source set to the height of unit
- Unit dimensions:
  - Length - 3.66 m
  - Width - 3.66 m
  - Height - 7.3 m
- Operating duty assumed to be as follows:
  - Daytime – 100%
  - Night-time – 60%
- Noise reduction measures adopted:
  - Low noise fan.
  - 'Noise mat' and acoustic louvre to air intake.

Cullet cooling tower source sound levels used in the model are shown in

Table 3-2. Total sound power levels are the sum of the sound power level for the fan and estimated sound power level for the air intake. The air intake was assumed to be 1 dB noisier than the fan without attenuation; and a 3 dB reduction was included to account for attenuation options added to the air intakes i.e. there is a 2 dB difference overall).

Table 3-2 – Cullet cooling tower noise levels (per cell)

Description	Sound level
100% duty	
Fan sound power level (stated)	94.2
Air intake sound power level (calculated)	96.2
Calculated total sound power level (used in model)	98.3
60% duty	
Fan sound power level (stated)	80.9
Air intake sound power level (calculated)	82.9
Calculated total sound power level (used in model)	85.0

Figure 3-4 – Truwater EC-S Series cooling tower photograph

Compressor cooling tower noise model sources

Cooling tower details are as follows:

- Manufacturer - Evapco
- Model – ESW4-12-46N12-SP
- Stated cooling capacity – 1967 kW
- Number – 2
- Each cooling tower modelled as a point sound source set to the height of unit
- It is assumed that all three cooling towers are operating simultaneously at 50% duty during the day and night-time.
- Unit dimensions:
  - Length - 3.65 m
  - Width - 3.61 m
  - Height - 7.46 m
- Noise reduction measures adopted:
  - Low noise fan (4-7 dB sound reduction).

Cooling tower source sound levels used in the model are shown in.

Table 3-3. A broadband sound level reduction of 4 dB was included in the model to account for a 'low noise fan'. This is a conservative assumption as the fans are stated to typically provide 4-7 dB sound reduction depending on specification.

Table 3-3 – Compressor cooling tower noise levels (per tower)

Description	Octave band (Hz) dB_{lin}								dBA
	63	125	250	500	1k	2k	4k	8k	
Total sound power level per unit at 50% duty (stated)	87	88	89	87	88	86	85	84	94
Total sound power level per unit at 50% duty inc. low noise fan (used in model)	83.7	84.7	85.7	83.7	84.7	82.7	81.7	80.7	90
Note – the sound spectrum stated by the manufacturer sums to 93.3 dBA overall not 94 dBA as stated. Therefore, the 4 dB sound reduction provided by the low noise fan has been accounted for by reducing each octave band by 3.3 dB – so that the overall dBA level used in the model is 90 dBA.									

Figure 3-5 – Evapco ESW4 cooling tower photograph

Compressor noise model sources

Compressor details are as follows:

- Manufacturer - Atlas Copco
- Model – Centrifugal Air Compressor ZH710+ 8/6.6kV
- Number – 4
- Compressors are located in pairs within GRP enclosures
- Each compressor enclosure was modelled as a 3D building with 'area' noise sources covering the roof, walls and ventilation louvres. The sound power level of the area noise sources was calculated by CadnaA based on the specified internal sound pressure level within the enclosure and the sound reduction of the element.
- Compressor dimensions:
  - Length - 5.27 m
  - Width - 2.23 m
  - Height - 2.23 m

- Compressor enclosure dimensions:
  - Length - 12.5 m
  - Width - 8.5 m
  - Height - 4.0 m
- Compressor enclosure details:
  - Walls constructed from GRP/18mm WBP ply core with encapsulated timber strengtheners and 25mm polyurethane insulation (sound reduction index of R_w 25 dB stated)
  - Roof constructed from GRP/12mm WBP ply core and joists encapsulated in GRP with 200mm rockwool insulation (sound reduction index of R_w 40 dB calculated)
  - 2 no. 1.2m x 1.6 m aluminium weather louvres in the walls (no sound reduction assumed).
  - 2 no. roof apertures approximately 2.1 m x 1.6 m within an aluminium penthouse louvre (no sound reduction assumed).

Cooling tower source sound levels used in the model are shown in .

Table 3-3. Sound power levels have been derived from the stated sound pressure levels and dimensions of the unit.

Table 3-4 – Compressor noise levels

Description	Sound level
Stated mean sound pressure level at 1 m from unit	72 dB L_{pA}
Calculated overall sound power level of each unit	92 dB L_{wA}
Calculated sound pressure level within enclosure (used within model)	82 dB L_{pA}

Table 3-5 – Compressor sound level spectrum

Description	Octave band (Hz) dB_{lin}						dBA
	125	250	500	1k	2k	4k	
Stated sound pressure level at 1 m for Atlas Copco 'ZH' type compressor (dB L_p)	73	65	64	60	63	68	71
Calculated sound power level of each compressor (dB L_w)	94	86	85	81	84	89	92
Calculated sound pressure level in compressor enclosure (used in model) (dB L_w)	86	77	75	71	74	79	82

Figure 3-6 – Atlas Copco compressor photograph

Figure 3-7 – GRP compressor enclosure photograph

4 EQUIPMENT AND METEOROLOGY

A noise survey carried out during the day on 11 January 2024 and early morning on 12 January 2024 at the positions shown in Figure 2-1.

During the attended noise survey weather conditions were noted to be dry with no rain and wind speeds below 5 m/s. Roads were moist although this is not expected to have affected the noise measurement results which were dominated by noise from the Site.

The sound measuring equipment used to undertake the survey is summarised in Table 4-1. The sound level meter was subject to field calibration tests prior to and on completion of the measurements using the calibrator identified below. No significant drift occurred with between the pre- and post-survey calibration checks which both registered at 94.0 dB L_{AF} on the sound level meter with no adjustment.

Table 4-1 - Sound level meter details

Equipment Description	Manufacturer & Type No.	Serial No.	Date of Last Calibration
Sound level meter	Rion NL52	00821130	13/10/2022
Pre-amplifier	Rion NH-25	21171	
Microphone	Rion UC-59	04130	
Calibrator	Larson Davis CAL200	9091	

5 NOISE MONITORING DATA AND PREDICTIONS

5.1 NOISE SURVEY RESULTS

The results of the noise survey carried out during the day on 11 January 2024 and early morning on 12 January 2024 are presented below.

Table 5-1 - Summary of daytime noise survey data

Location	Start time, hh:mm	Duration, hh:mm:ss	dB $L_{Aeq,T}$	dB $L_{A90,T}$
Measurements at receptor locations				
MP1	13:32	00:15:13	55	54
MP2	13:49	00:15:07	54	49
MP3	14:06	00:15:03	60	47
MP22	16:18	00:15:18	49	47
On-site measurements - external				
MP4	14:25:03	00:05:23	63	53
MP5	14:30:35	00:01:39	70	55
MP6	14:33:53	00:05:02	65	64
MP7	14:40:52	00:02:03	73	73
MP13	15:09:39	00:02:02	76	75
MP14	15:13:10	00:01:54	82	82
MP15	15:15:44	00:00:50	82	82
MP16	15:17:22	00:02:01	75	75
MP17	15:21:37	00:01:01	71	70
MP18	15:24:09	00:01:38	68	64
MP19	15:26:27	00:05:50	69	62
MP20	15:33:40	00:15:02	57	51
MP21	15:50:55	00:02:28	85	81
On-site measurements - internal				
MP8	14:48:57	00:02:02	76	75

MP9	14:52:14	00:02:06	74	74
MP10	14:54:55	00:02:02	86	86
MP11	14:57:29	00:01:15	90	90
MP12	15:02:34	00:02:02	77	74

Table 5-2 - Summary of night-time noise survey data

Location	Start time, hh:mm	Duration, hh:mm:ss	dB $L_{Aeq,T}$	dB $L_{A90,T}$
Measurements at receptor locations				
MP3	01:38:40	00:15:53	41	41
MP22	02:02:52	00:16:36	42	41

A description of the noise climate at each location is provided below.

Table 5-3 – Description of measurement positions

Location	Description
Measurements at receptor locations	
MP1	East of car park , approx. 1.5 m above ground and 1 m away from residential boundary wall. Constant plant noise from Knauf plant from east. Occasional noise from surrounding road network and aircraft. Occasional empty forklift trucks on Site and light vehicle movements.
MP2	West of car park at approx. 1.5 m above ground and 2 m from residential boundary wall. Low rumble audible, shutter is open for the factory at the west side. Occasional car movements in car park. Distant traffic from surrounding road network audible. Forklift truck movements audible from Knauf Site.
MP3	Daytime - Approx. 1.5 m above ground at least 8 m from front façade of houses. Resident opposite MP3 to the west side using power tools intermittently. Frequent car passes on residential road. Distant traffic from surrounding road network audible. Distant low freq. rumble from west/southwest. Night-time – Potentially tonal plant noise audible from east (louver /stack noise from Knauf Site). Occasional noise from Site works, intermittent, coming from Veolia direction to the southeast.
MP22	Daytime - Approx. 1.5 m above ground in free-field conditions. Whining distant plant noise from east. Occasional aircraft. Distant traffic from surrounding road network audible. Night-time - Distant plant noise audible from east. Low freq. rumble , barely perceptible, hard to pinpoint location. Occasional distant road traffic noise from surrounding road network audible at times.

On-site measurements - external	
MP4	1.5 m above ground and 1 m from factory wall, shutter closed. Shutter opens towards end of measurement.
MP5	1.5 m above ground and 1 m from factory wall, shutter open.
MP6	1.5 m above ground and at least 3 m away from reflective surfaces. Constant plant noise and low freq. rumble.
MP7	1.5 m above ground and 3 m away from plant.
MP13	1.5 m above ground and at least 3 m away from reflective surfaces.
MP14	1.5 m above ground 3 m from plant north side.
MP15	1.5 m above ground 1 m from water pumps
MP16	1.5 m above ground 5 m from plant (potentially condensers).
MP17	1.5 m above ground, west of BOC building, fan approx. 15 m away from existing compressor coolers at a height of approx.. 5 m
MP18	1.5 m above ground, approx. 10 m away from BOC plant, 2no. HGV pass-bys.
MP19	1.5 m above ground, 10 m from HGV hitching trailer. 5no. HGV pass-bys at approx. 3 m. Batch plant noise audible in background.
MP20	1.5 m above ground. Distant plant noise audible from BOC building direction to the south. Frequent HGV movements, entering and leaving Site at approx. 40m distance. Occasional forklift truck movements. Occasional aircraft.
MP21	1.5 m above ground, 5 m away from plant building. Plant seems to release steam periodically from stack at roof level
On-site measurements - internal	
MP8	Inside factory , from main entrance 10 m from plant near the furnace end towards the east.
MP9	Inside factory, towards east , 5 m from plant.
MP10	Inside factory, 5 m from HD line plant.
MP11	Inside factory, 3 m from plant.
MP12	Inside factory, 3 m east of plant.

5.2 BACKGROUND SOUND LEVELS

Background noise levels used in the assessment have been based on limited short-term measurements carried out in January 2024 and data from 3rd party noise impact assessments carried out in 2023, 2016 and 2002:

- NVC Ltd (07 July 2016) Environmental Noise Assessment Relating to Proposed Glass Recycling Facility at Ravenhead Road St Helens Merseyside for Veolia Environmental Services (UK). Provided in full in **Appendix A**.
- ENS Ltd (07 October 2023) Proposed New Care Home. Land to the East of Alexandra Drive, Former Ravenhead Social Club, St Helens, WA10 3UJ. Noise Impact Assessment for: ADG Architects. Provided in full in **Appendix B**.
- Diamond Environmental Ltd (January 2002) Environmental Noise Survey. KnaufAlcopor Ltd. Ravenhead. Provided in full in **Appendix C**.

The background sound levels are presented in the tables below.

Table 5-4 - Background noise levels and data sources for NSR 1 and 2

Closest noise sensitive receptor	Data source and background sound level dB L_{A90} reported	
	Care Home 2023 (MP1-2)	Knauf 2002 (Meas. 3)
Daytime	41-47	47
Night-time	37-40	37

Table 5-5 - Background noise levels and data sources for NSR 3 and 4

Closest noise sensitive receptor	Data source and background sound level dB L_{A90} reported		
	Knauf 2024 (MP1-3)	Veolia 2016 (P1-2)	Knauf 2002 (Meas. 5-6)
Daytime	47 - 54	47-49	54-57
Night-time	41		51-54

Table 5-6 - Background noise levels and data sources for NSR 5

Closest noise sensitive receptor	Data source and background sound level dB L_{A90} reported	
	Knauf 2024 (MP22)	Knauf 2002 (Meas. 10)
Daytime	47	51
Night-time	41	44

Based on the data sources above, the following representative background sound levels have been determined for the noise sensitive receptors:

Table 5-7 – Representative background sound levels at sensitive receptors

Noise sensitive receptor	Background sound level, dB L_{A90}	
	Daytime 07:00-23:00 hrs	Night-time 23:00-07:00 hrs
NSR 1	41	37
NSR 2	41	37
NSR 3	47	41
NSR 4	47	41
NSR 5	47	41

It is noted that the above background sound levels could include noise from the Site and that background sound levels could be lower without influence from the Site. However, to minimise the risk associated with this, the lowest recorded values have been selected for the assessment.

5.3 SPECIFIC NOISE LEVELS FROM NEW NOISE SOURCES

Specific sound levels from the Site operations have been calculated at the nearest sensitive receptors using the noise model. The results are presented in Table 5-8 below.

Table 5-8 - Noise model results

Noise sensitive receptor	Calculated specific noise level, dB $L_{Aeq,T}$	
	Daytime	Night-time
NSR 1	37	30
NSR 2	32	23
NSR 3	45	33
NSR 4	38	36
NSR 5	39	33

The characteristics of the noise from the new cooling towers and compressors is unknown, although they are unlikely to differ in character from the existing noise sources on Site. However, as a conservative approach, a 3 dB penalty has been applied to the specific noise level for *"characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment*", in accordance with BS 4142.

6 NOISE IMPACT ASSESSMENT

Specific sound levels from the identified new items of external plant have been calculated at the nearest sensitive receptors using the noise model. With reference to section 11 of BS 4142, an assessment of the impacts is presented in Table 6-1 and Table 6-2 below.

Table 6-1 - BS 4142 noise impact assessment - daytime

Sensitive receptor	Calculated specific noise level, dB $L_{Aeq,1hr}$	Acoustic feature correction (dB)	Calculated rating level (dB $L_{Ar,Tr}$)	Typical background sound level (dB L_{A90})	Excess over background sound level (dB)
NSR 1	37	+ 3	40	41	-1
NSR 2	32	+ 3	35	41	-7
NSR 3	45	+ 3	48	47	+1
NSR 4	38	+ 3	41	47	-6
NSR 5	39	+ 3	42	47	-5

Table 6-2 - BS 4142 noise impact assessment – night-time

Sensitive receptor	Calculated specific noise level, dB $L_{Aeq,15min}$	Acoustic feature correction (dB)	Calculated rating level (dB $L_{Ar,Tr}$)	Typical background sound level (dB L_{A90})	Excess over background sound level (dB)
NSR 1	30	+ 3	33	37	-5
NSR 2	23	+ 3	26	37	-11
NSR 3	33	+ 3	36	41	-5
NSR 4	36	+ 3	39	41	-2
NSR 5	33	+ 3	36	41	-5

The quantitative assessment above indicates the following impacts at the closest receptors:

Table 6-3 - Noise impact from new items of plant

Sensitive receptor	Excess of rating level over background sound level (dB)		Impact
	Daytime	Night-time	
NSR 1	-1	-5	Low impact
NSR 2	-7	-11	Low impact
NSR 3	+1	-5	Low, but potentially adverse impact during the day depending on context Low impact at night
NSR 4	-6	-2	Low impact
NSR 5	-5	-5	Low impact

Considering the calculated impacts above in the context of the receptor locations, adjacent to a large established industrial area, a low impact is expected. Local residents are unlikely to find the proposed new items of plant distinctive against the ambient noise climate in the area which historically is influenced by the Site and other nearby industrial operations.

It should be noted that the above assessment includes several worst-case assumptions and that impacts are likely to be lower in reality, these are as follows:

- Cooling towers have been modelled as a single point sources at the top of each unit. In reality a substantial proportion of the noise will radiate from the air intakes close to ground level and, therefore, noise levels at receptors will be lower than currently assumed due to screening.
- No directivity has been applied to the cooling tower noise sources which are currently assumed to radiate sound spherically. In reality, the fans at the top of the units will direct a substantial proportion of the sound energy vertically, reducing the amount of sound energy being emitted horizontally towards sensitive receptors.
- The assumed operating duties for the cooling towers are based on the worst-case conditions (i.e. high outdoor temperatures) and, in reality, they will operate at a lower duty for 95% of the time which will reduce noise emission levels compared to the predicted levels.
- For practical reasons the model was simplified and did not include all structures and buildings on the Site or stored finished goods (which are stacked outside, but are not static screens) and parked HGV trailers (also not static). Therefore, a substantial amount of additional screening to the nearby receptors is likely to be provided than can be accounted for in the model. If these additional screening elements are considered, noise levels from the new items of plant are further reduced.

7 NOISE CONTROL

The new items associated with the proposed changes to the site are expected to result in a low impact at nearby residential receptors. Therefore, further noise reduction measures are not necessary.

Noise reduction measures have been incorporated into the design and are considered the Best Available Techniques (BAT) for reducing noise from these sources, these measures are summarised as follows:

- Furnace cooling towers:
  - Lowered fan speed.
  - Noise attenuators added to the water basin to reduce noise from falling water.
- Cullet cooling towers:
  - Low noise fan.
  - ‘Noise mat’ and acoustic louvre to air intake.
- Compressor cooling towers:
  - Low noise fan.
  - Low duty operating modes
- Compressors located within GRP enclosures.

8 UNCERTAINTY

Due to time constraints, the background noise level surveys were undertaken over a shorter duration, and geographic spread, than is preferable, and with the Site operational and audible at the measurement sites. As such, statistical analysis of the measured $L_{A90,T}$ has not been undertaken due to the small sample size. The lowest measured levels during any monitoring period have been used to minimise the uncertainty from the shortened measurement durations and noise data from 3rd party reports has been considered in the assessment.

It is recognised that this approach is not ideal and an opportunity to obtain background data will be presented when the Site shuts down in Summer of 2024. Measurement of L_{90} data in the absence of process noise should be collected at this juncture

There is some uncertainty associated with equipment sound power data provided by equipment manufacturers. Few details regarding the measurement or calculation methodologies are provided and sound spectrum data for the cooling towers was based on on-site measurements of similar, but different, items of plant. Therefore, although tonality of the cooling tower noise sources is not expected, as currently installed equipment of the same general type are observed to produce a broadband sound. A 3 dB correction for acoustic features has been applied as a conservative approach.

The sound propagation between the Site and the receptors has been calculated using ISO 9613-2; this standard calculates the downwind sound level i.e. meteorological conditions favourable to sound propagation, allowing for a robust assessment.

Noise impact has only been assessed at the nearest sensitive receptors. Noise effects at other, more distant, receptors will even less due to their greater distance from the Site.

Due to time constraints, it was not possible to model all structures and buildings on the Site. In addition, a substantial amount of screening to some receptors will be provided by stored finished goods (which are stacked outside) and substantial numbers of parked HGV trailers. Therefore, the specific sound levels calculated at receptors from the new plant are higher than would be expected in reality.

Overall, it is considered that the uncertainties have been minimised as far as possible within the constraints of the information and conditions at the time of the surveys. Where uncertainties are regarded to be greater than ideal, the result is to increase the calculated noise impact to a level greater than is expected in practice.

9 CONCLUSION

Noise levels from the proposed new items of external plant associated with the permit variation have been calculated at the nearest noise-sensitive receptors using a 3D noise model.

The results of a noise survey undertaken on the Site and in the vicinity of the nearest noise sensitive receptors to the Site have been presented. In addition, noise measurement data from several 3rd party reports has been presented.

An assessment in accordance with BS 4142 has shown that the proposed operations are likely to have a low impact on the nearest noise sensitive receptors.

More appropriate background data should be collected when the Site shuts down fully in the Summer of 2024.

Appendix A

NVC LTD (07 JULY 2016) ENVIRONMENTAL NOISE ASSESSMENT RELATING TO PROPOSED GLASS RECYCLING FACILITY AT RAVENHEAD ROAD ST HELENS MERSEYSIDE FOR VEOLIA ENVIRONMENTAL SERVICES (UK).

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Environmental Noise Assessment
Relating to Proposed Glass Recycling Facility

At

Ravenhead Road
St Helens
Merseyside

for

Veolia Environmental Services (UK)

Consultant: D.R. Kettlewell MSc MIOA MAE I.Eng

Ref No.: R16.0305/3/DRK
Date: 7th July 2016

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Noise Impact Assessment

For Proposed
Glass Recycling Facility

Ravenhead Road
St Helens
Merseyside

For

Veolia Environmental Services (UK) plc

Consultant: D.R. Kettlewell MSc MIOA MAE I.Eng

Report prepared by:

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Ref. No. R16.0305/3/DRK

Report prepared by:
D R Kettlewell MSc MIOA MAE I.Eng – Principal Consultant:

Date: 7th July 2016

Summary

1. The assessment is being carried out as a result of a proposed planning application for the development of a Glass Recycling Facility ("GRF"). Veolia Environmental Services (UK) plc has requested information on the noise impact from the operation of the proposed GRF to ensure noise levels meet appropriate guidance standards for noise.

2. The site is located at the Knauf building situated just south of the main Knauf works off Ravenhead Road. The site has been subject to various uses including a sports hall and is currently used by Knauf as a storage facility.

3. Background sound measurements have been undertaken in the vicinity of nearest residential boundaries during a typical weekend daytime and night-time period to obtain the lowest likely representative background sound levels.

4. The most relevant noise criteria for this type of facility is BS4142: 2014 and where the `rating' noise level does not exceed the representative background sound level the standard concludes that there would be a low impact.

5. Measurements of typical GRF facilities in operation have enabled us to determine the noise contribution from the proposed site at the nearest residential properties for comparison with representative background measurements in accordance with BS4142: 2014.

Existing Noise Climate:

6. The results of the investigations into the existing noise climate have established the following:

Representative background sound levels based on the methodology and guidance found in BS4142: 2014 were established. The representative (most common value) for the background sound was shown to be between 47dB to 49dB LA90 during the proposed operating hours (in the vicinity of the nearest residential boundaries).

Typical Site Operational Noise Levels

7. Noise surveys have been undertaken at similar Glass Recycling Facilities operating in the UK during peak operating activities and the data obtained from these surveys have been used to inform the noise model. The recorded noise levels at similar sites in the UK, varied from 81dB(A) to 98dB(A) Leq at 1m in near field positions to main machine areas with reverberant levels from main processing plant between 90dB(A) and 93dB(A) Leq. Noise measurements taken of glass offloading are shown to be approximately 82dB(A) @ 10m with LAmax levels up to 96dB. Noise levels from proposed dust extraction system range from 80dB to 85dB LAeq at 1m.

Conclusions

8. The results of these measurements and detailed analysis have shown the following:

   (a) Predicted noise levels from the operation of the Glass Recycling Facility including mobile plant, processing plant, dust extraction and HGV movement show that the noise contribution would not exceed representative background sound levels and therefore unlikely to result in an adverse impact according to BS4142: 2014.

   (b) The noise level from site would also be between 8dB and 15dB below typical residual ambient sound levels.

   (c) The projected HGV movements from the glass recycling facility will be similar to those already received on site under the existing usage.

   (d) Additional HGV movement off would not result in any likely significant impact according to the advice provided within DMRB 2011.

   (e) Results of further calculations of `event' noise (i.e. reverse alarms) show that these would not be significant. Further advice is however provided below in terms of reverse alarms on mobile plant and site management controls to minimise noise radiating from the site.

   (f) The results of noise calculations of the highest likely noise levels generated during the construction phase of the development shows that this would not exceed unreasonable noise levels according to BS5228. This phase of the development is a temporary noise situation and best practice would be applied during the construction works to control noise.

9. Taking into account the operational times of the GRF activities, access and route arrangements, noise control measures proposed, ambient and background sound levels, predicted noise levels and the relative position of the nearest residential properties it is concluded that residential amenity would be adequately protected. This opinion assumes that mitigation measures similar to that proposed are implemented.

CONTENTS

1.0 INTRODUCTION

1.1 At the request of Veolia Environmental Services (UK) plc, Noise & Vibration Consultants Ltd ("NVC") was commissioned to assess the noise impact of the proposed Glass Recycling Facility ("GRF") located at an existing industrial building located just south of Ravenhead Road, St Helens in Merseyside.

1.2 The assessment is being carried out to guide and support the planning application for the development of the site. The Local Planning Authority will require information on the noise levels from the operation of the site so that the impact at nearest residential properties can be determined.

1.3 The development includes for a GRF to be located within an existing brick built building currently used by Knauf as a storage facility.

1.4 Noise levels have been considered and assessed during the operational phase of the proposed development with consideration also afforded to the construction period. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.

Sources of Information

1.5 Information used in this assessment has been obtained from the following sources:

- Ordnance Survey maps of the local area;
- Information relating to the general layout of the proposed site was provided by Veolia Environmental Services (UK) plc (drg.nos. A7241-G-BI 00100 to 00108 Rev3.);
- BS5228: `Code of practice for noise and vibration control on construction and open sites': 2009;
- Noise Policy Statement for England (NPSE) – March 2010;
- Department for Communities and Local Government: National Planning Policy Framework: March 2012;
- Former Planning Policy Guidance ("PPG") 24, `Planning and Noise' – 1994;
- British Standards BS4142: 2014, BS7445: 2003 & BS8233: 2014;
- Department of Transport `Calculation of Road Traffic Noise': 1988; and
- Design Manual for Roads and Bridges, Volume 11, Environmental Assessment: 2008 & 2011.

Assessment Methodology

1.6 The aim of the survey and assessment was to provide information and advice on the following:

- identify plant equipment and its location;
- identify the nearest noise sensitive receptors or sites;
- determine likely source noise levels;
- provide information on existing background sound levels and specific site noise levels at the nearest sensitive receptors;

- provide predictions of resultant noise levels at the nearest sensitive receptors; and
- advice on any appropriate amelioration measures to reduce noise for the proposed development by applying Best Available Techniques.

1.7 Where new noise sources have been identified as being significant or has the potential of causing a significant increase in existing noise levels, we would provide (where practicable) recommendations for noise amelioration using Best Available Techniques (BAT).

1.8 Appendix 1 provides details of technical terms within the chapter, for ease of reference. There is also a chart showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.

1.9 The potential noise generated by the above plant is considered in the context of the existing background noise at the site, which is generally influenced by local road traffic and occasional train movement.

1.10 This study benefits from a number of noise surveys carried out at other Glass Treatment Facilities operating in the UK and a background survey and inspection at the proposed site carried out on Friday 4th to Monday 7th March 2016.

2.0 SITE DESCRIPTION

2.1 Location

2.1.1 The proposed development site is located on land off Ravenhead Road in St Helens in Merseyside. The development would be housed within the existing Alexandra Warehouse, which is currently used by Knauf as a storage facility.

2.1.2 The site location is adjacent to an existing railway line, which runs northeast to southwest along the south eastern boundary of the site.

2.1.3 The existing building consists of a single storey four bay brick built warehouse type building with a steel `A' frame roof support structure with inner layer of asbestos cladding and externally clad with profile single sheet cladding above containing single skin skylights.

2.1.4 The offloading area of the building would be constructed with internal concrete push walls to the lower sections. Vehicular access is via roller shutter doors to the front façade (i.e. eastern façade), which face towards the railway line (i.e. opposite direction to receptors off Ravenhead Road).

2.2 Site Access

2.2.1 The site is accessed via Ravenhead Road which is east of the Site, which connects to Burtonhead Road via the existing industrial estate. This provides access to St Helens Linkway (A570) and Junction 7 of the M62 which lies approximately 2 miles to the south of the premises. The HGV movement to and from site would be via the Knauf site access (i.e. left out of site and across Ravenhead Road and into the Knauf site). Access from the Knauf factory is via the north onto the A58 Prescot Road, which is the current access used by HGVs travelling to and from the existing storage facility where a similar number of HGVs travel on a daily basis.

2.3 Site Operation Noise Sources

2.3.1 The GRF would be utilised to bulk municipal solid waste and commercial and industrial wastes collected from local householders and businesses and would comprise the following features:

- Glass Recycling Facility with associated glass treatment equipment including bulking bays for glass collected from householders, recycling centres, commercial and industrial customers;
- Dust Extraction Plant and associated fans, ductwork, filter and exhaust stack;
- Weighbridge and weighbridge office;
- Administration facilities
- Staff, visitors and drivers car parking;
- Hardstanding area for vehicle turning and manoeuvring;
- Sub-station
- Vehicle wash bay and bunded fuel tanks;
- Sprinkler Tank and associated pump house; and
- HGV overnight parking for 7 vehicles.

2.4 Operating Hours

2.4.1 The site is proposed to operate from 0600-2200 Monday to Sundays.

2.4.2 There is no proposed external offloading or loading of glass external to GRF building. All offloading would take place in the bay at the south western end of the warehouse and loading of finished product at the bay located at the north eastern end.

2.4.3 Loading doors into the warehouse are located on the south eastern façade of the warehouse with one roller shutter door on each bay.

2.4.4 Doors into the GRF building would be open as required to allow entry and exit of HGVs during daytime and closed for all other periods except for emergency or maintenance.

2.5 Noise Sources on Site

2.5.1 In terms of noise generated by the proposed development, we have considered the following activities:

(i) Noise from the offloading of glass into the south western end bay of the building with grab within the building to load the hopper and conveyor system.
(ii) Noise from the glass processing operation;
(iii) Noise from the dust extraction system; and
(iv) Noise from the movement of HGVs on site and the cumulative effect of HGVs and GRF in operation.

2.6 Materials Flow

2.6.1 Glass would enter the building at the southwestern end bay via offloading bay. The glass would be bulked into bat areas within the building and loaded into a hopper via a front loader, which would then be conveyed into the processing plant for screening and sorting. The material that is sorted would be conveyed into the various bulking bays further along the building ready for loading onto bulker HGVs for onward transfer.

2.7 Nearest Receptors

2.7.1 The nearest residential property is located east and north of the site off Ravenhead Road and the nearest sensitive receptors at the following approximate distance from the GRF building:

Receptor Location	Approx. Distance from GRF building (m)
1. Ravenhead Road (north of site)	25m
2. Ravenhead Road (west of site)	65m
3. Ravenhead Road (northwest)	95m

2.7.2 Figures 1 and 2 attached, shows the layout of the site and the site position relative to the nearest residential areas. The Knauf industrial site is located just north of the site and there are some smaller businesses units neighbouring the residential properties adjacent to the Ravenhead Road receptors north of the site.

3.0 NOISE CRITERIA

3.1 Introduction

3.1.1 Noise has been defined as sound that is unwanted by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

General Planning Guidance

The National Planning Policy Framework (NPPF)

3.1.2 Chapter 11 of the National Planning Policy Framework (NPPF) is concerned with the conservation and enhancement of the natural environment. It indicates at paragraph 109 that: *"…the planning system should contribute to and enhance the natural environment by:*

- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"*

3.1.3 Paragraph 123 refers directly to the issue of noise and 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; and*
- *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."*

3.1.4 The Noise Policy Statement for England (NPSE) was published in March 2010. It specifies the following long-term vision and aims:

"*Noise Policy Vision: Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*

This long term vision is supported by the following aims:

Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

3.1.5 The NPSE introduced three concepts to the assessment of noise, as follows:

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

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

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

3.1.6 The above categories are undefined in terms of noise levels and for the SOAEL the NPSE indicates that the noise level will vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research is therefore required to establish what may represent a SOAEL. It is acknowledged in the NPSE that not stating specific SOAEL levels provides policy flexibility until there is further evidence and guidance.

3.1.7 The following commentary is given on the representation of NOEL and LOAEL in relation to existing British Standards/ International guidelines:

NOEL – Inaudibility
LOAEL – The guideline values for community noise in specific environments as set out in table 1 of the WHO `Guidelines for Community Noise': 1999 and in tables 5 and 6 of BS8233: 1999 - `Sound insulation and noise reduction for buildings - Code of Practice'.

- The NPSE indicates how the LOAEL and SOAEL relate to the three aims listed above. The first aim of NPSE requires that:

"significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development."

3.1.8 The second aim of the NPSE (mitigating and minimising adverse impacts on health and quality of life) refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

3.1.9 The third aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development.

3.1.10 The Government is undertaking a review of technical guidance but currently there is no agreed methodology for noise to accompany the NPPF guidance.

Planning Practice Guidance

3.1.11 On March 6th 2014 the Government published the National Planning Practice Guidance ("NPPG") on noise, which provides further information in respect of new developments which may be sensitive to the prevailing noise environment.

3.1.12 The NPPG refers to the NPPF and NPSE documents and under the heading `How to determine the noise impact?' it states:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

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

3.1.13 The NPPG includes a table summarising the noise exposure hierarchy, based on the likely average response. Under the heading of 'perception' the '*noticeable and not intrusive*' assessment of noise is defined as '*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 there is a perceived change in the quality of life*'. The increasing effect level under these conditions is deemed to be '*no observed adverse effect*' and '*no specific measures are required*'.

3.1.14 The NPPG explains this by stating:
"*At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect as long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.*
As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise)."

Relevant Guidance & Standards – Fixed Industrial Noise

BS 4142: 2014 `Methods for rating and assessing industrial and commercial sound'

3.1.15 BS 4142: 2014 `Methods for rating and assessing industrial and commercial sound' is based on the measurement of background sound using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The differential between the two measurements; once any corrections have been applied for source noise tonality, distinct impulses etc. (i.e. the `rating' level); determines the likelihood of complaints.

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) 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.

3.1.16 In terms of establishing the rating level, corrections for the noise character has to be taken into consideration. These include the following factors:

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB 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 3 dB can be applied.

NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

3.1.17 The assessment of noise from the fixed and mobile plant at the nearest receptors is considered and our expert opinion is provided below:

a) In terms of tonality, the plant that is likely to contain this type of characteristic would be mobile plant and `beeper' type reverse alarms. The mobile plant working on site would be fitted with broadband type noise reverse alarms. Taking into account the noise mitigation measures proposed, resultant noise contribution from these noise sources relative to existing residual noise we would not expect tonal noise to be audible at the nearest receptor and would not expect tonal penalty correction to be applicable.

b) In terms of impulsivity characteristics this would occur within the GRF building. Taking into consideration the predicted noise contribution at nearest receptors, LAmax levels and residual noise from road traffic during daytime periods we would expect this characteristic to be occasionally just perceptible during loading/unloading and a +3dB penalty would apply.

c) In terms of intermittency the only likely intermittent activity on site is likely to be HGV movements. Taking into account the position and route of HGVs onto and off site and the predicted noise contribution relative to the residual noise levels we would not anticipate that the intermittency is likely to be distinctive during the daytime at nearest sensitive receptors (due to ambient noise levels compared with noise contribution).

3.1.18 In conclusion, we would add +3dB to the calculated noise contribution for impulse noise although with the proposed mitigation measures we do not expect this to be perceptible.

BS8233:2014 `Guidance on sound insulation and noise reduction for buildings'

3.1.19 The British Standard BS8233 provides additional guidance on noise levels within buildings. These are based on the WHO recommendations and the criteria given in BS8233 for unoccupied spaces within residential properties.

3.1.20 The guidance provided in section 7.7 of BS8233 provides recommended internal ambient noise levels for resting, dining and sleeping within residential dwellings. Table 3.1 provides detail of the levels given in the standard.

Table 3.1: BS8233: 2014 Indoor ambient noise levels for dwellings

Activity	***Location***	***07:00 to 23:00***	***23:00 to 07:00***
Resting	Living Room	35 dB $L_{Aeq,16hours}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hours}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$

3.1.21 For a partially open window the standard refers to a reduction of approximately 10-15dB. This would therefore indicate a noise level outside the window of approximately 45-50dB $L_{Aeq,16hours}$ for living rooms during daytime and 40-45dB $L_{Aeq,8\ hours}$ during night-time outside bedrooms.

World Health Organisation (WHO) Guidelines for Community Noise: April 1999

3.1.22 This document provides further updated information on noise and its effects on the community. The document for noise `*In Dwellings'* states "*The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events. Lower noise levels may be disturbing depending upon the nature of the noise source."*

3.1.23 The WHO document also states "*To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB L_{Aeq}. To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development."*

3.2 Survey Techniques

3.2.1 The background sound survey has been carried out in accordance with BS4142: 2014 and monitoring conditions in accordance with advice given in BS7445-1:2003 `Description and measurement of environmental noise'.

3.3 Representative Background Sound Level

3.3.1 According to BS4142: 2014 where the `rating' level does not exceed the measured background sound level the impact would be low. In terms of what is defined as the background sound the standard states the following:

8.1.1 Ensure that the measurement time interval is sufficient to obtain a representative value of the background sound level for the period of interest. This should comprise continuous measurements of normally not less than 15 min intervals, which can be contiguous or disaggregated.

8.1.2 The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed.

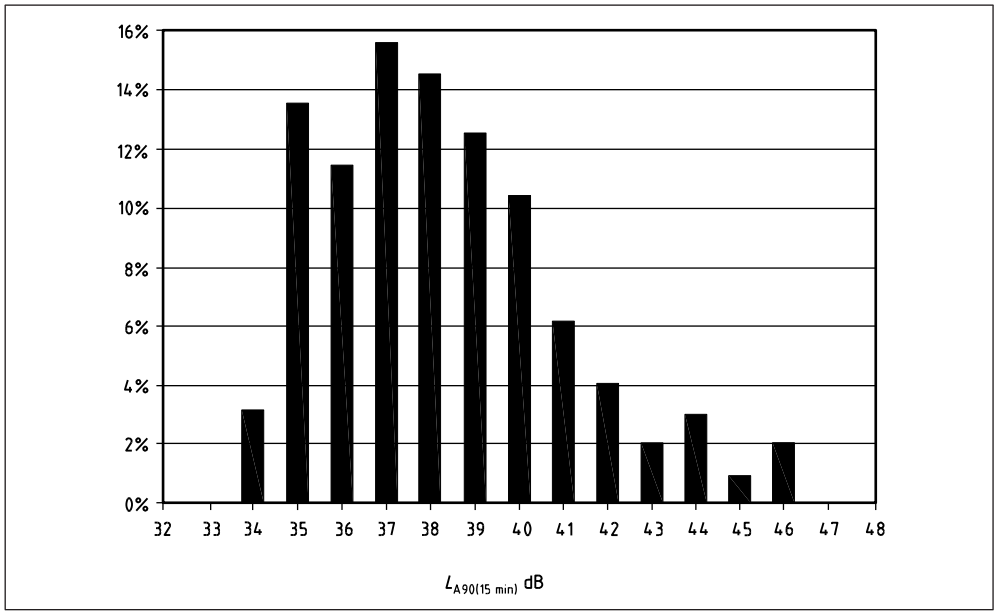
NOTE 1 To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.

NOTE 2 The mean average of a series of measured background sound levels is not numerically equal to the overall period background sound level that would otherwise be obtained by a single measurement spanning individual measurement periods.

NOTE 3 Background sound can be significantly affected by meteorological conditions, particularly where the main sources of residual sound are remote from the assessment location(s).

NOTE 4 Figure 4 shows an example of a statistical analysis of the results of all the measurement periods in order to determine a background sound level. For this distribution of the data an LA90 (15min) of 37 dB was considered to be representative and in this instance was also the most commonly occurring value.

Figure 4 Example of a statistical analysis to determine the background sound level



3.3.2 To establish the background sound level the standard requires the determination of a representative value which is not deemed to be the lowest but under statistical analysis the most common when measured over a representative time period.

3.4 Guidance on Construction Noise

BS 5228: 2009 `Code of practice for noise and vibration control on construction and open sites'

3.4.1 BS 5228 refers to *"the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on, construction and open sites. It recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners."*

3.4.2 Part 1 deals with noise in terms of background legislation and gives recommendations for basic methods of noise control relating to construction and open sites where significant noise levels may be generated. The guidance is aimed at giving advice on achieving `best practice' in controlling noise and vibration from construction and open sites. There is an example of noise limits given in Annex E, which sets out cut-off limits between 65dB(A) and 75dB(A) or 5dB(A) above the ambient noise, whichever is the greater. Part 2 of BS 5228 deals specifically with vibration control and provides the legislative background to the control of vibration and recommendations for controlling vibration at source and management controls (e.g. liaison with communities, supervision, preparation and choice of plant etc.)

3.5 Road Traffic Noise Assessment

3.5.1 Access to the application site is from Ravenhead Road, which connects to Burtonhead Road.

3.5.2 In order to assess the likelihood of any impact upon existing residential properties from on-site traffic noise, noise calculations have been undertaken using BS5228: 2009 `haul road' methodology and traffic flow information. The use of CRTN methodology is used for the impact of `off-site' road traffic.

3.5.3 The Design Manual for Roads and Bridges (DMRB) – May 2008 (Part 2 GD 01/08) provides information and advice principally for Trunk Road works. The guidance states, "*It may also be applicable in part to other roads with similar characteristics. Where it is used for local road schemes, it is for the local highway authority to decide on the extent to which the documents in the manual are appropriate in any particular situation."* Volume 11, Section 3, Part 7 (HD 213/11): November 2011 provides advice on noise and vibration. The procedure for assessing noise impacts advises the use of a LA_{10} measurement index based on an 18 hour time period (i.e. 0600 to 2400 hours). Further assessment of the impact would be required where changes of 1dB(A) or more are expected in the short-term and changes of 3dB(A) in the long term. Section 3.37 provides an example of the magnitude of impact for different changes in noise level for the short-term and long-term situation. Tables 3.1 and 3.2 (within Part 7 of DMRB) is provided below, represented as Table 3.2 and 3.3:

Table 3.2: Example of Magnitude of Impact for Changes in Road Traffic Noise in the short term

Noise Change, $L_{A10,18hour}$	Magnitude of Impact
0	No Change
0.1-0.9	Negligible
1-2.9	Minor
3-4.9	Moderate
5+	Major

Table 3.3: Example of Magnitude of Impact for Changes in Road Traffic Noise in the long term

Noise Change, $L_{A10,18hour}$	Magnitude of Impact
0	No Change
1.0-2.9	Negligible
3.0-4.9	Minor
5-9.9	Moderate
10+	Major

3.6 Relevant Noise Criteria

3.6.1 Standards and guidance that would be appropriate for this type of activity would include the following:

a) Site operational noise including on site mobile plant, processing plant and HGV movements from an overall level perspective using BS4142: 2014 and LAmax event noise compared with baseline levels. Refer to section 4.0 for the assessment of noise criteria relative to established background sound levels.

b) For consideration of construction noise this would include BS5228: 2009 `Code of practice for noise and vibration control on construction and open sites'.

Survey Techniques

3.6.2 The background noise survey has been carried out in accordance with BS4142: 2014.

4.0 BASELINE SOUND SURVEY METHOLDOGY & RESULTS

4.1 Baseline Sound Survey

4.1.1 An environmental sound survey was carried out in the vicinity of nearest residential areas to the site to determine typical baseline sound levels.

4.1.2 The sound monitoring exercise was carried out over a typical weekend period during appropriate weather conditions as defined by BS4142: 2014.

4.1.3 See attached plan of site (Figure 1) which shows the location of the static sound measurement position.

4.2 Instrumentation

4.2.1 For sound measurements in the vicinity of nearest sensitive property boundary positions to the site, the following instrumentation was used:

Table 4.1: Detail of Noise Instrumentation

Manufacturer	***Description***	***Type***	***Calibration Due date***	***Serial No.***
Cirrus	Integrating sound level meter	831A	July 2016	B15046FF
Cirrus	Real Time Analyser	171A	January 2017	G061253
Cirrus	Acoustic Calibrator	CR: 531A	June 2016	31692

4.2.2 The following set-up parameters were used on the sound level meters during noise measurement:

Time Weighting: Fast
Frequency Weighting: `A'
Measurement Period: 1 hour

4.3 Calibration

4.3.1 The noise meters were calibrated with the electronic calibrator prior to commencement and on completion of the survey. No significant drift in calibration was observed.

4.4 Survey Dates and Personnel

4.4.1 Sound pressure levels were taken at two fixed positions on land adjacent to nearest properties to establish typical background sound data during a weekend period. The survey was set up on Friday 4th and collected on Monday 7th March 2016 by Mr D. R. Kettlewell of Noise & Vibration Consultants Ltd.

4.4.2 Measurements of background sound were recorded over approximately 71 hours, at the positions shown on Figure 1. Data logging of L_{Aeq}, L_{A10}, L_{A90} and L_{Amax} were recorded at 1 hour intervals.

4.4.3 Observations at site indicated that the noise climate is dominated by local road traffic noise and a low level distant `hum' from local industrial sources.

4.5 Meteorological Conditions

4.5.1 Weather conditions were recorded during the period of the survey and are detailed below:

Friday 4th – Saturday 5th March 2016

4.5.2 Mostly dry, occasional light rain between 1000-1320 hours, variable cloud cover and a light variable wind (2-3m/sec). Temperature 3-6deg C. The night-time period was dry with variable cloud and a light variable wind (2-3m/s). Temperature 3-5deg C.

Saturday 5th – Sunday 6th March 2016

4.5.3 The daytime monitoring period remained dry with variable cloud and a light north-north-west to northwest wind (2-3m/sec). Temperature ranging from 3-7deg C. Overnight continued to be dry, mostly clear and a light variable wind (1-2m/s) and temperature 2-4degC.

Sunday 6th – Monday 7th March

4.5.4 Dry with variable cloud and a light variable wind (2-3m/sec). Temperature around 2 to 6deg C. The night time period was mostly dry, mostly clear with a light north-westerly to northerly wind (2-3m/s), temperature 2-3degC.

4.5.5 The above climatic conditions were suitable for monitoring environmental noise levels in accordance with advice given in BS4142: 2014.

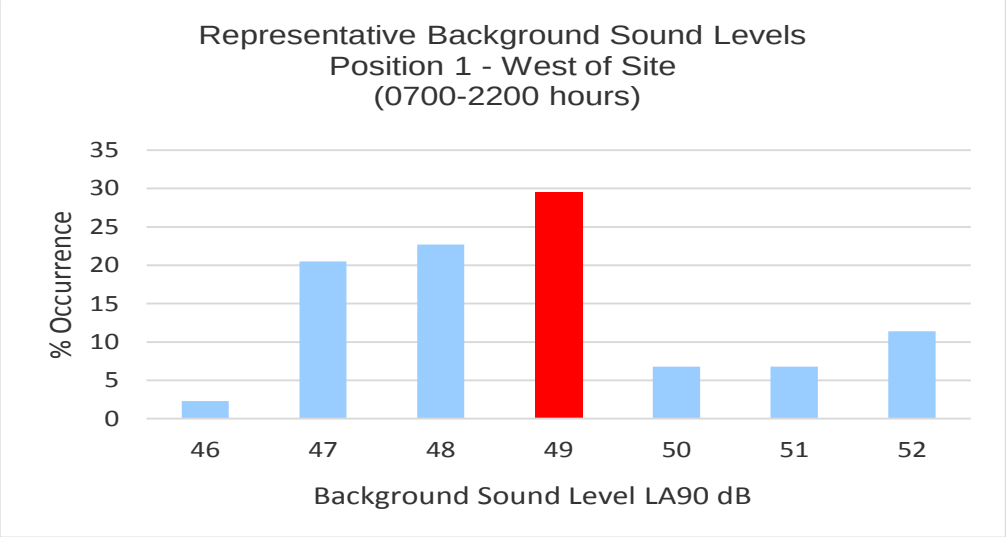
4.6 Noise Survey Results

4.6.1 The results of background sound analysis taken at the fixed monitoring position is presented below in Table 4.2 and detailed measurements in Appendix 2.

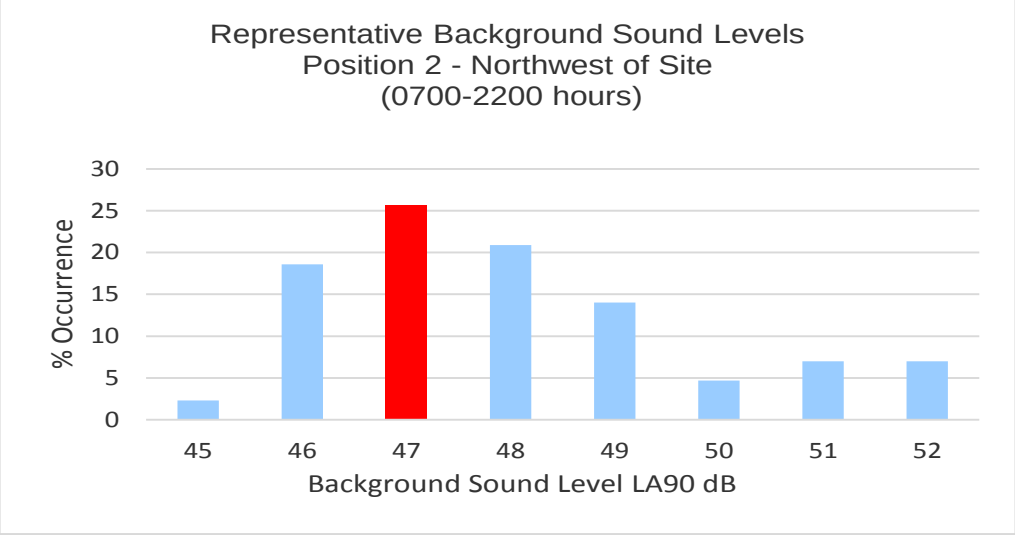
Baseline Levels:

4.6.2 The background sound levels have been analysed for the monitoring period and the most commonplace values determined for establishing the `representative' background sound level. These are represented below in Graphs 4.1 to 4.2.

Graph 4.1: Representative Background Noise Levels - West of Site



Graph 4.2: Representative Background Sound Levels – North west of Site



4.6.3 The above results show that in accordance with BS4142: 2014 the established representative background sound levels are as follows:

Table 4.2: Representative Background Sound Levels

Position	Time Period	Average Residual Levels LAeq dB	Representative background sound Level LA90 dB
1.West of Site	0600-0700 0700-2200	52 51	48 49
2.Northeast to northwest of Site	0600-0700 0700-2200	52 52	48 47

Established Noise Criteria

4.6.4 In accordance with BS4142: 2014 using the above determined representative background sound levels and noise character analysis undertaken, the following minimum criteria would be required at the nearest sensitive receptor:

Table 4.3: Noise limit criteria

Time Period	Location	Representative background sound Level LA90 dB	Noise character correction assumed dB(A)	Noise limit Criteria allowing for noise character LAeq dB
0600-0700	W	48	+3	45
0700-2200		49	+3	46
0600-0700	NE to NW	48	+3	45
0700-2200		47	+3	44

4.7 Glass Processing Noise Measurements

4.7.1 Noise surveys have been undertaken at similar Glass Recycling Facilities operating in the UK during peak operating activities and the data obtained from these surveys have been used to inform the noise model.

4.7.2 The recorded noise levels at similar sites in the UK, varied from 81dB(A) to 98dB(A) Leq at 1m in near field positions to main machine areas with reverberant levels from main processing plant between 90dB(A) and 93dB(A) Leq.

4.7.3 Noise measurements taken of glass offloading are shown to be approximately 82dB(A) @ 10m with LAmax levels up to 96dB.

4.7.4 Noise from the operation of the dust extraction system for external plant would be between 80dB to 85dB LAeq @ 1m as advised by the manufacturer. Plant is located external adjacent to the south eastern façade towards the centre of the building.

4.8 Vibration

4.8.1 Ground-borne vibration has not been considered in this assessment as the separation distance between the nearest residential receptor and the site is beyond the point at which any vibration would be perceptible.

5.0 NOISE LEVEL PREDICTIONS

5.1 Introduction

5.1.1 Noise has been defined as sound, which is undesired by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

5.1.2 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.

5.1.3 In general, the level of noise in the local environs that arises from a development site will depend on a number of factors. The more significant of which are:-

(a) The sound power levels (SWL's) of the plant or equipment used on site.
(b) The periods of operation of the plant on site.
(c) The distance between the source noise and the receiving position.
(d) The presence or absence of screening effects due to barriers, or ground absorption.
(e) Any reflection effects due to the facades of buildings etc.
(f) Noise character

5.2 Prediction Methodology

Construction Noise

5.2.1 The prediction method used for the construction phase of the development is based on that outlined in British Standard (BS) 5228:2009 `Code of practice for noise control on construction and open sites'.

Operational Noise

5.2.2 For site operational noise we have used ISO9613-2 prediction modelling and CadnaA software for producing noise maps of the highest likely generated noise.

5.2.3 The methodology takes into account source position, distance, duration of activity in relation to site activities and the nearest sensitive receptors. The noise modelling assumes that all plant is operating. The prediction calculations therefore provide an indication of the highest likely noise level.

5.2.4 Predictions for mobile plant movements on site have also been based on the calculation methodology provided under BS5228. We have used CadnaA software prediction modelling for the calculations (refer to Appendix 4 for noise map). The noise model uses empirical data and reasonable settings to give an accurate prediction of noise from site.

5.3 Plant Complement

5.3.1 A list of plant sound pressure levels from which the noise predictions were made are presented in Appendix 3. The plant complement is based on empirical data from site measurements recorded by plant suppliers and NVC at other similar sites in the UK.

5.4 Results of Noise Predictions

Site Plant Noise Assessment:

5.4.1 Noise levels from fixed plant operating at the development site would be assessed against BS4142: 2014.

Table 5.1: Predicted Noise Contribution from GRF (including HGVs, Mobile plant & Glass Processing Plant) with proposed noise mitigation measures

Receptor Position (Refer to Figure 1)	Period	Typical Existing LAeq dB Levels	Background sound level LA90 (dB) [representative]	Rating noise level LAeq(dB)	Level Difference* dB(A)
A) Ravenhead Road (north of site)	Morning (0600-0700) Daytime (0700-2200)	52 52	48 47	45-46 45-46	-3 to -2 -2 to -1
B) Ravenhead Road (west of site)	Morning (0600-0700) Daytime (0700-2200)	52 51	48 49	44 44	-4 -5
C) Ravenhead Road (northwest)	Morning (0600-0700) Daytime (0700-2200)	52 52	48 47	39 39	-9 -8

*Level difference relates to predicted rating noise in column 5 compared with background sound in column 4. This does include a +3dB penalty for noise character. Note: Daytime periods assumes doors closed during offloading or loading of glass or product. Doors open during entry and exit of vehicles. Receptor height assumed to be 4m from ground level for `worst case' scenario.

5.4.2 The above tables show the range of predicted highest likely noise levels from site operation which would occur during peak operating periods.

5.4.3 The results show no exceedance of background sound which includes a +3dB penalty based on a representative background level and highest likely site noise contribution according to BS4142: 2014.

5.4.4 We have used empirical data of the fixed and mobile plant to be used to maintain the accuracy of the calculations at the nearest property boundary locations during site operations. The access doors of the GRF building into the loading and offloading areas are assumed to be closed except to allow access for occasional entry and exit of vehicles. Doors into the processing area are assumed to be closed except when plant is on shut-down or for emergency or for maintenance.

LAmax Predicted Levels

5.4.5 The predicted LAmax levels at nearest receptors from GRF activities are likely to be between 5dB and 14dB higher than the LAeq predictions. This is represented in Table 5.2 below.

Table 5.2: LAmax noise predictions

Receptor Position	Period	Typical existing LAmax dB	Predicted LAmax (dB)
A) Ravenhead Road (north of site)	0600-0700 0700-2200	64-70 59-85	50-60 50-60
B) Ravenhead Road (west of site)	0600-0700 0700-2200	66-79 58-80	49-58 49-58
C) Ravenhead Road (northwest)	0600-0700 0700-2200	64-70 59-85	44-53 44-53

5.4.6 The above table shows the highest likely LAmax levels to be for the vast majority of the time much lower than existing ambient noise and is therefore not considered to be significant.

Event Noise

HGV Reversing Alarms

5.4.7 The noise associated with the operation of a reverse alarm varies depending on the type and level and is required to ensure pedestrians can hear an audible warning, but is intermittent in nature and typically occurs for less than one minute at a time. For the purpose of this assessment we have assumed a 10% operating time, broadband noise type reverse alarm and screening from existing or proposed buildings. Noise levels from broadband noise type reversing alarms are likely to be in the region of 85dB L_{Aeq} at a distance of 1 metre. Allowing for a noise character correction for intermittency of +3dB and +3dB for tonality the assessment of impact is shown below in Table 5.3.

5.4.8 The results of the noise prediction at the sensitive receptors are given in Table 5.3 below:

Table 5.3: Predicted noise levels from reversing alarms

Receptor	Existing LAeq (dB) (LA90)	Criterion L_{Aeq} (dB)$_{1hr}$ (0700-2200 hrs), 15mins (0600-0700)	Predicted Noise Level LA_{eq} (dB)
A) Ravenhead Road (north of site)	52 (48) 52 (47)	45 44	18-20 18-20
B) Ravenhead Road (west of site)	52 (48) 51 (49)	45 46	20 20
C) Ravenhead Road (northwest)	52 (48) 52 (47)	45 44	14-15 14-15

Note: Noise levels assume 4m above ground for worst case.

5.4.9 The results of the assessment of reverse alarms would indicate that the levels generated by this noise source would be below background and residual sound levels. Noise from this source is therefore not deemed to be significant.

5.5 Construction Noise

5.5.1 Site preparation work is likely to involve internal changes to the building layout and infrastructure and acoustic improvements to the roof. Further external works is likely to involve the extension to the end western bay and improvements to the service yard area. It is considered that excavators, concrete breakers, haulage lorries, cranes, dumpers, concrete mixers and hand tools would all, at some time during the construction programme, be operating on the site. However given the fact that the main structure of the building exists the extent of construction work is expected to be limited. In addition, ancillary equipment such as small generators and compressors may also be operating on occasions during the amendments to the building and layout.

5.5.2 The above noise sources and their associated activities would vary from day to day and may be in use at different stages of the proposed development for relatively short durations. The noisiest activities are expected to occur during internal infrastructure work during the initial stages of the development when excavators, concrete breakers and concreting plant or similar may be in use.

Construction Noise Prediction

5.5.3 The actual noise level produced by construction work would vary at the nearest property boundary at any time depending upon a number of factors including the plant location, duration of operation, hours of operation, intervening topography and type of plant being used.

5.5.4 Detailed below is an indication of the highest likely noise levels at the nearest receptors based on infrastructure work and building construction activities at the closest approach to existing residential areas.

5.5.5 The calculations use the methodology provided within BS 5228: 2009. For this method the sound power level of the noise source is defined and the attenuation is calculated between its location and the selected receiver, taking account of distance, screening due to barriers, ground attenuation and the time that a noise source would be operating.

5.5.6 It is difficult to estimate how long the different types of activity would last, but typically in areas close to the site boundary (i.e. noisiest construction period assessed) this is normally completed in weeks rather than months. Given the construction activities involved, especially given the activities already undertaken on site, it is considered that noise issues will be limited. The Civil Construction phase is expected to last approximately 8 months with the installation of internal equipment taking a further month to complete. In total the construction phase and associated internal work will last approximately 9 months.

5.5.7 The results of calculations for infrastructure work, general site activities and building construction are shown below in Table 5.4.

Table 5.4: Noise Predictions for Highest Likely Construction Noise

Position	Distance to receptor (m)	Activity	Noise Level, dB L_{Aeq}	Typical residual noise dB L_{Aeq}	BS5228 Threshold ABC Method
1. Receptor north of site	25-90	Internal Works General site activities Infrastructure Building Construction	41-55 46-54 43-57 59-68	52	65
2. Receptor west of site	65-170	Internal Works General site activities Infrastructure Building Construction	34-45 39-54 36-46 52-61	52	65
3. Receptor northwest of site	95-190	Internal Works General site activities Infrastructure Building Construction	33-41 37-50 35-42 51-58	52	65

5.5.8 For the development, the highest community noise levels are likely to be created during the construction of infrastructure and building roof alterations and extension. This would be well within the level of noise normally found to be acceptable for an activity of this type and duration.

5.6 Road Traffic Noise

5.6.1 To assess the effect of HGV movement from the proposed GRF on existing residential properties, noise calculations have been undertaken using BS5228: 2009 `haul road' method and traffic flow information provided for the proposed development.

5.6.2 Based on HGV movements during daytime periods, calculations have been undertaken relative to nearest receptors to assess the likely increase as a result of the proposed development. The results are shown below in Table 5.5. It should be noted that it is generally accepted that the appropriate method for assessing traffic related noise impacts is normally against an 18hr flow. However, an assessment of a 1 hour period traffic flow has been assessed, which gives a pessimistic view of the noise impact.

Table 5.5: Predicted Noise from GRF vehicle movements on local road network

Receptor Position	Period	Ambient noise level $LA10_{1hr}$ dB	Predicted noise level $LA10_{1hr}$ (dB)	Increase in level $LA10_{1hr}$ dB	Impact significance
1. North of site	0600-2200	53	38-44	+0 to +0.5	Neutral to Negligible
2. West of site	0600-2200	53	37	0	Neutral
3. Northwest of site	0600-2200	53	30	0	Neutral

5.6.3 The results of the calculations indicate no significant increase in noise levels as a result of the movement of HGVs onto the local road network. It should also be noted that the projected number of HGV movements to and from the development would be similar to those already received on site.

5.6.4 In accordance with the DMRB guidance the impact magnitude for the operating periods is shown to be neutral in the short and neutral in the long term and therefore no significant change in subjective response.

5.7 Noise Predictions

5.7.1 A noise prediction model of the site has been developed based on the information detailed in the report and Appendix 3 based on library data of similar facilities and plant together with information concerning the proposed development and layout. The prediction model used includes the use of ISO9613-2 which is a nationally recognised calculation method to provide good accuracy.

5.7.2 Within BS4142: 2014 section 10.3 deals with `uncertainty in calculation' and states:

"Uncertainty in calculating sound levels can arise from:

a) uncertainty in any measured sound levels used in the calculations;

b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;

c) uncertainty in the calculation method;

d) simplifying the real situation to "fit" the model (user influence on modelling); and

e) error in the calculation process.

Where the sound power level is used for calculating sound pressure levels, it ought to be representative of the source and the conditions under which the source is expected to operate.

Where possible, use recognized standards to establish the sound power level and the uncertainty (e.g. BS EN ISO 3740 and BS EN ISO 3747). Where it is not possible to use appropriate standards, describe the method of establishing the sound power level, report the uncertainty and state the reasons for using this method.

Use a validated method of calculating sound levels, e.g. ISO 9613-2 or similar. If an alternative calculation method is used, fully describe the method and state the reasons for using this method.

Check the implementation of the calculation method for errors.

For simple cases, e.g. where the level of variability in sound propagation resulting from changes in meteorological conditions is likely to be small, simple calculation methods might be sufficient."

5.7.3 In terms of the prediction calculations undertaken, the following points are noted:

(i) Baseline survey work has been carried out at nearest receptors over a weekend period to cover the lowest likely representative time period over which the site is operating to determine representative background sound levels for the assessment.

(ii) A recognised standard for calculation has been used with appropriate settings to give an accurate prediction.

(iii) Input data for the GRF is based on measured plant noise levels within a reverberant environment and external `event' noise at similar sites in the UK.

(iv) Detailed layout of the site and the surrounding building heights has been used to inform the noise model.

(v) Information on the existing building construction has been obtained during a site visit for input into the noise model.

5.7.4 The only potential variation in predicted noise levels is likely to be as a result of sound propagation resulting from changes in meteorological conditions. This is difficult to predict and in the situation where there is a positive wind vector in the direction of nearest sensitive receptors the actual background noise level could, in any case, be higher than when measured under ideal conditions. Additionally, the proximity of the receptors to the site mean that meteorological factors do not have any significant impact on propagation. We therefore would not consider this to be a significant factor and when assessing the site for compliance this would be carried out in any case be carried out in suitable meteorological conditions. We therefore conclude that the assessment of site noise is accurate and uncertainty is minimised.

6.0 CONCLUSIONS & MITIGATION MEASURES

6.1 General

6.1.1 Background sound measurements have been recorded at the nearest sensitive receptors during daytime and night-time periods during a weekend to establish the lowest likely representative background and residual sound levels.

6.1.2 Calculations have been carried out to determine the highest likely noise contribution at the nearest residential property boundary positions for comparison with ambient and background sound levels.

6.1.3 The noise assessment has considered the effect of noise `break-out' from the GRF building as shown on the site layout plan (see Figure 1). The assessment has also considered the effect of road traffic movements on and off site to assess any significant impacts as a result of changes in transportation noise. Additional `event' noise sources have been examined relative to reverse alarm activities.

6.1.4 In order to calculate the likely noise `break-out' from the proposed GRF building we have used empirical data of mobile plant operations and processing plant to assess the noise `break-out'. The calculations assume that the mobile or fixed noise source is operating for 100% of the time and takes into account spectral corrections for building attenuation, directivity, distance and area factors.

6.2 Existing Noise Climate

6.2.1 Representative background sound levels during the proposed operational periods were established to be between 47dB(A) and 49dB(A) L90 and a residual noise level of 51dB(A) to 52dB(A) Leq (in the vicinity of nearest residential boundaries).

6.2.2 Measurements of LAmax levels during the daytime periods indicated this to be typically between 58dB to 85dB.

6.3 Conclusions

6.3.1 The results of analysis of measured baseline data, detailed calculations and consideration of appropriate and relevant noise guidance and standards, we have concluded the following:

(a) Predicted noise levels from the operation of the Glass Recycling Facility including mobile plant, processing plant and HGV movement show that the noise contribution would not exceed representative background sound levels and therefore unlikely to result in an adverse impact according to BS4142: 2014.

(b) The noise level from site would also be between 10dB and 16dB below typical residual ambient sound levels.

(c) The projected HGV movements from the glass recycling facility will be similar to those already received on site under the existing usage.

(d) Additional HGV movement off would not result in any likely significant impact according to the advice provided within DMRB 2011.

(e) Results of further calculations of `event' noise (i.e. reverse alarms) show that these would not be significant. Further advice is however provided below in terms of reverse alarms on mobile plant and site management controls to minimise noise radiating from the site.

(f) The results of noise calculations of the highest likely noise levels generated during the construction phase of the development shows that this would not exceed unreasonable noise levels according to BS5228. This phase of the development is a temporary noise situation and best practice would be applied during the construction works to control noise.

6.4 Mitigation Measures

6.4.1 The control of noise from site has been based on the following minimum control measures which will ensure that site operations achieve reasonable and relevant noise criteria. Further advice on applying management controls based on good practice is provided to minimise noise levels although these are not required to meet reasonable and appropriate noise level criteria:

Noise mitigation measures

New roof areas:

(i) New roof areas to be formed by an insulated `built-up' roof cladding system that provides with an Rw =50dB and minimum mass of 40kg/m2. For example Kingspan KS 1000 RW/40 + I + 2 x Py [I = Insulation and Py = 10mm thick dense particle board (11.7kg/m2)]. Walls would remain as brickwork as exists, and additional walls above existing brickwork would need to have an Rw value near to 55dB. **Note: no skylights are allowed in the roof design.**

Proposed extension to western end bay:

(ii) In terms of the new extension to the roof and walls of the western end bay this will involve the use of a high performance cladding system e.g.

Walls: Concrete walls to lower levels and Kingspan KS1000LP/45 + insulation + 2 x 12.5mm dense plasterboard (Rw 58dB) or equivalent system to upper wall areas.

Roof: Kingspan KS1000 RW/40 + insulation + 10mm thick dense particle board (Rw=48dB)

Doors:

(iii) During tipping of glass or loading of glass within the end bays we would expect that the doors to outside to be closed.

(iv) Any doors located on the northern façade may need to be fitted with an inner door or lobby and secondary door to prevent noise `break-out' and perceptible impulse noise.

External Dust Extraction Plant (External)

(v) The external dust extraction plant will need to be reduced from 80-85dB(A) LAeq at 1m to 70-75dB(A) at 1m [i.e. reduce overall noise by -10dB(A)]. This may be achieved in a number of ways which may include enclosing the plant or noise control applied to plant at source (e.g. in-duct silencers, cladding of filter housing/ducting and fan casings etc.). The plant would also be designed to ensure there are no tonal characteristics perceptible at nearest residential receptors.

Management Control Applying Best Practice

(vi) Drivers of mobile plant instructed to avoid un-necessary banging of loading `buckets' onto GRF floor areas (i.e. bucket placed on floor), avoid un-necessary scraping of floor areas and excessive revving of engines.

(vii) Vehicles arriving or exiting site (particularly prior to 0700 or after 1900 hours) should consider the following general management procedures in accordance with the `quiet deliveries demonstration scheme':

- Consideration to noise and the neighbours is shown as an approach is made to the site and manoeuvring in the service yard;
- The vehicle horn is not to be used to alert the site on arrival or waiting;
- Engines are switched off when you are not manoeuvring;
- Radios are switched off and doors not slammed when alighting the cab;
- Load retaining straps/bars are carefully placed in stowage points, not dropped onto the floor;
- Minimise excessive air braking noise;
- Switch off engines for prolonged stops, but minimise unnecessary start-ups and engine revving;
- Always unload in the designated delivery area, unless instructed by the site management to do otherwise;
- Report any circumstances to management where adherence to these instructions cannot be fulfilled.

REFERENCES

BS4142: 2014 `Method for rating industrial noise affecting mixed residential and industrial areas';

BS8233: 2014 `Sound insulation and Noise Reduction for Buildings – Code of Practice';

Guidelines for Community Noise: World Health Organisation: April 1999

BS5228: 2009 `Code of practice for noise control on construction and open sites';

Calculation of Road Traffic Noise (CRTN): 1988

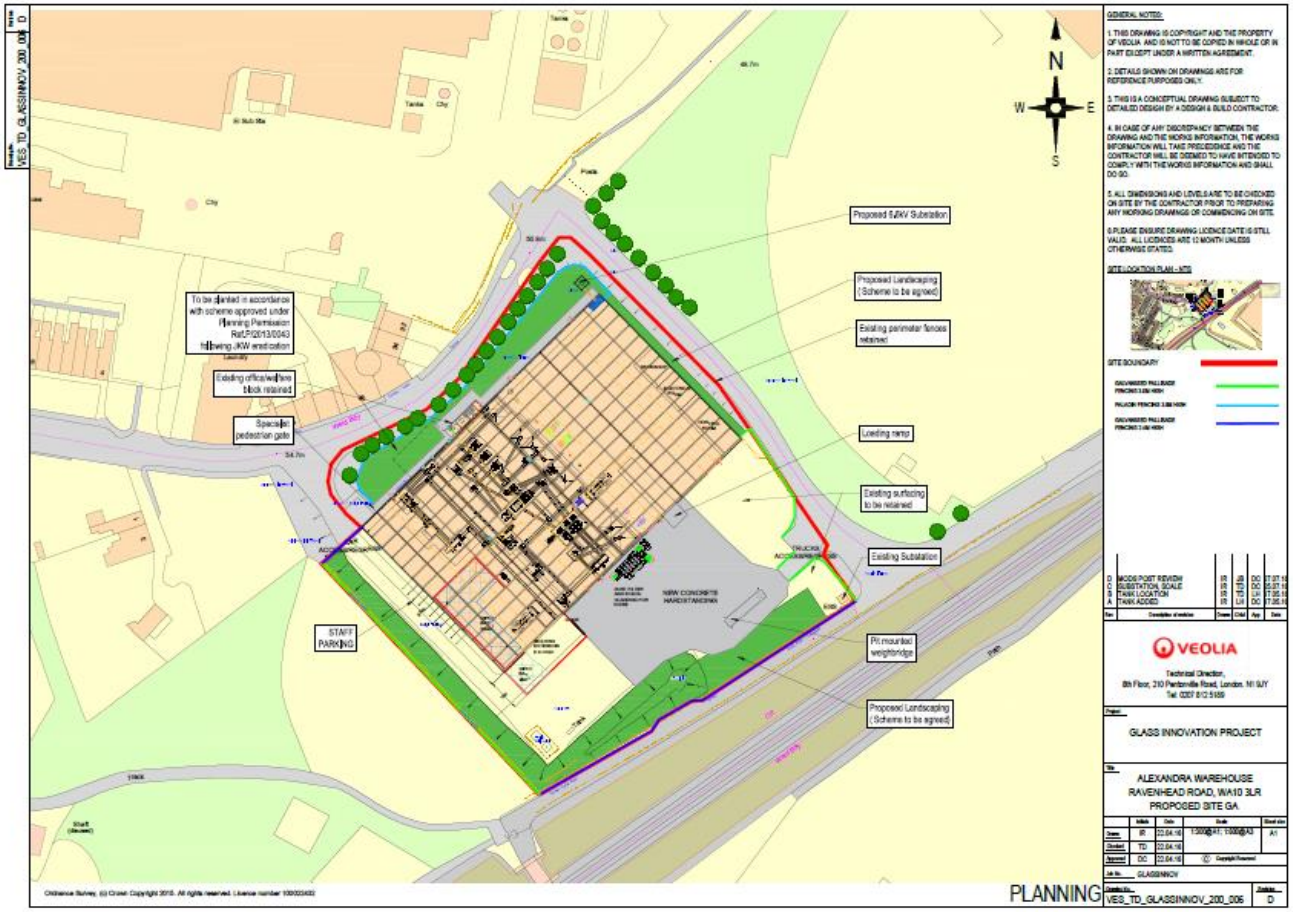
Department for Communities and Local Government: National Planning Policy Framework: March 2012

ISO 9613-2: 1996 `Acoustics – Attenuation of Sound During Propagation Outdoors'.

FIGURES

Figure 1: Site Location, Baseline Sound Measurement Locations & Receptor Positions

Figure 2: Draft Site Layout



Appendix 1

BASIC ACOUSTIC TERMINOLOGY

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Sound Pressure Level is a measurement of the size of these pressure fluctuations. It is expressed in decibels (dB) on a logarithmic scale. Each 3 dB increase in sound pressure level represents a doubling of the sound energy. The threshold of hearing is approximately 0 dB.

The rate at which the pressure fluctuations occur determines the pitch or frequency of the sound. The frequency is expressed in Hertz (Hz), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hz to 20,000 Hz. Although sound can be of one discrete frequency - a 'pure tone' - most noises are made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same 'subjective' way. This is the basis of the A-weighted sound level dB(A), normally used to assess the effect of noise on people. The dB(A) weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Measurement

The measurement of sound pressure level is only really meaningful where the level of noise is constant. In the typical industrial environment noise levels can vary widely and sometimes short duration high levels of noise are interspersed with periods of relative quiet. The most widely used means of 'averaging' the noise over a period of time is the Equivalent Continuous Sound Level. Normally written as L_{Aeq} this value takes into account both the level of noise and the length of time over which it occurs. There are many meters available which are capable of measuring L_{Aeq} by electronic integration over the measurement period.

The L_{Aeq} or A-weighted equivalent continuous noise level is a measure of the total noise energy over a stated time period and includes all the varying noise levels and re-expresses as an 'average', allowing for the length of time for which each noise level was presented.

The L_{An} parameters are defined as the noise levels which are exceeded for n% of the monitoring period, thus, for example, the L_{A90} parameter is the noise level exceeded for 90% of the 15 minute period, i.e. 13.5 minutes. The L_{A50} parameter is the noise level exceeded for 50% of the hourly period, i.e. 30 minutes, etc. The L_{max} parameter is the maximum RMS A-weighted noise level occurring during the measurement period.

The definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work.

A-weighting: Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Attenuation: Noise reduction

Background noise: The general quiet periods of ambient noise when the noise source under investigation is not there.

Decibel (dB): The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.

dB(A) [decibel A weighted]: Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.

dB(C): [decibel C weighted]: Frequency weighting which does not alter low frequency octave band levels by very much compared to `A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)

Frequency (Hz): The number of sound waves to pass a point in one second.

L_{Aeq}: This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner which correlates well with human perceptions of loudness.

$L_{A10,T}$: This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 10 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A10} reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

$L_{A90,T}$: This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.

L_{Amax}: This is the highest `A' weighted noise level recorded during a noise measurement period.

Residual noise: The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Specific noise: The noise source under investigation for assessing the likelihood of complaints

Examples of typical noise levels

Source/Activity	**Indicative noise level [dB(A)]**
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Appendix 2

Background Sound Level Results

Noise Survey Results

Date: Friday 4th March 2016 **TABLE 1**
Location: Ravenhead Road, St Helens
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 1 - West of Site Adjacent to Property off Ravenhead Road**
Instrumentation: Cirrus 831A Integrating Precision SLM (B15046FF) Calibration due July 2016
Weather Conditions: Occ. light rain (10:30-13:20), light variable winds (2-3m/s), temp. 3-6degC
Calibration: 94dB

Start Time	Run Time (hrs.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
08:00	01:00	53.6	55.4	48.5	77.2	Local and distant road traffic noise
09:00	01:00	52.2	54.1	49.7	66.7	Low level `hum' from the industrial
10:00	01:00	52.4	54.1	49.8	67.6	area
11:00	01:00	53.2	54.6	50.7	75.8	
12:00	01:00	53.9	55.4	51.8	71.5	
13:00	01:00	53.5	54.9	51.9	64.2	
14:00	01:00	53.6	55.1	51.8	68.1	
15:00	01:00	54.4	56.1	52.3	66.2	
16:00	01:00	54.2	55.8	52.1	68.2	
17:00	01:00	53.4	54.7	51.1	69.4	
18:00	01:00	52.5	53.6	50.5	70.4	
19:00	01:00	50.9	52.1	49.3	63.5	
20:00	01:00	50.6	52.0	48.6	64.9	
21:00	01:00	50.6	51.9	48.8	60.5	
22:00	01:00	49.2	50.2	47.8	61.6	
Average 0800-2300		52.7	54.0	50.3	61-77	
Average 0800-2200		52.9	54.3	50.5	61-77	

Noise Survey Results

Date: Friday 4th - Saturday 5th March 2016
Site: Ravenhead Road, St Helens **TABLE 2**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 1 - West of Site Adjacent to Property off Ravenhead Road**
Instrumentation: Cirrus 831A Integrating Precision SLM (B15046FF) Calibration due July 2016
Weather Conditions: Dry, variable cloud, light variable winds (2-3m/s), temp. 3-5degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	01:00	49.2	50.2	47.9	62.5	
00:00	01:00	48.5	49.5	47.3	62.0	
01:00	01:00	47.6	48.4	46.5	53.2	
02:00	01:00	48.3	48.9	47.1	61.8	
03:00	01:00	48.0	48.7	47.1	53.7	
04:00	01:00	47.8	48.5	46.8	55.4	
05:00	01:00	50.5	50.8	47.4	76.9	
06:00	01:00	51.4	53.1	49.1	65.5	
Average 2300-0700		49.1	49.8	47.4	53-77	
Average 0800-2300		52.7	54.0	50.3	61-77	

Noise Survey Results

Date: Saturday 5th March 2016
Location: Ravenhead Road, St Helens **TABLE 3**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 1 - West of Site Adjacent to Property off Ravenhead Road**
Instrumentation: Cirrus 831A Integrating Precision SLM (B15046FF) Calibration due July 2016
Weather Conditions: Dry, variable cloud, light NNW-NW winds (2-3m/s), temp. 3-7degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
07:00	01:00	51.7	52.5	49.1	75.3	
08:00	01:00	51.3	53.0	48.7	71.8	
09:00	01:00	51.8	53.2	49.2	71.2	
10:00	01:00	52.4	54.0	49.3	71.4	
11:00	01:00	53.7	53.7	49.1	73.7	
12:00	01:00	52.4	53.0	49.2	79.0	
13:00	01:00	52.2	53.5	49.3	69.0	
14:00	01:00	53.0	54.2	49.2	75.5	
15:00	01:00	53.3	54.0	49.5	70.8	
16:00	01:00	51.4	53.1	49.0	69.5	
17:00	01:00	50.5	52.4	47.5	63.1	
18:00	01:00	48.9	49.9	47.2	62.9	
19:00	01:00	48.8	49.3	46.8	68.3	
20:00	01:00	48.8	49.8	47.5	60.4	
21:00	01:00	48.7	49.5	47.6	60.0	
22:00	01:00	49.1	50.0	47.7	61.4	
Average 0700-2300		51.4	52.2	48.5	60-79	
Average 0700-2200		51.5	52.3	48.5	60-79	

Noise Survey Results

Date: Saturday 5th - Sunday 6th March 2016
Site: Ravenhead Road, St Helens **TABLE 4**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 1 - West of Site Adjacent to Property off Ravenhead Road**
Instrumentation: Cirrus 831A Integrating Precision SLM (B15046FF) Calibration due July 2016
Weather Conditions: Dry, mostly clear, light variable winds (1-2m/s), temp. 2-4degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	01:00	48.1	49.2	46.6	53.9	
00:00	01:00	47.0	47.6	46.1	55.6	
01:00	01:00	47.7	48.5	46.5	55.3	
02:00	01:00	47.9	49.0	46.4	53.4	
03:00	01:00	46.5	47.4	45.3	53.7	
04:00	01:00	46.9	47.3	44.9	61.0	
05:00	01:00	56.2	55.4	45.1	79.3	
06:00	01:00	49.7	51.1	45.5	68.6	
Average 2300-0700		50.2	49.4	45.8	53-79	
Average 0700-2300		51.4	52.2	48.5	60-79	

Noise Survey Results

Date: Sunday 6th March 2016
Location: Ravenhead Road, St Helens **TABLE 5**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 1 - West of Site Adjacent to Property off Ravenhead Road**
Instrumentation: Cirrus 831A Integrating Precision SLM (B15046FF) Calibration due July 2016
Weather Conditions: Dry, variable cloud, light variable winds (2-3m/s), temp. 2-6degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
07:00	01:00	49.2	50.4	45.7	68.8	
08:00	01:00	50.0	51.4	46.6	71.5	
09:00	01:00	51.5	52.2	46.9	78.4	
10:00	01:00	51.0	52.0	47.2	73.0	
11:00	01:00	50.9	52.3	47.7	71.1	
12:00	01:00	51.3	51.4	47.2	80.4	
13:00	01:00	50.0	51.6	47.4	67.2	
14:00	01:00	51.8	52.9	47.5	74.5	
15:00	01:00	50.6	52.3	47.3	65.8	
16:00	01:00	50.6	51.9	47.2	72.5	
17:00	01:00	50.9	52.5	47.6	69.0	
18:00	01:00	49.8	50.8	48.2	61.7	
19:00	01:00	49.7	50.4	48.1	73.1	
20:00	01:00	49.2	50.2	47.8	60.0	
21:00	01:00	48.9	49.8	47.7	58.4	
22:00	01:00	48.5	48.7	46.9	67.2	
Average 0700-2300		50.3	51.3	47.3	58-80	
Average 0700-2200		50.4	51.5	47.3	58-80	

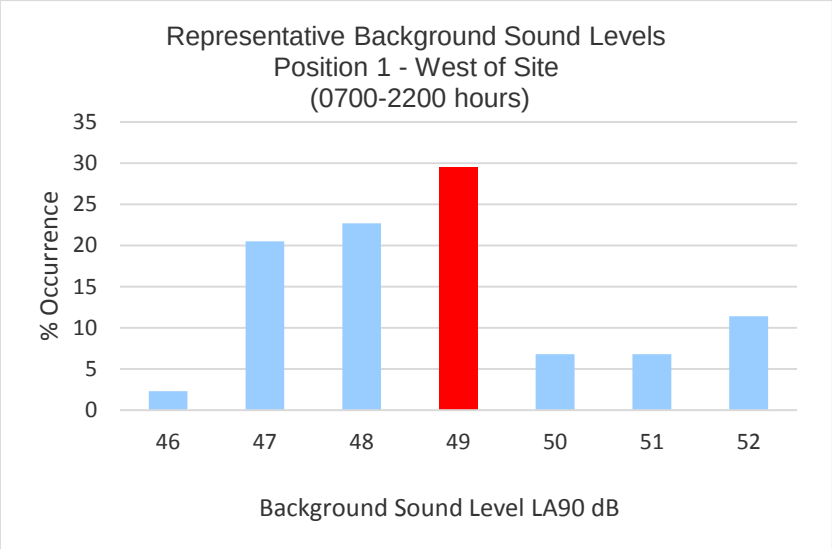
Noise Survey Results

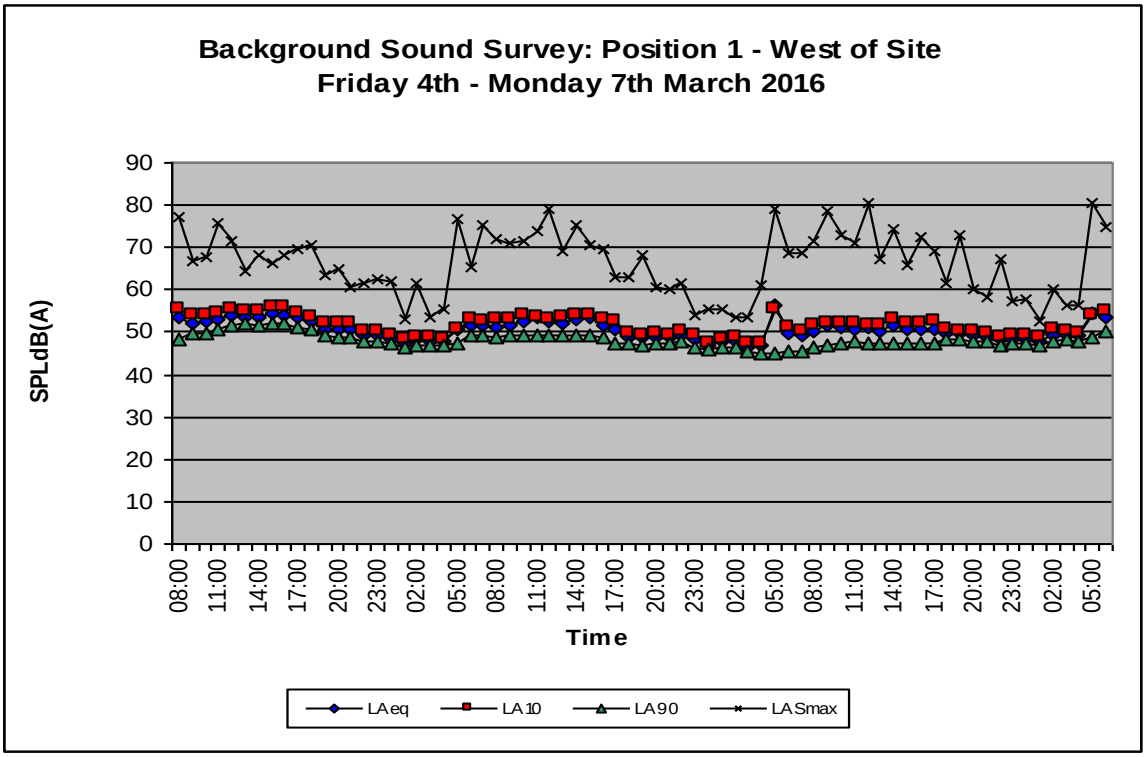
Date: Sunday 6th - Monday 7th March 2016
Site: Ravenhead Road, St Helens **TABLE 6**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 1 - West of Site Adjacent to Property off Ravenhead Road**
Instrumentation: Cirrus 831A Integrating Precision SLM (B15046FF) Calibration due July 2016
Weather Conditions: Dry, mostly clear, light variable winds (2-3m/s), temp. 2-3degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	01:00	48.5	49.3	47.5	57.5	
00:00	01:00	48.4	49.1	47.2	58.0	
01:00	01:00	48.0	48.9	46.7	52.7	
02:00	01:00	49.5	50.5	47.9	60.0	
03:00	01:00	49.2	50.1	48.1	56.4	
04:00	01:00	49.1	49.9	48.0	56.3	
05:00	01:00	54.7	53.8	48.9	80.6	
06:00	01:00	53.6	54.8	50.0	74.8	
Average 2300-0700		50.8	50.8	48.0	53-81	
Average 0700-2300		50.3	51.3	47.3	58-80	
Average 0600-0700		**51.8**	**53**	**48.2**	**66-79**	
Average 0700-2200		**51.7**	**52.7**	**48.8**	**58-80**	

LA90 Representative Levels

LA90	% Occurrence
46	2.3
47	20.5
48	22.7
49	29.5
50	6.8
51	6.8
52	11.4





Noise Survey Results

Date: Friday 4th March 2016 **TABLE 7**
Location: Ravenhead Road, St Helens
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 2 - Northwest of Site Opposite to Properties on Ravenhead Road**
Instrumentation: Cirrus 171A Real Time Analyser (G061253) Calibration due January 2017
Weather Conditions: Occ. light rain (10:30-13:20), light variable winds (2-3m/s), temp. 3-6degC
Calibration: 94dB

Start Time	Run Time (hrs.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
09:00	01:00	54.9	56.8	47.8	84.6	Local and distant road traffic noise
10:00	01:00	52.9	55.5	48.6	72.8	General `hum' from industrial area
11:00	01:00	53.2	55.7	49.9	66.9	
12:00	01:00	54.6	57.4	50.9	68.6	
13:00	01:00	54.7	57.2	51.6	69.4	
14:00	01:00	54.5	57.1	51.4	66.3	
15:00	01:00	55.4	58.0	52.3	67.6	
16:00	01:00	55.8	58.6	52.4	67.8	
17:00	01:00	54.8	57.7	51.1	66.7	
18:00	01:00	53.9	56.7	50.5	68.7	
19:00	01:00	52.7	54.8	49.4	74.8	
20:00	01:00	51.5	52.8	48.2	69.5	
21:00	01:00	51.5	52.7	48.2	68.2	
22:00	01:00	50.9	51.7	48.0	66.8	
Average 0900-2300		53.9	55.9	50.0	66-85	
Average 0900-2200		54.0	56.2	50.2	66-85	

Noise Survey Results

Date: Friday 4th - Saturday 5th March 2016
Site: Ravenhead Road, St Helens **TABLE 8**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 2 - Northwest of Site Opposite to Properties on Ravenhead Road**
Instrumentation: Cirrus 171A Real Time Analyser (G061253) Calibration due January 2017
Weather Conditions: Dry, variable cloud, light variable winds (2-3m/s), temp. 3-5degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	01:00	48.9	49.6	47.1	69.0	
00:00	01:00	48.3	49.0	47.2	62.7	
01:00	01:00	47.9	48.4	46.5	63.0	
02:00	01:00	48.9	49.2	46.3	61.2	
03:00	01:00	48.5	48.2	46.2	56.2	
04:00	01:00	48.6	48.3	46.1	57.6	
05:00	01:00	51.2	51.1	46.6	59.9	
06:00	01:00	51.9	52.7	48.5	64.3	
Average 2300-0700		49.5	49.6	46.8	56-69	
Average 0900-2300		53.9	55.9	50.0	66-85	

Noise Survey Results

Date: Saturday 5th March 2016
Location: Ravenhead Road, St Helens **TABLE 9**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 2 - Northwest of Site Opposite to Properties on Ravenhead Road**
Instrumentation: Cirrus 171A Real Time Analyser (G061253) Calibration due January 2017
Weather Conditions: Dry, variable cloud, light NNW-NW winds (2-3m/s), temp. 3-7degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
07:00	01:00	52.3	52.8	48.5	76.2	
08:00	01:00	52.1	53.5	47.9	72.6	
09:00	01:00	52.7	54.0	48.3	70.7	
10:00	01:00	52.9	54.9	48.4	72.3	
11:00	01:00	54.3	53.4	48.3	73.8	
12:00	01:00	53.2	52.8	48.6	79.9	
13:00	01:00	53.3	54.0	48.6	74.2	
14:00	01:00	53.9	54.8	48.3	76.8	
15:00	01:00	54.1	54.8	48.6	72.4	
16:00	01:00	52.2	52.9	48.0	70.6	
17:00	01:00	51.4	52.3	46.6	66.4	
18:00	01:00	49.5	50.4	46.3	66.5	
19:00	01:00	49.6	50.1	45.7	63.8	
20:00	01:00	48.5	50.7	46.3	62.6	
21:00	01:00	48.5	49.0	46.8	62.8	
22:00	01:00	49.7	50.5	46.9	61.9	
Average 0700-2300		52.1	52.6	47.6	62-80	
Average 0700-2200		52.2	52.7	47.7	63-80	

Noise Survey Results

Date: Saturday 5th - Sunday 6th March 2016
Site: Ravenhead Road, St Helens **TABLE 10**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 2 - Northwest of Site Opposite to Properties on Ravenhead Road**
Instrumentation: Cirrus 171A Real Time Analyser (G061253) Calibration due January 2017
Weather Conditions: Dry, mostly clear, light variable winds (1-2m/s), temp. 2-4degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	01:00	48.9	48.9	45.9	54.8	
00:00	01:00	47.9	47.4	45.2	54.7	
01:00	01:00	48.3	49.1	45.6	55.8	
02:00	01:00	48.7	49.5	45.5	54.2	
03:00	01:00	46.2	48.2	44.1	54.6	
04:00	01:00	46.7	48.2	43.8	60.2	
05:00	01:00	49.8	52.1	44.2	66.2	
06:00	01:00	50.6	51.9	44.6	69.5	
Average 2300-0700		48.6	49.4	44.9	55-70	
Average 0700-2300		52.1	52.6	47.6	62-80	

Noise Survey Results

Date: Sunday 6th March 2016
Location: Ravenhead Road, St Helens **TABLE 11**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 2 - Northwest of Site Opposite to Properties on Ravenhead Road**
Instrumentation: Cirrus 171A Real Time Analyser (G061253) Calibration due January 2017
Weather Conditions: Dry, variable cloud, light variable winds (2-3m/s), temp. 2-6degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
07:00	01:00	49.7	51.2	44.8	69.7	
08:00	01:00	50.6	51.3	45.5	70.7	
09:00	01:00	52.3	52.7	46.0	72.3	
10:00	01:00	52.1	52.8	46.2	74.1	
11:00	01:00	51.8	53.2	46.8	72.0	
12:00	01:00	52.1	50.9	46.7	70.2	
13:00	01:00	50.6	52.1	46.6	71.8	
14:00	01:00	52.6	53.5	46.8	73.3	
15:00	01:00	51.4	53.1	46.4	69.1	
16:00	01:00	51.7	51.7	46.3	71.7	
17:00	01:00	51.5	53.1	46.6	67.9	
18:00	01:00	50.4	51.6	47.3	64.5	
19:00	01:00	50.5	50.1	47.3	72.5	
20:00	01:00	50.1	50.0	46.9	63.2	
21:00	01:00	49.7	49.3	46.6	58.9	
22:00	01:00	49.4	49.2	45.7	58.2	
Average 0700-2300		51.1	51.6	46.4	58-74	
Average 0700-2200		51.2	51.8	46.5	59-74	

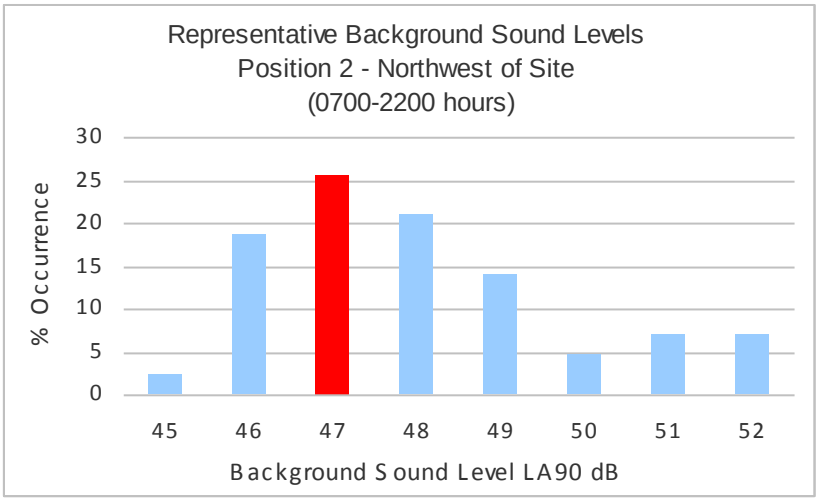
Noise Survey Results

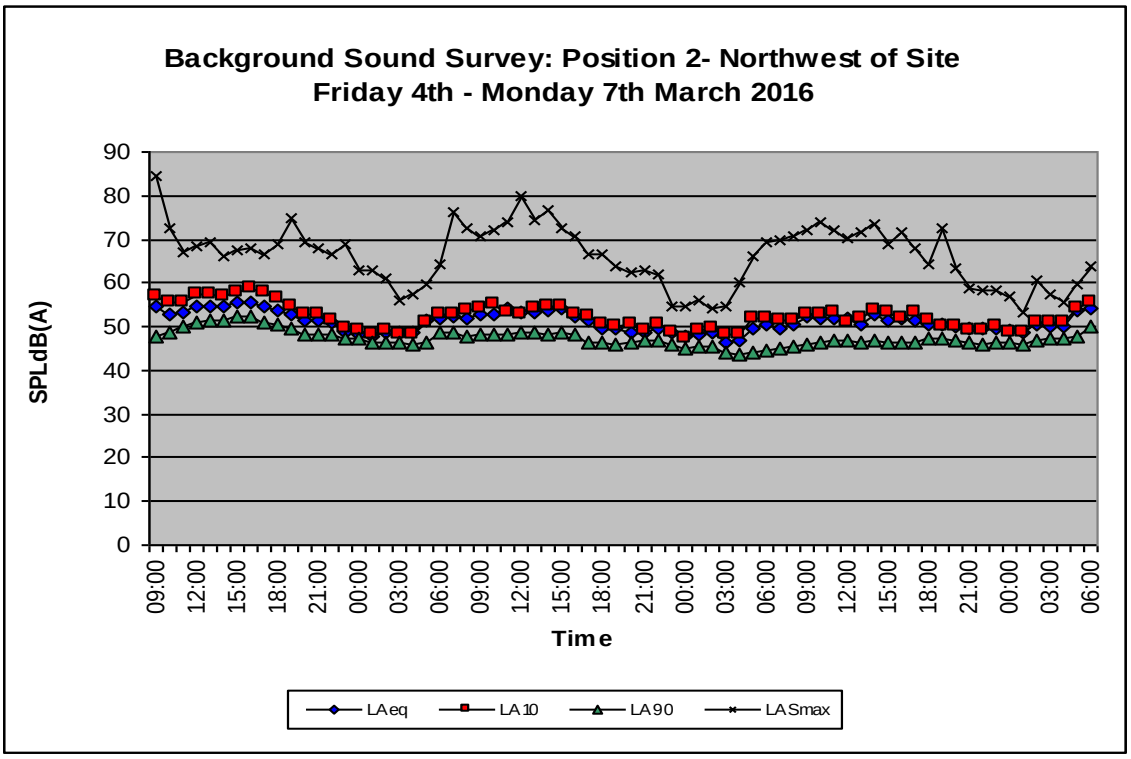
Date: Sunday 6th - Monday 7th March 2016
Site: Ravenhead Road, St Helens **TABLE 12**
Client: Veolia Environmental Services
Project: Glass Processing Facility
Data: **Position 2 - Northwest of Site Opposite to Properties on Ravenhead Road**
Instrumentation: Cirrus 171A Real Time Analyser (G061253) Calibration due January 2017
Weather Conditions: Dry, mostly clear, light variable winds (2-3m/s), temp. 2-3degC
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
23:00	01:00	49.6	50.2	46.6	58.4	
00:00	01:00	49.3	48.8	46.2	57.1	
01:00	01:00	48.8	48.7	45.9	53.2	
02:00	01:00	50.4	51.0	46.8	60.8	
03:00	01:00	50.0	50.9	47.2	57.3	
04:00	01:00	50.2	50.8	47.2	55.5	
05:00	01:00	53.6	54.4	47.8	59.5	
06:00	01:00	54.2	55.6	50.2	63.8	
Average 2300-0700		51.2	51.3	47.2	53-64	
Average 0700-2300		51.1	51.6	46.4	58-74	
Average 0600-0700		**52.4**	**53.4**	**47.8**	**64-70**	
Average 0700-2200		**52.6**	**53.6**	**48.1**	**59-85**	

LA90 Representative Levels

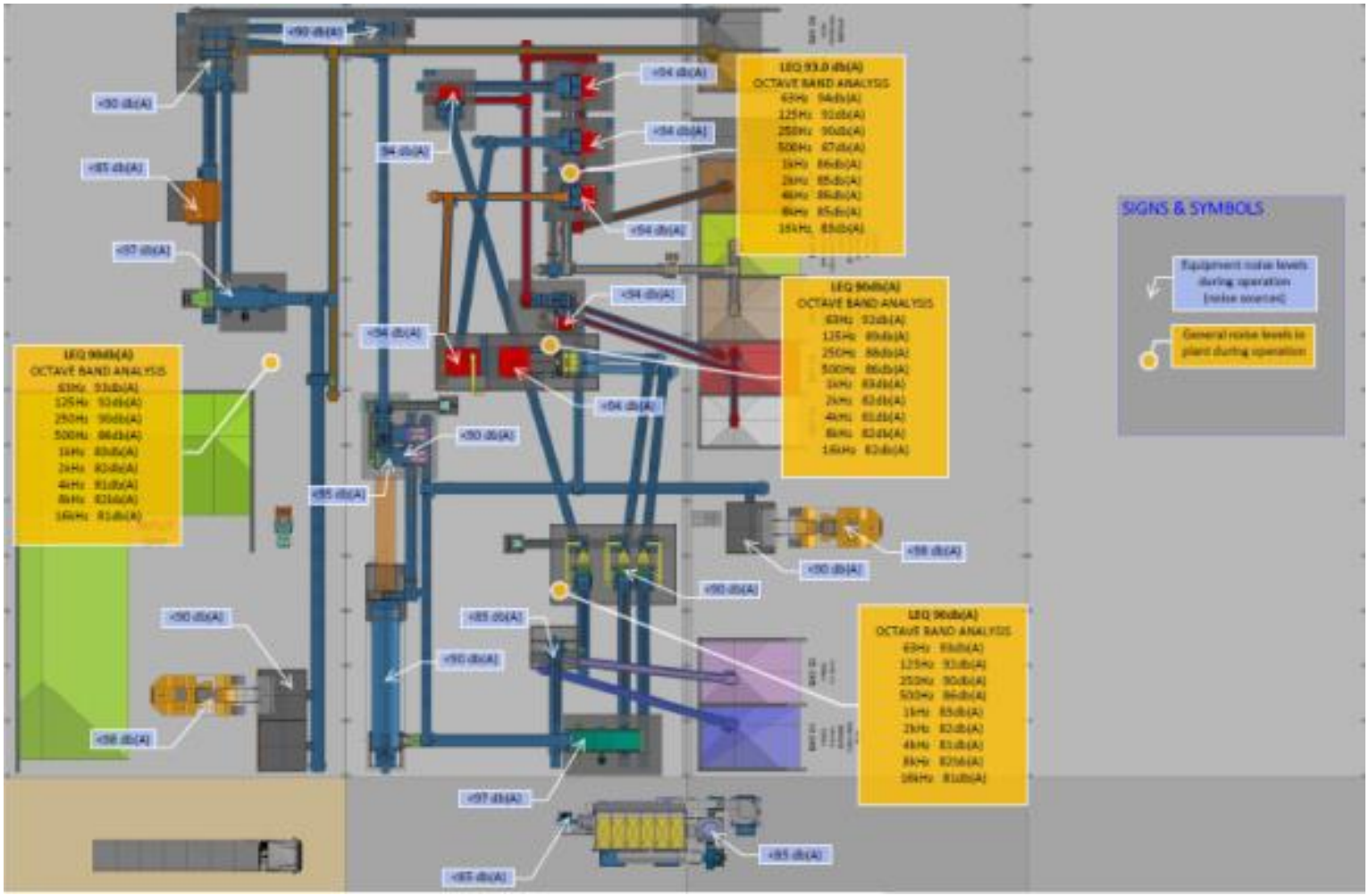
LA90	% Occurrence
45	2.3
46	18.6
47	25.6
48	20.9
49	14.0
50	4.7
51	7.0
52	7.0





Appendix 3

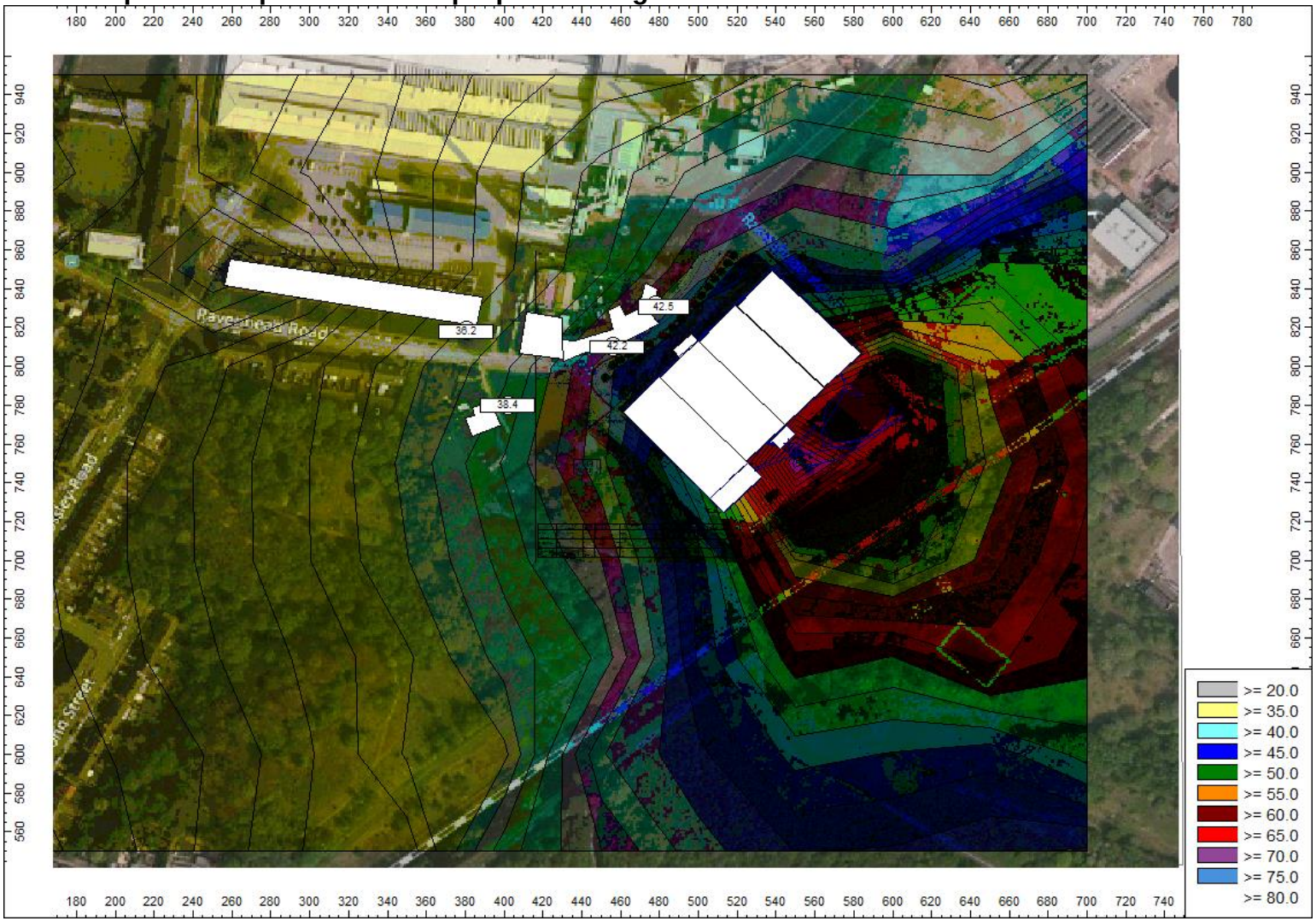
Typical Glass Recycling Noise Levels



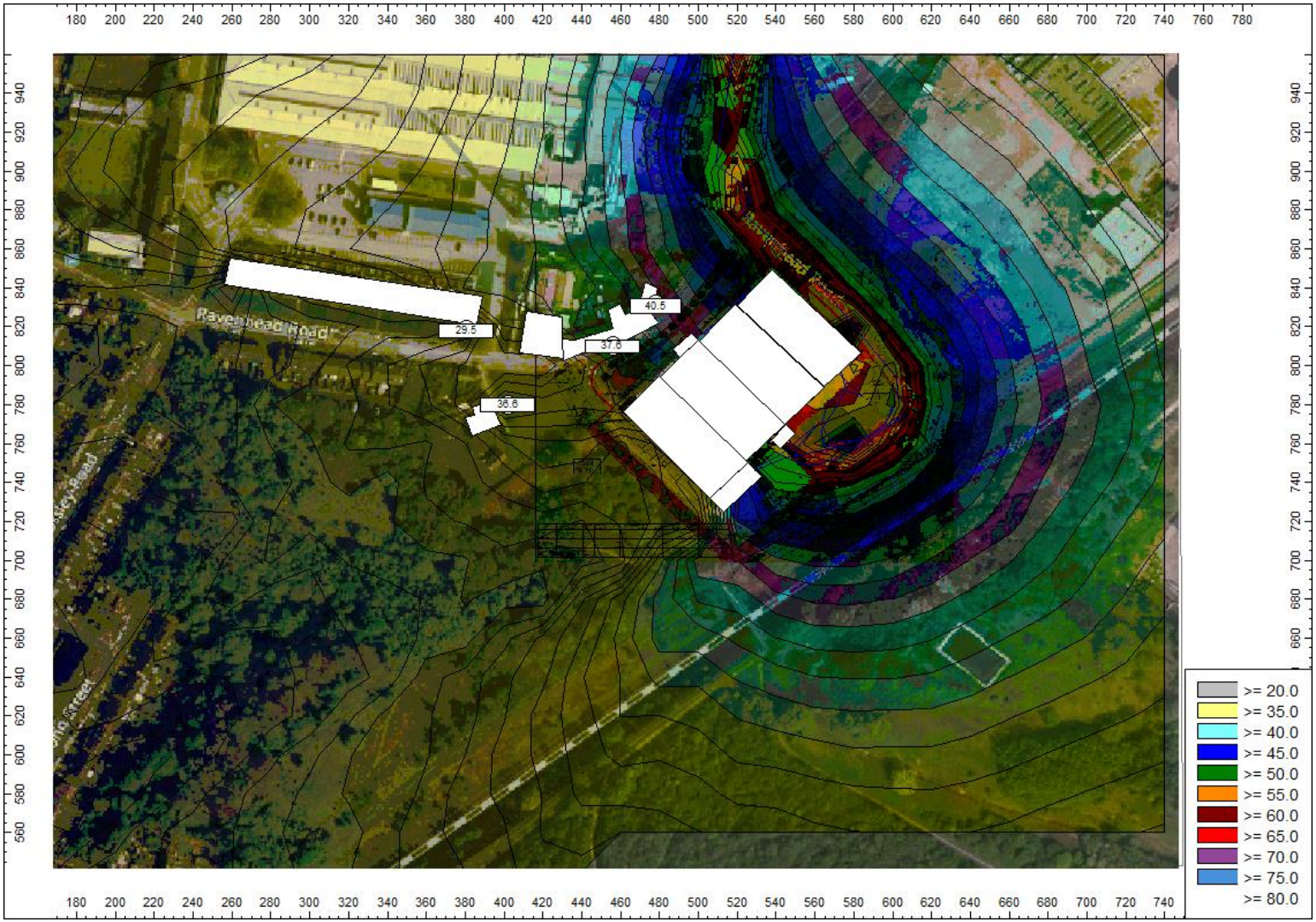
Appendix 4

Noise Mapping Results

Noise Map 1: Site Operations with proposed mitigation



Noise Map 2: HGV Movement to and from Site



Appendix 5

Consultant's Experience & Qualifications

Consultant: Dean Robert Kettlewell - MSc MIOA MAE I.Eng
(Director - Principal Acoustic Consultant)

Précis

As Director and Principal Acoustic Consultant with Noise & Vibration Consultants Ltd, Dean has over 30 years background experience in a wide range of issues relating to environmental, industrial and commercial noise and vibration assessment. He currently manages corporate and unit specific contracts for:

- Assessment of Environmental & Industrial Noise
- Environmental Noise Impact Assessments
- Expert Witness representation for Deafness and `Vibration White Finger' Claims
- Integrated Pollution Prevention and Control (IPPC) Applications
- Industrial Noise Assessment and Control
- Planning Issues for Residential and Commercial Development
- Noise at Work Regulations Assessments
- Building Acoustics and Sound Insulation Tests
- Wind Farm Noise Impact Assessments
- Entertainment Noise Assessment and Control
- Architectural Acoustics
- Specialist knowledge in the Design of Noise Control Systems
- Ground borne vibration measurement and assessment
- Project Management of Noise Control Systems
- Hand-arm Vibration Assessments

Relevant Work Experience

Director & Principal Consultant - Noise & Vibration Consultants Ltd	2001- to date
Senior Acoustic Consultant - Vibrock Limited	1998 - 2001
Associate & Principal Acoustic Consultant - John Savidge & Associates	1994 - 1998
Technical Manager – LBJ Limited (Noise Control Division)	1990 - 1994
Technical Engineer/Technical Manager (1988) - Vibac (Noise Control) Ltd	1982 - 1990

Qualifications and Education

M.Sc. Applied Acoustics (Derby University – Distinction)
HNC Electrical & Electronic Engineering
IOA Diploma in Acoustics & Noise Control
IOA Certificate in Law and Administration
Certificate of Competence in Workplace Noise Assessment
Certificate of Competence in Ground Vibration Monitoring

Affiliations: Member of Institute of Acoustics (MIOA)
Member of Academy of Experts (MAE)
Member of Association of Noise Consultants (ANC)
Incorporated Engineer (I.Eng)


NVC
Noise &
Vibration
Consultants Ltd.

Appendix B

ENS LTD (07 OCTOBER 2023) PROPOSED NEW CARE HOME. LAND TO THE EAST OF ALEXANDRA DRIVE, FORMER RAVENHEAD SOCIAL CLUB, ST HELENS, WA10 3UJ. NOISE IMPACT ASSESSMENT FOR: ADG ARCHITECTS.

Environmental Noise Solutions Limited

Suite 24
Doncaster Business Innovation Centre
Ten Pound Walk
Doncaster
DN4 5HX

Proposed New Care Home

Land to the East of Alexandra Drive, Former Ravenhead Social Club, St Helens, WA10 3UJ

Noise Impact Assessment

For:

ADG Architects

07 October 2022

Ref: NIA-10557-22-10733- v1.0
Issue: Draft
Author: R. Habeshaw MSc, MIOA

Contents

1 Introduction

1.1.1 Environmental Noise Solutions Ltd (ENS) has been commissioned by ADG Architects to undertake a Noise Impact Assessment for a Proposed New Care Home on land to the rear of Land to the East of Alexandra Drive, Former Ravenhead Social Club, St Helens, WA10 3UJ (hereafter referred to as 'the site').

1.1.2 This report has been prepared to accompany the planning application in order to address national and local authority policy planning requirements and guidelines.

1.1.3 The objectives of the noise impact assessment are to:

- Determine external ambient and background noise levels in the vicinity of the application site during relevant time periods.
- Assess the potential impact of the background noise on the proposed residential development with reference to relevant guidelines
- Provide recommendations for a scheme of sound attenuation works, as necessary, to protect dwellings from a loss of amenity due to noise.

1.1.4 This report details the methodology and results of the assessment and provides recommendations for the building envelope (fenestration and ventilation). It has been prepared to aid in the assessment of the development application by St Helens Borough Council.

1.1.5 This report details the methodology and results of the assessment. It has been prepared for ADG Architects for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult the aforementioned and ENS as to the extent to which the findings may be appropriate for their use.

1.1.6 A glossary of acoustic terms used in the main body of the text is contained in Appendix A.

2 Site Layout

2.1.1 The development comprises of a multi-bedroom care home occupying an area to the north and south of the (former) Ravenhead Social Club, St Helens, WA10 3UJ.

2.1.2 The surrounding area is mixed residential and commercial, with residential areas to the west and south of the site and the Knauf Insulation factory to the east and northeast. Local noise sources are expected to be commercial and road traffic noise related. It is assumed the bedrooms of the development will be passively ventilated, however a plant room is noted which may provide mechanical ventilation and cooling.

2.1.3 An indication of the location of the building is given in Figure 1-1 below, the monitoring positions used in the survey are given in Appendix B.

Figure 1-1: Location Plan

3 Assessment Guidance

3.1 National Planning Policy Framework

3.1.1 The National Planning Policy Framework (NPPF)[1] was updated in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied.

3.1.2 Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 174 where it states that 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…..noise pollution'.

3.1.3 Paragraph 185 advises that:

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

3.1.4 The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

3.2 Noise Policy Statement for England

3.2.1 The Noise Policy Statement for England[2] (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life
- Mitigate and minimise adverse impacts on health and quality of life
- Where possible, contribute to the improvement of health and quality of life

3.2.2 The NPSE describes the following levels at which noise impacts may be identified:

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

3.2.3 According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

'….all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.'

[1] National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2019)
[2] Noise Policy Statement for England. Government Department for Environment, Food and Rural Affairs (2010)

3.3 Planning Practice Guidance on Noise

3.3.1 Planning Practice Guidance[3] (PPG) is an online resource (last updated 2019) which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- 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
- Whether or not a good standard of amenity can be achieved

3.3.2 In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

'...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 particular situation'.

3.3.3 Table 3-1 summarises the PPG noise exposure hierarchy.

Table 3-1: PPG 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; 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 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; 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
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, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

[3] Planning Practice Guidance on Noise, 2014: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/

The PPG also provides general advice on the typical options available for mitigating noise, suggesting that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

'Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed'.

3.4 ProPG Planning and Noise: New Residential Development

3.4.1 'ProPG Planning and Noise: New Residential Development' (ProPG)[4] was published in 2017 by the Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health.

3.4.2 Stage 2: Element 2 of ProPG sets indoor ambient noise levels for residential dwellings based on the guidance contained in British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233) (see table below).

Table 3-2: Recommended Maximum Residential Target Levels (BS8233:2014)

Activity	Location	Good Indoor Ambient Noise Levels	
Resting	Living Room	35 dB $L_{Aeq\ (0700–2300)}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq\ (0700–2300)}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq\ (0700–2300)}$	30 dB $L_{Aeq\ (2300–0700)}$ 45 dB $L_{AFMax\ (2300–0700)}$

3.4.3 Note 4 to the above table states:

'A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic *noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB* $L_{Amax,F}$ *more than 10 times a night.'*

3.4.4 Note 5 to the above table states:

'Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} *target levels should not normally be exceeded, subject to the further advice in Note 7'.*

3.4.5 This is consistent with the guidance contained within the PPG, which states that:

'... 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. Further information on ventilation can be found in the Building Regulations'.

3.4.6 On the basis of the above, the following criteria (with windows closed and an alternative means of ventilation provided) are considered appropriate for the proposed residential development and considered to represent good resting and sleeping conditions:

- ≤ 35 dB $L_{Aeq\ (0700-2300)}$ during the daytime
- ≤ 30 dB $L_{Aeq\ (2300-0700)}$ and 45 dB L_{AFMax} not regularly exceeded during the night-time

[4] 'ProPG Planning and Noise: New Residential Development (ProPG)', 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

3.4.7 With regard to external amenity, ProPG reflects the advice given in BS 8233 as follows:

'The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50–55 dB $L_{Aeq,16hr}$.'

3.4.8 'These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.'

4 Noise Survey and Results

4.1.1 In order to establish the current external noise levels at the subject site, a noise survey was undertaken on Wednesday 21st, Thursday 22nd and Tuesday 27th September 2022.

4.1.2 For the purposes of the background noise assessment, two measurement locations were taken covering the noise in the immediate area of the site:

- MP1 was located to the south of the former social club covering traffic noise from Stafford Road and the neighbouring factory site
- MP2 was located at the north eastern façade of the development.

4.1.3 Noise measurements were made in free field conditions at 4 metres above ground level using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. A windshield was fitted for all measurements. The calibration of the measurement system was verified immediately before and after the survey using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. Weather conditions during the survey periods were appropriate for monitoring.

4.1.4 Measurements consisted of A–weighted broadband parameters, together with linear octave band L_{eq} levels. Table 4-1 presents a summary of the measurement data for each measurement session, rounded to the nearest decibel.

Table 4-1 – Summary of Noise Measurement Data

Location	Date	Time (hh:mm)	Length (hh:mm)	L_{Aeq} (dB)	$L_{Amax,F}$ (dB)	L_{A90} (dB)	L_{A10} (dB)	Comment
MP1	21/09/2022	11:47	03:00	49	72	45	50	Noise from Stafford Road driving background levels. Some low-level noise from factory audible during the daytime period.
MP2		15:24	00:30	49	61	47	50	
MP1		20:17	01:00	44	63	41	46	
MP2	22/09/2022	00:20	01:00	42	61	39	44	
MP1		01:28	01:00	40	53	38	41	
MP2		02:31	00:30	39	52	37	41	
MP2	27/09/2022	23:19	01:00	43	59	40	44	No significant noise or services noted from factory during night-time monitoring.
MP1		00:20	01:00	41	59	39	43	
MP2		01:28	01:00	39	65	37	40	
MP1		02:32	00:30	39	48	37	40	

4.1.5 During the daytime, the ambient noise environment was controlled by noise from the local road network, with some low-level noise noted from the factory area over the daytime period, no services noise was noted at either location. It is expected that the layout of the factory site is beneficial in terms of shielding any emitted site noise by the outer factory buildings.

4.1.6 Average daytime levels on the site were no greater than 49 dB $L_{Aeq,(0700\text{-}2300)}$ with a night-time average of 41 dB $L_{Aeq,(2300\text{-}0700)}$ and 65 dB $L_{Amax,F}$. These levels are used as the design levels for the development.

5 Noise Assessment

5.1 Sound attenuation scheme proposals

5.1.1 The design noise levels at the development footprint are as follows:

- ≤ 49 dB $L_{Aeq\ (0700\text{-}2300)}$ during the daytime
- ≤ 41 dB $L_{Aeq\ (2300\text{-}0700)}$ during the night time
- ≤ 65 dB $L_{AMax,F}$ during the night time

5.1.2 Daytime ambient noise levels are ≤ 50 dB $L_{Aeq\ (0700\text{-}2300)}$, which is below the desirable threshold as described in BS 8233. On this basis, there is expected to be no issue with respect to external levels within amenity areas around the development.

5.1.1 Regarding internal noise levels; Based on measurements taken at numerous sites, a typical standard double-glazed window with standard trickle vents provides circa 27 dB(A) sound insulation from external to internal. For reference, the World Health Organisation (WHO) Guidelines for Community Noise (1999) states *"the noise reduction from outside to inside with the window partly open is 15 dB."*

5.1.2 A prediction is made of the resulting internal noise levels in the table below.

Table 5-1: External Noise Levels and Resultant Internal Noise Levels

Location	External Noise Level	Reduction	Resultant Internal Level
Worst affected façades	≤ 49 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 41 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 65 dB $L_{Amax,F\ (2300\text{-}0700)}$	–27 dB (closed windows)	≤ 22 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 16 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ 38 dB $L_{Amax\ (2300\text{-}0700)}$
		–15 dB (open windows)	≤ 34 dB $L_{Aeq\ (0700\text{-}2300)}$ ≤ 26 dB $L_{Aeq\ (2300\text{-}0700)}$ ≤ ***50** dB $L_{Amax\ (2300\text{-}0700)}$
*Infrequent occurrence, external L_{Amax} usually no greater than 59 dBA.			

5.1.3 The internal noise levels are found to be within the internal noise criteria detailed in Section 3.4 with closed standard double glazed windows.

5.1.4 Only $L_{Amax,F}$ during the night-time has the potential to be in exceed the recommended L_{Amax} with open windows, however given this was an infrequent occurrence (two events over approximately 4 hours of monitoring) with the usual L_{Amax} no greater than 59 dBA, it is assumed unlikely that internal $L_{Amax,F}$ of 45 dBA would be exceeded more than 10 times in any night-time period, even with windows open for ventilation.

5.1.5 It is therefore expected that the future amenity of residents of the development can be achieved in all cases without the need for further mitigation measures other than the use of standard double-glazed windows.

5.1.6 Based on the measured levels stated above it is considered that the proposed residential development will not place any unreasonable constraints on the neighbouring commercial uses, and is therefore in keeping with the aims of Paragraph 187 of the NPPF.

6 Summary and Conclusions

6.1.1 A noise impact assessment has been undertaken for the proposed residential care home at Land to the East of Alexandra Drive, Former Ravenhead Social Club, St Helens, WA10 3UJ.

6.1.2 The noise environment at the subject site is controlled by local road traffic, with some low-level noise noted from the neighbouring factory site. Measured levels were not above a level that would be expected to lead to adverse impact.

6.1.3 It is expected the amenity of the future care home residents will be achieved as internal and external noise levels are below guidance criteria without the need for any mitigation other than standard double-glazed windows.

Appendix A – Abbreviations and Definitions

Sound Pressure Level (L_p)
The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$L_p = 20 \log_{10}(p/p_o)$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_o = reference sound pressure (20 µPa).

A-weighting
A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$
The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$
The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$
The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$
The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})
The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)
Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix B – Noise Measurement Positions

Appendix C

DIAMOND ENVIRONMENTAL LTD (JANUARY 2002) ENVIRONMENTAL NOISE SURVEY. KNAUFALCOPOR LTD. RAVENHEAD.

DIAMOND
Environmental Ltd

ENVIRONMENTAL NOISE SURVEY

KNAUFALCOPOR LTD

RAVENHEAD

JANUARY/FEBRUARY 2002

Date : 28 August 1998

Our Ref : 1787Rav

Prepared for :

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1 INTRODUCTION

Diamond Environmental Ltd undertook an environmental noise survey including day and night-time measurements at various positions on and off KnaufAlcopor's Ravenhead site. The survey aimed to provide a noise profile of the factory for the site's Integrated Pollution Prevention and Control (IPPC) application.

The measurement positions were chosen in order to provide a representative noise profile of the works and to include assessments of particular noise sources which may impact on the surrounding residential areas. Figure 1 shows a plan of the site/surrounding areas and illustrates the positions where noise measurements were taken.

The daytime measurements were undertaken on the 24th January, 13th February and the 2nd April, the night-time survey on 14th February. The site-work was undertaken by Andrew Silvester. 2002

2 SURVEY METHODOLOY

Prior to carrying out the noise measurements, initial observations of the weather conditions were made including wind speed/direction, temperature and cloud cover etc. Noise levels would then be assessed providing that the wind speed was below 5 m/s and there was no heavy rain.

A Cirrus CR:831A Type 1 Integrating sound level meter (mounted on a tripod) was used to measure L_{eq} and L_{90} at selected positions around the site boundary and at four points off-site (positions 3,4,10 & 11). The meter was calibrated before and after the survey using a Cirrus CR: 513A acoustic calibrator and was set to read in A weighted decibels [dB(A)].

At the end of each measurement period, the L_{eq} and L_{90} were noted and recorded. Following the survey, the data was downloaded from the noise meter onto a laptop computer and summary charts and tables were produced. The positions are indicated on Figure 1, and the results are given in Tables 1, 2 and 3. Graphs showing the time histories for each measurement position have been appended.

3 DISCUSSION

At positions 1,2,3 & 4 the noise generated by the site was barely audible and the measured levels were largely due to other sources, predominantly road traffic. During the daytime measurements position 1 was also affected by construction work on an adjacent factory and position 3 at Rochester Gardens was affected by a loudspeaker radio operated by one of the residents who began some DIY activity in his garage.

The results from Positions 5 and 6 were dominated by the noise generated by the Ceil Coat Plant and during the daytime L_{eq}s of 57 and 59 dB(A) respectively, were measured. Night-time levels were found to be slightly lower at 52 and 56 dB(A). More detailed measurements of the noise generated by the Ceil Coat Plant are shown in Table 3. It was noted that there are some residential houses (Factory Row) running along the south side of the site which could be affected by this particular noise source.

As one would expect, the noise climate at position 7 was dominated by noise from the Furnace Plant and stack. Day and night-time L_{eq}s were found to be 67 and 65 dB(A) respectively. Although these are among the higher levels measured, it was noted that there were no residential properties nearby which were likely to be affected by these sources.

Position 8, next to the commercial entrance/exit yielded a daytime L_{eq} of 60 dB(A) and a night-time L_{eq} of 55 dB(A). During the day tankers/trucks regularly passed through this gate and these vehicles were the main source of noise. The night-time measurement was indicative of the general background noise produced by the site and included contributions from the BOC gas installation and intermittent blower noise from the Batch Plant.

An L_{eq} of 72 dB(A) was obtained at position 9. This was attributable to the two tankers which blew into the Batch Plant using the site blowers during the measurement period. During the night-time measurement (51 dB(A)) there were no tankers but there was significant noise generated by the plastic flaps covering the rear doorway to the Batch Plant.

Measurement positions 10 and 11 were indicative of the noise levels encountered on the nearby housing estate to the north of the site (The Shires). During the daytime, position 10 yielded an L_{eq} of 58 dB(A) and during this reading two tankers were blowing into the Batch Plant (using the Batch blowers). Position 11, on top of the embankment between The Shires and the Batch Plant, an L_{eq} of 59 dB(A) was obtained during the blowing of material from one tanker into the Batch Plant. Towards the end of the blowing in procedure the drivers tended to strike the tankers with a hammer, this created peak noise levels of approximately 75 dB(A).

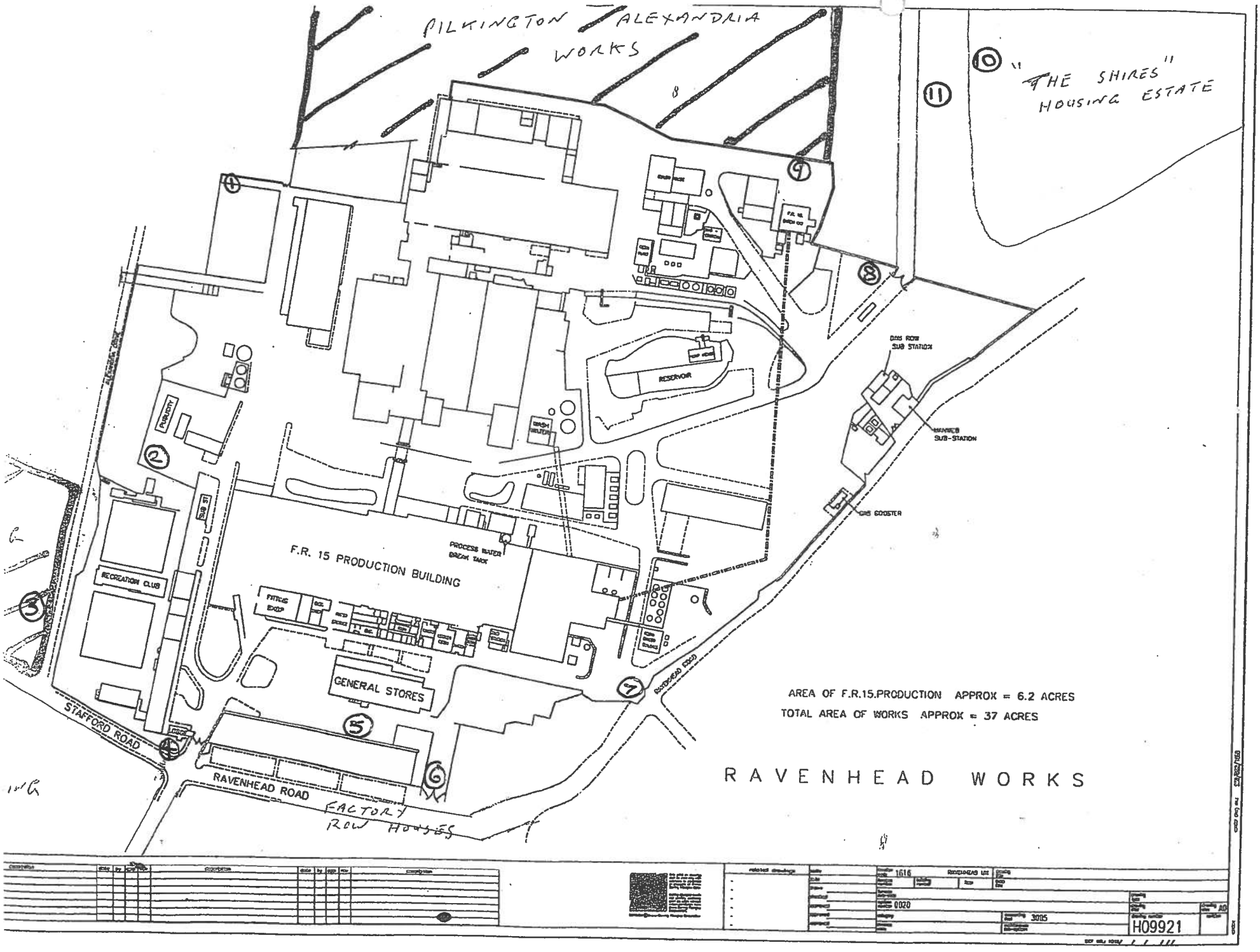
Another significant noise source at this point was the passing of HGVs on the road behind The Shires. Noise levels peaked at around 80 dB(A) as the trucks passed the measurement location. It was noted that a noise level of approximately 54 dB(A) was measured at position 11 when there were no tankers unloading at the Batch Plant or any trucks/tankers passing on the exit road from the site.

GLOSSARY

L_{eq} Equivalent continuous noise level. A measure of average noise level over a period of time. Takes into account variations in noise such as impacts, cyclic changes etc.

L_{90} The noise level exceeded during 90% of the measurement period

Figure 1 - Map Showing Noise Measurements Positions


PILKINGTON ALEXANDRIA WORKS
"THE SHIRES" HOUSING ESTATE
RESERVOIR
DAS ROW SUB STATION
MANWEB SUB-STATION
GAS BOOSTER
PURIFIERS
SUB ST
RECREATION CLUB
F.R. 15 PRODUCTION BUILDING
PROCESS WATER BREAK TANK
FITTERS EXCEP
GENERAL STORES
STAFFORD ROAD
RAVENHEAD ROAD
FACTORY ROW HOUSES
AREA OF F.R.15.PRODUCTION APPROX = 6.2 ACRES
TOTAL AREA OF WORKS APPROX = 37 ACRES
RAVENHEAD WORKS
H09921

Environmental/Operating Conditions and Equipment Details KnaufAlcopor Limited, Ravenhead.

Daytime Noise Measurements (24/01/02)

Weather Conditions

Dry; Some Cloud; Temp = 5 ^{0}C.
North Westerly Wind; Speed < 4 m/s.

Equipment Details

Cirrus CR:831A Type 1 integrating sound level meter fitted with wind shield. Mounted on a tripod, approximately 1.2 metres above ground level.

Cirrus CR: 513A acoustic calibrator.

Production Details

Normal operation.

Daytime Noise Measurements (13/02/02)

Weather Conditions

Dry; Cloudy ; Temp = 8 ^{0}C.
North Easterly Wind; Speed < 4 m/s.

Equipment Details

Cirrus CR:831A Type 1 integrating sound level meter fitted with wind shield. Mounted on a tripod, approximately 1.2 metres above ground level.

Cirrus CR: 513A acoustic calibrator.

Production Details

Normal operation. HD Line not running (not thought to affect results).

Daytime Noise Measurements (02/04/02)

Weather Conditions

Dry; Cloudy ; Temp = 9 ^{0}C.
North Easterly Wind; Speed < 1 m/s.

Equipment Details

Cirrus CR:831A Type 1 integrating sound level meter fitted with wind shield. Mounted on a tripod, approximately 1.2 metres above ground level.

Cirrus CR: 513A acoustic calibrator.

Production Details

Normal operation. Main Line not running (not thought to affect results).

Night-time Noise Measurements (14/02/02)

Weather Conditions

Dry; Clear Sky ; Temp = 2^{0}C.
Northerly Wind; Speed < 2 m/s.

Equipment Details

Cirrus CR:831A Type 1 integrating sound level meter fitted with wind shield. Mounted on a tripod, approximately 1.2 metres above ground level.

Cirrus CR: 513A acoustic calibrator.

Production Details

Normal operation.

Table 1 - Daytime Noise Measurements (24/01/02, 13/02/02 & 02/04/02)
KnaufAlcopor Limited, Ravenhead.

Position	Location	Date	Measurement Time	L_{eq} dB(A)	L_{90} dB(A)	Comments
1	Northwest corner of site - trailer park/warehouse area.	24/01	14:30 - 15:30	59	54	Noise from site not audible. Noise generated by construction work on adjacent factory.
2	West side of site. Corner of Laboratory car park.	24/01	15:36 - 16:36	51	48	Off site road traffic heard in distance. Occasional alarms and on site traffic evident.
3	Residential area to west of site - Rochester Gardens cul de sac.	13/02	13:31 - 14:37	56	47	Noise from site barely audible. Local resident began DIY activity, including use of a loudspeaker radio at 14:00.
4	Southwest of site. Corner of the turn in to the gatehouse.	13/02	14:45 - 15:46	64	50	Noise from site not audible above the noise generated by passing road traffic on Ravenhead Road.
5	South side of site. Car Park at rear of Factory Row houses.	24/01	13:08 - 14:08	57	55	Continuous noise heard from Ceil Coat Plant. 3 cars pass on car park. Distant traffic noise heard.
6	South side of site. End of Factory Row houses, next to old gatehouse.	13/02	16:12 - 17:12	59	57	Noise from Ceil Coat Plant audible. Noise heard from neighbouring factory unit. Some passing traffic on Ravenhead Road.
6	South side of site. End of Factory Row houses, next to old gatehouse.	02/04	11:04 - 11:19	58	54	
7	Southeast side of site. Corner of site close to the Binder Plant.	24/01	12:01 - 13:01	67	65	Continuous noise from plant audible. Dominated by noise from furnace plant and stack.
8	Northeast boundary. Next to commercial entrance/exit gate.	13/02	12:23 - 13:23	60	53	Seven lorries/tankers passed during measurement period. Noise from Tankers blowing in at Batch Plant audible. Some noise from adjacent factory evident.

Position	Location	Date	Measurement Time	L_{eq} dB(A)	L_{90} dB(A)	Comments
9	North side of site. Batch plant boundary.	24/01	9:47 - 10:47	72	64	Main noise source was two tankers blowing in to Batch Plant silos. Continuous noise heard from Batch Plant.
10	Residential area to Northeast of site. The Shires.	13/02	11:15 - 12:15	58	51	Noise generated by two tankers blowing into batch plant silos audible. Peaks due to passing vehicles.
11	Northeast of site. On top of embankment between batch plant and The Shires.	02/04	12:45 - 13:45	59	52	Noise generated by one tanker using batch plant blower. Peaks due to HGVs entering/exiting site. Noise level after blowing in completed was approx. 52 dB(A).

Table 2 - Night Time Noise Measurements (14/02/02) KnaufAlcopor Limited, Ravenhead.

Position	Location	Measurement Time	L_{eq} dB(A)	L_{90} dB(A)	Comments
1	Northwest corner of site - trailor park/warehouse area.	01:20 - 01:35	44	42	Noise from site not audible. Off site traffic noise evident.
2	West side of site. Corner of Laboratory car park.	01:39 - 01:54	49	48	Nearby truck cabin generated audible hum. Peaks due to warehouse activity in loading bay. Noise from plant audible.
3	Residential area to west of site - Rochester Gardens cul de sac.	04:40 - 04:55	40	37	Noise from site barely audible. Distant traffic noise heard.
4	Southwest of site. Corner of the turn in to the gatehouse.	04:16 - 04:31	46	41	Faint noise from site audible. Road traffic heard in distance. Peak due to passing vehicle on Ravenhead Road.
5	South side of site. Car Park at rear of Factory Row houses.	02:00 - 02:15	52	51	Continuous noise heard from Ceil Coat Plant.
6	South side of site. End of Factory Row houses, next to old gatehouse.	02:20 - 02:35	56	54	Noise from Ceil Coat Plant audible. Some passing traffic on Ravenhead Road.
7	Southeast side of site. Corner of site close to the Binder Plant.	02:40 - 02:55	65	65	Continuous noise from plant audible. Dominated by noise from furnace plant and stack.
8	Northeast boundary. Next to commercial entrance/exit gate.	03:33 - 03:48	55	53	Intermittent noise from Batch Plant blowers audible. Some noise from adjacent factory evident. Gas installation plant (BOC) audible.
9	North side of site. Batch plant boundary.	03:55 - 04:10	51	47	Intermittent noise from Batch Plant blowers audible. Some noise generated by plastic flaps covering rear doorway to Batch Plant.
10	Residential area to Northeast of site. The Shires.	03:05 - 03:20	48	44	Faint noise heard from site. Peak due to passing vehicle.

Table 3 - Noise Levels Generated by Ceil Coat Plant (02/04/02 - Daytime)

KnaufAlcopor Limited, Ravenhead.

Position	Location	Measurement Time	L_{eq} dB(A)	L_{90} dB(A)	Comments
A	1 metre from Ceil Coat Plant.	11:20 - 11:35	83	82	Continuous broad-band noise generated by Ceil Coat Plant.
B	10 metres from Ceil Coat Plant.	11:40 - 11:55	76	75	Continuous broad-band noise generated by Ceil Coat Plant
6	South side of site. End of Factory Row houses, next to old gatehouse.	11:58 - 12:13	58	54	Noise from Ceil Coats audible. Noise heard from neighbouring factory unit. Some passing traffic on Ravenhead Road.

Graphs Showing Daytime Results

Note to Diamond Environmental Sound Survey.

Please note that the time history charts for some of the positions discussed in the report were not in the original Diamond Environmental Report due to problems that they experienced down loading the data from the monitoring equipment.

KnaufAlcopor
Ravenhead Insulation Plant

Position 3 - Rochester Gardens (Daytime)

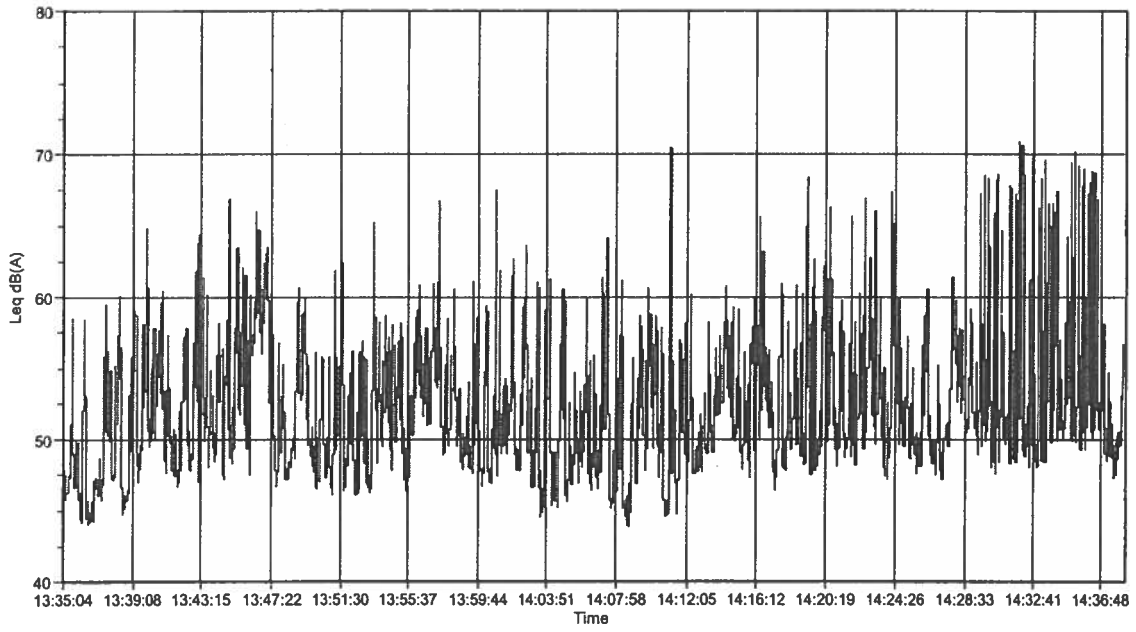
Noise Measurement Report

Date: 13/02/02 Time: 13:35:04

Run Time: 01:00:00
Range: 20-80 dB

Leq 55.9^dBA
Lepd 46.9^dBA
LAFTeq 63.0 dBA
LAFmax 76.0^dBA
Peak 88.8^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
67.6^dBA	57.6^dBA	50.9^dBA	46.9^dBA	45.9^dBA	44.5^dBA



Notes:

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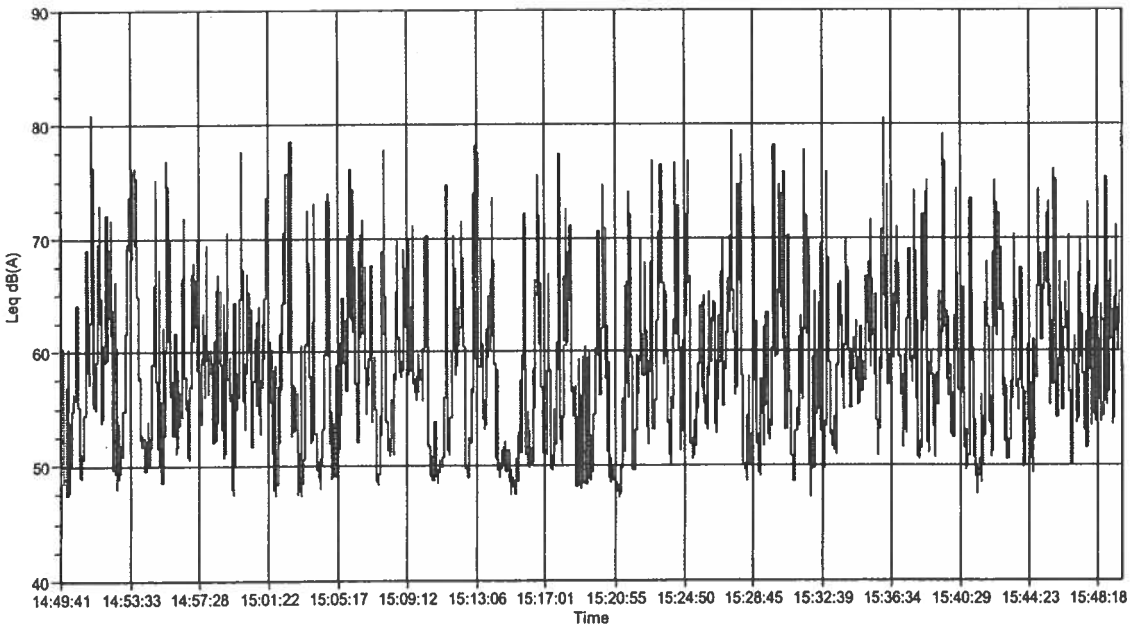
Position 4 - Turn-in to Gatehouse (Daytime)

Date: 13/02/02 Time: 14:49:41

Run Time: 01:00:00
Range: 20-80 dB

Leq	64.4^dBA
Lepd	55.4^dBA
LAFTeq	69.7 dBA
LAFmax	82.1^dBA
Peak	90.7^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
76.1^dBA	67.7^dBA	57.8^dBA	49.7^dBA	48.8^dBA	47.7^dBA



Notes:

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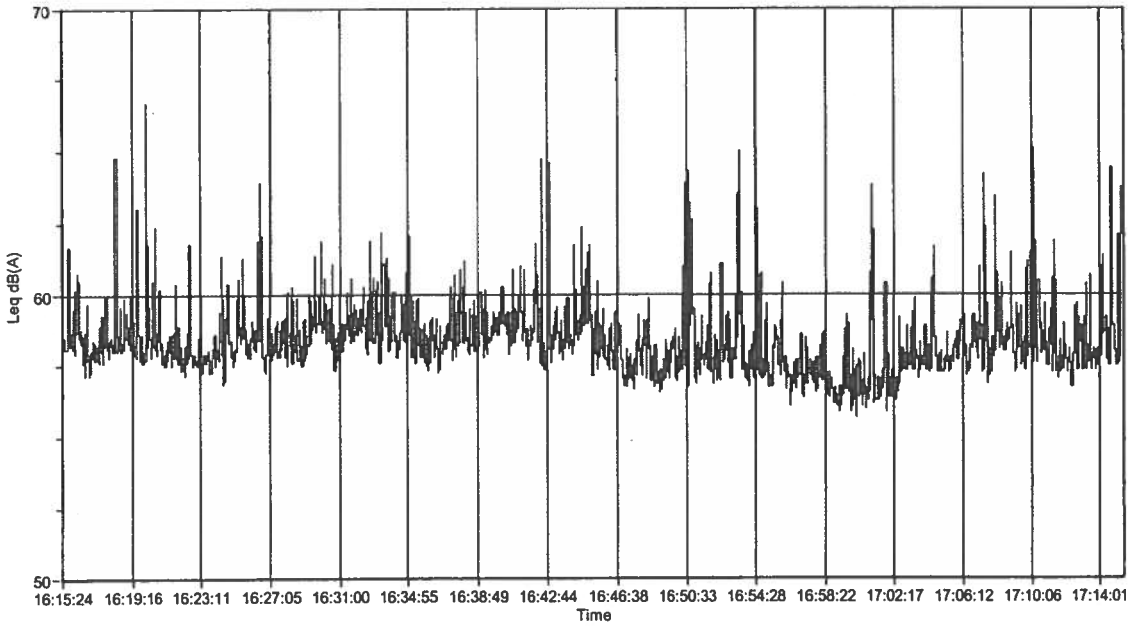
Position 6 - End of Factory Row, Old Gatehouse (Daytime)

Date: 13/02/02 Time: 16:15:24

Run Time: 01:00:00
Range: 20-80 dB

Leq	58.5^dBA
Lepd	49.5^dBA
LAFTeq	60.6 dBA
LAFmax	71.6^dBA
Peak	89.1^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
62.2^dBA	59.3^dBA	57.9^dBA	56.9^dBA	56.6^dBA	56.0^dBA



Notes:

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Position 6 - Repeat Measurement, Old Gatehouse (Table 3, Daytime)

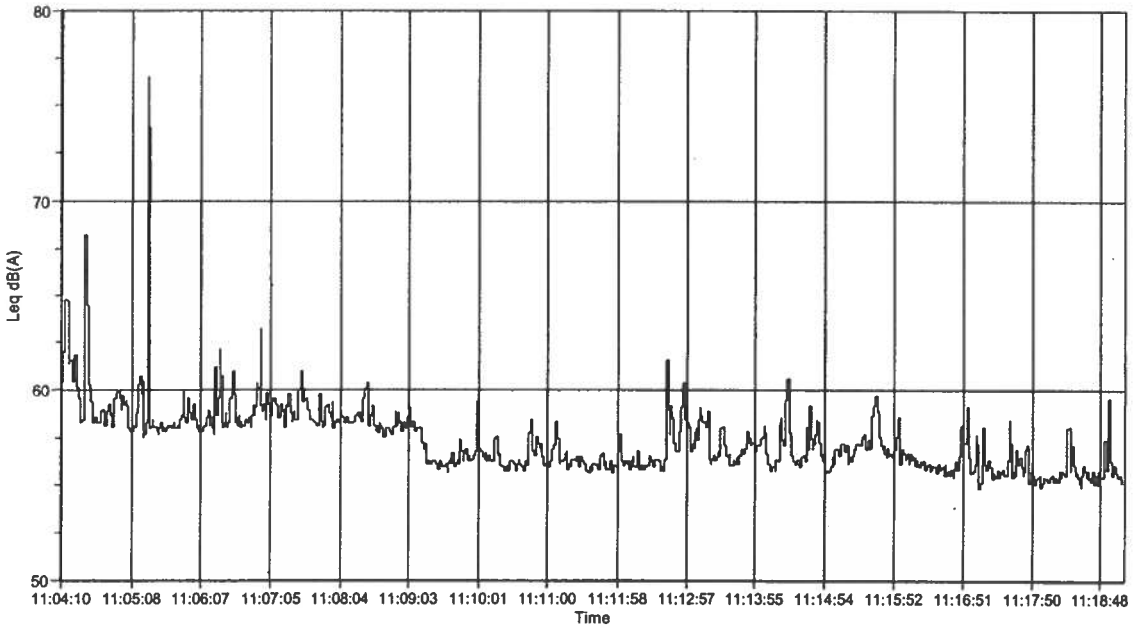
Noise Measurement Report

Date: 02/04/02 Time: 1 :04:10

Run Time: 00:15:00
Range: 40-100 dB

Leq	58.3 dBA
Lepd	43.2 dBA
LAFTeq	61.5 dBA
LAFmax	78.9 dBA
Peak	93.1 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
54.9 dBA	54.8 dBA	54.5 dBA	54.0 dBA	53.9 dBA	53.9 dBA



Notes: old gate house

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Position 8 - Northeast Commercial Entrance/Exit (Daytime)

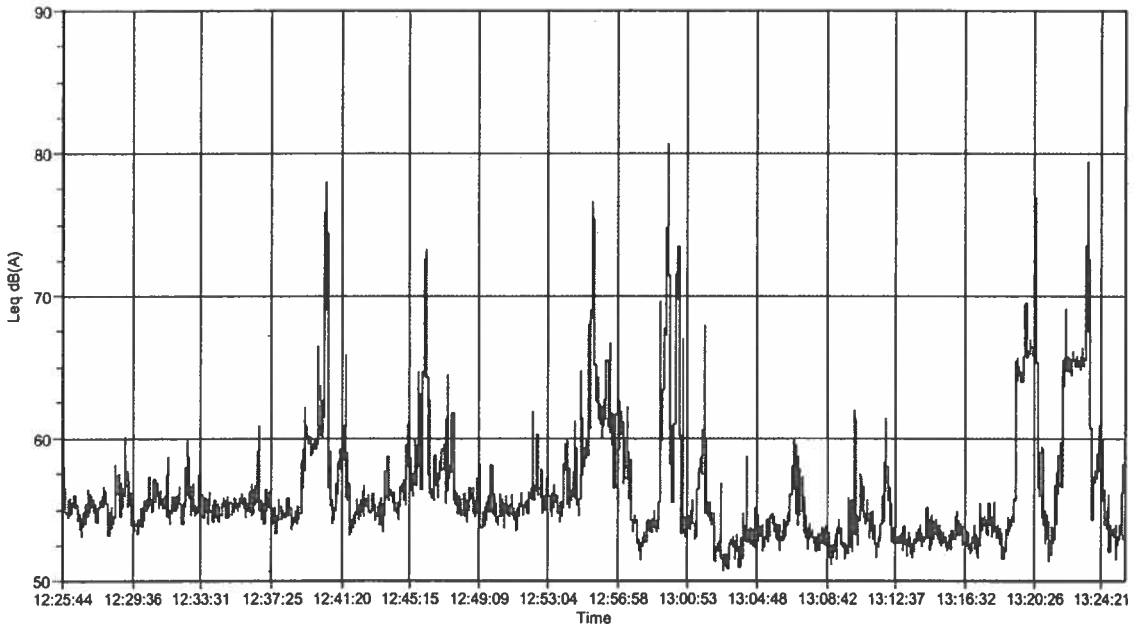
Noise Measurement Report

Date: 13/02/02 Time: 12:25:44

Run Time: 01:00:00
Range: 20-80 dB

Leq	60.4^dBA
Lepd	51.4^dBA
LAFTeq	64.3 dBA
LAFmax	82.0^dBA
Peak	89.6^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
72.4^dBA	60.8^dBA	54.9^dBA	52.6^dBA	52.1^dBA	51.3^dBA



Notes:

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Position 10 - The Shires (Daytime)

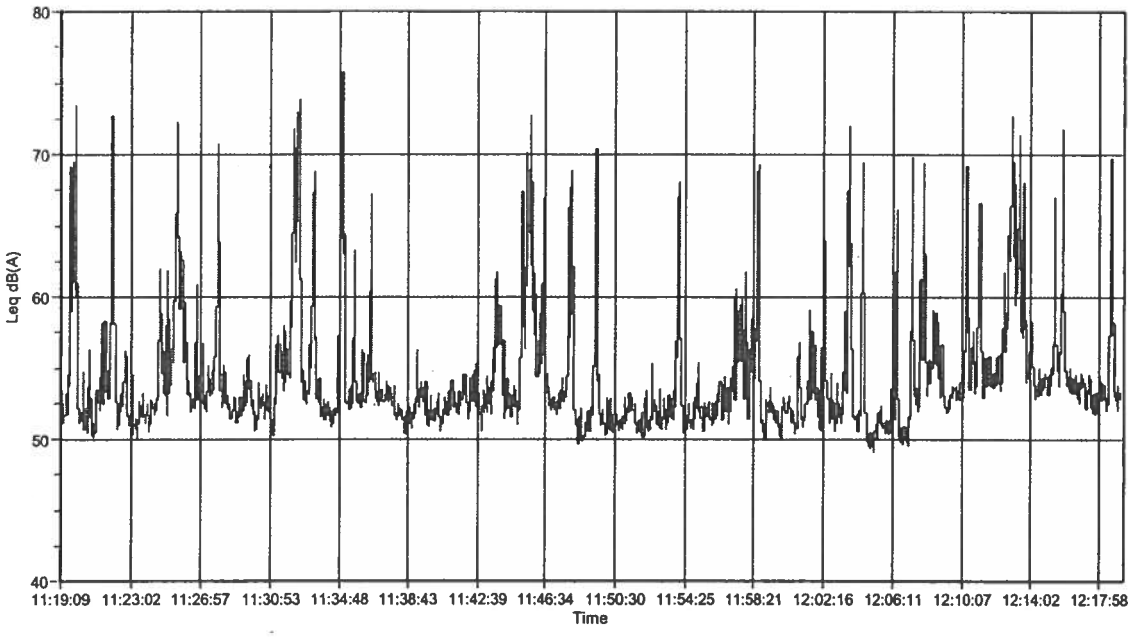
Noise Measurement Report

Date: 13/02/02 Time: 11:19:09

Run Time: 01:00:00
Range: 20-80 dB

Leq	57.8^dBA
Lepd	48.8^dBA
LAFTeq	61.8 dBA
LAFmax	77.1^dBA
Peak	89.9^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
69.4^dBA	59.3^dBA	52.8^dBA	50.8^dBA	50.4^dBA	49.7^dBA



Notes:

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Position 11 - On the top of the Embankment (Daytime)

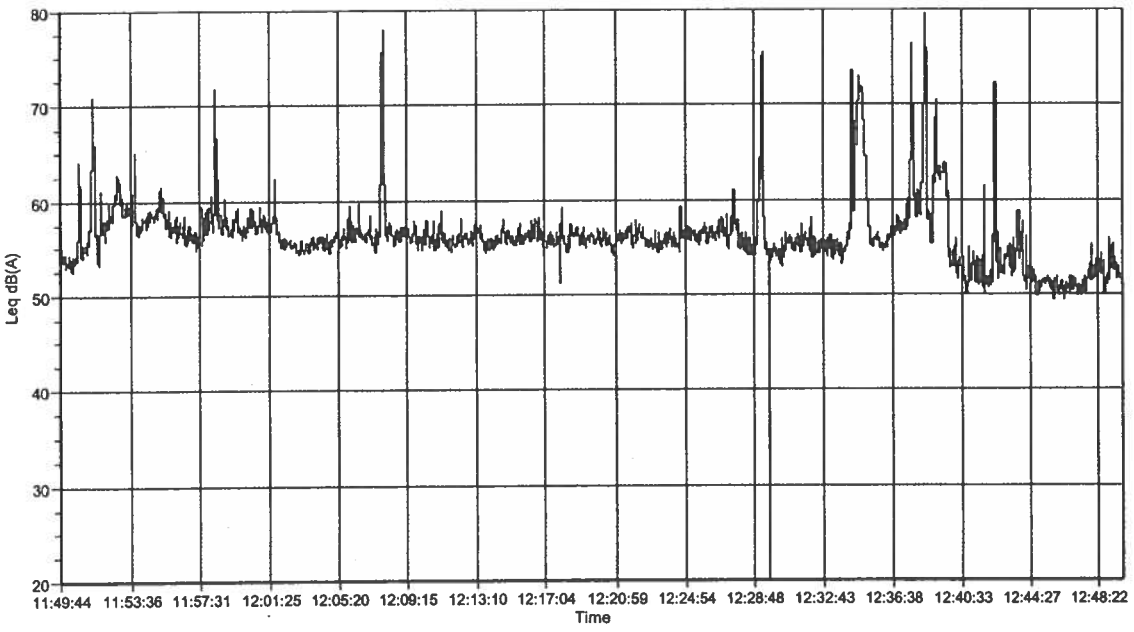
Noise Measurement Report

Date: 02/04/02 Time: 1 :49:44

Run Time: 01:00:00
Range: 40-100 dB

Leq	59.3 dBA
Lepd	50.2 dBA
LAFTeq	61.6 dBA
LAFmax	79.9 dBA
Peak	96.3 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
58.2 dBA	57.0 dBA	55.2 dBA	51.9 dBA	50.8 dBA	49.9 dBA



Notes: the shires

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Position A - One metre from Ceil Coats (Daytime)

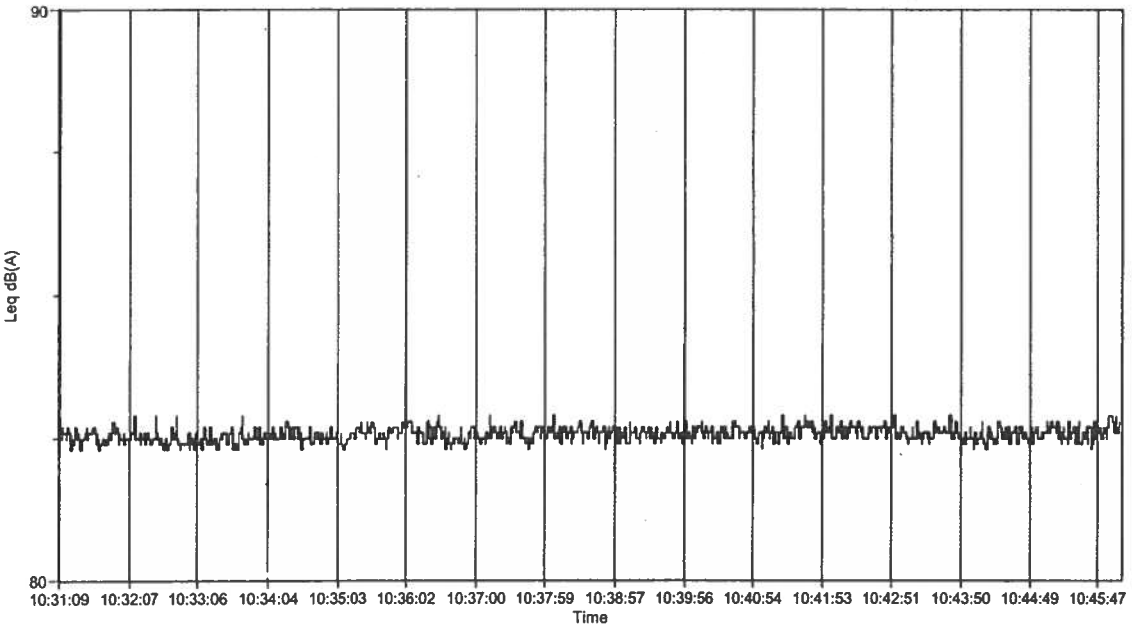
Noise Measurement Report

Date: 02/04/02 Time: 10:31:09

Run Time: 00:15:00
Range: 40-100 dB

Leq	82.6 dBA
Lepd	67.5 dBA
LAFTeq	82.6 dBA
LAFmax	83.2 dBA
Peak	102.1 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
82.9 dBA	82.7 dBA	82.5 dBA	82.2 dBA	82.1 dBA	82.0 dBA



Notes: 1 metre from ceil coat

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Position B - Ten metres from Ceil Coats (Daytime)

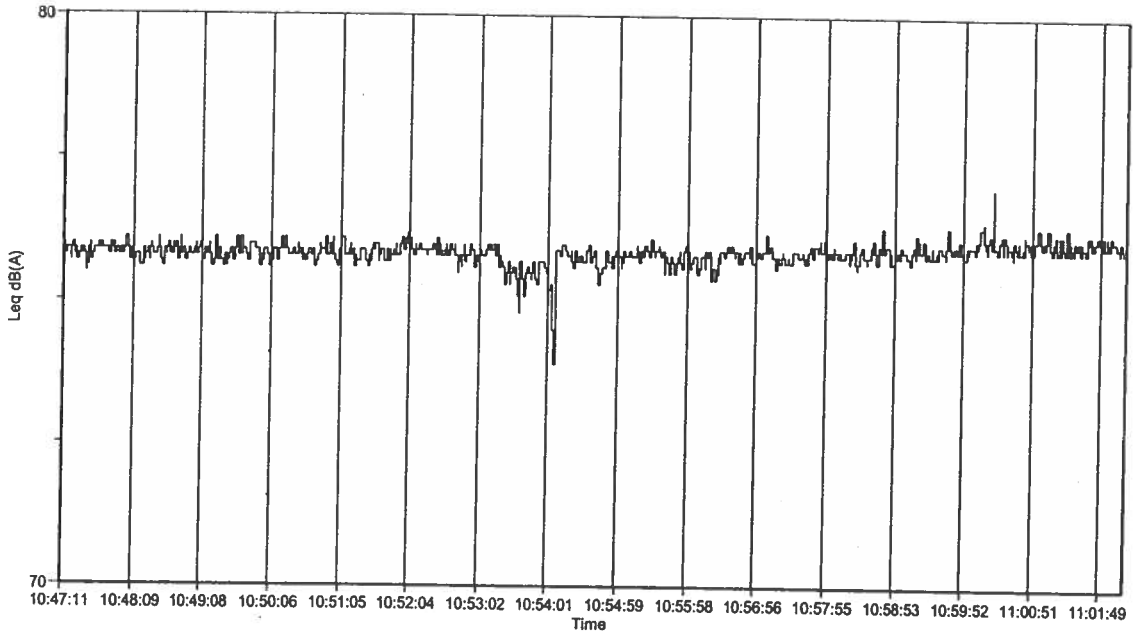
Noise Measurement Report

Date: 02/04/02 Time: 1..:47:11

Run Time: 00:15:00
Range: 40-100 dB

Leq	75.9 dBA
Lepd	60.9 dBA
LAFTeq	75.9 dBA
LAFmax	77.7 dBA
Peak	95.2 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
76.2 dBA	75.9 dBA	75.6 dBA	75.3 dBA	75.2 dBA	74.9 dBA



Notes: 10 metres from ceil coat

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Graphs Showing Night-time Results

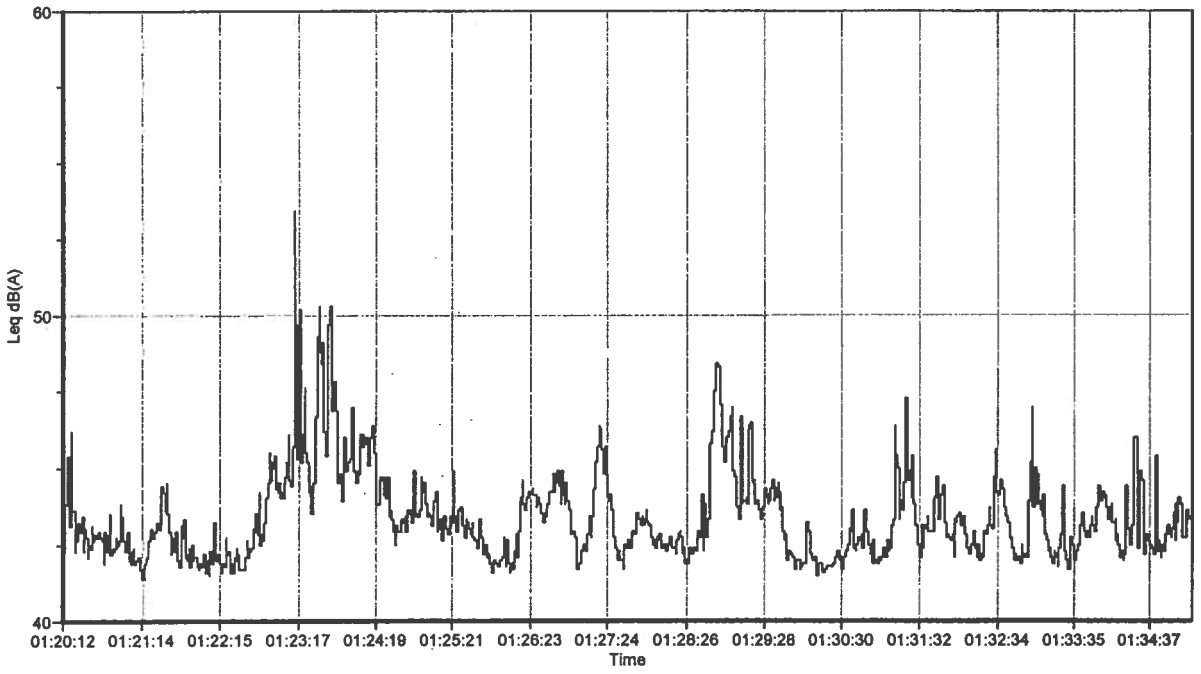
Position 1 - Trailor Park/Warehouse Area

Date: 14/02/02 Time: 01:20:12

Run Time: 00:15:00
Range: 20-80 dB

Leq	43.7 dBA
Lepd	28.7 dBA
LAFTeq	45.5 dBA
LAFmax	54.4 dBA
Peak	84.0 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
48.4 dBA	44.9 dBA	42.6 dBA	41.6 dBA	41.4 dBA	41.2 dBA



Notes:

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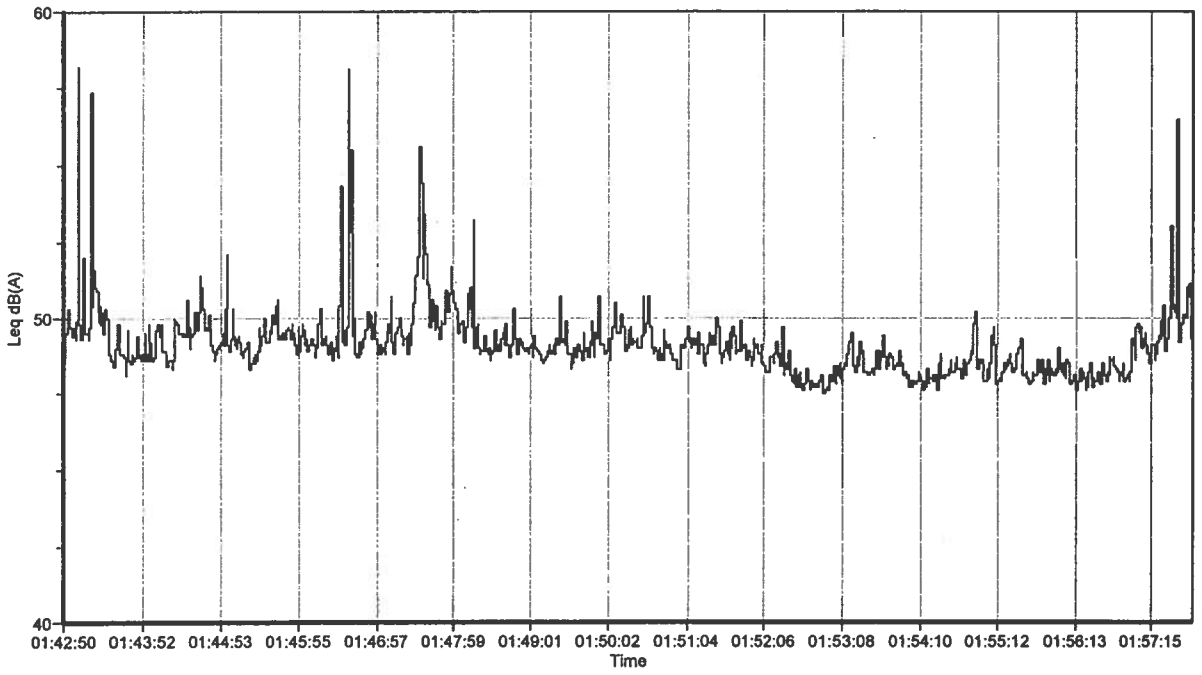
Position 2 - Laboratory Car Park

Date: 14/02/02 Time: 01:42:50

Run Time: 00:15:00
Range: 20-80 dB

Leq	49.4 dBA
Lepd	34.3 dBA
LAFTeq	51.9 dBA
LAFmax	64.6 dBA
Peak	86.1 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
52.3 dBA	49.8 dBA	48.6 dBA	47.7 dBA	47.5 dBA	47.3 dBA



Notes:

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Position 3 - Rochester Gardens

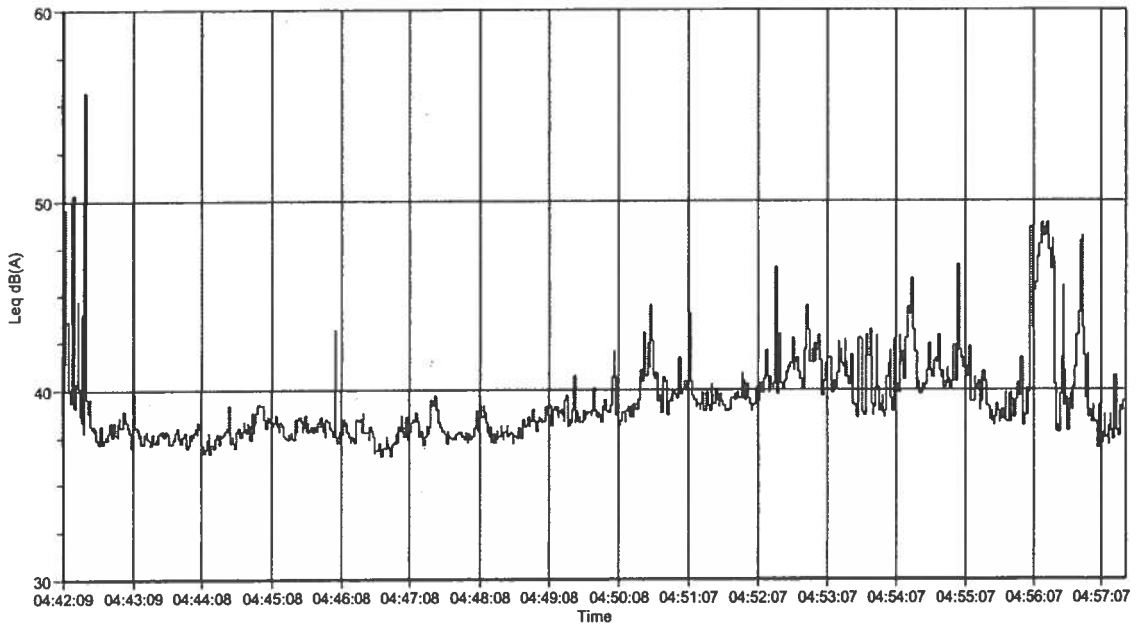
Noise Measurement Report

Date: 14/02/02 Time: 04:42:09

Run Time: 00:15:00
Range: 20-80 dB

Leq	40.2^dBA
Lepd	25.1^dBA
LAFTeq	45.6 dBA
LAFmax	63.9^dBA
Peak	84.3^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
46.4^dBA	41.2^dBA	38.3^dBA	36.9^dBA	36.7^dBA	36.3^dBA



Notes:

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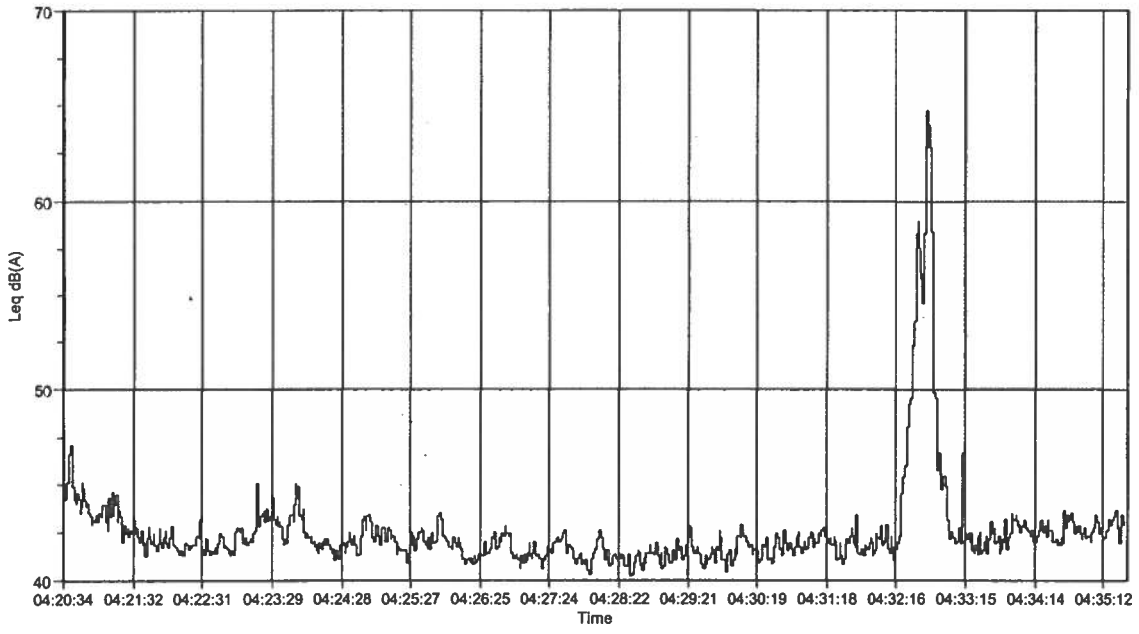
Position 4 - Turn-in to Gatehouse

Date: 14/02/02 Time: 04:20:34

Run Time: 00:15:00
Range: 20-80 dB

Leq	46.0 dBA
Lepd	30.9 dBA
LAFTeq	49.3 dBA
LAFmax	67.4 dBA
Peak	86.7 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
56.2 dBA	43.3 dBA	41.8 dBA	40.8 dBA	40.5 dBA	40.2 dBA



Notes:

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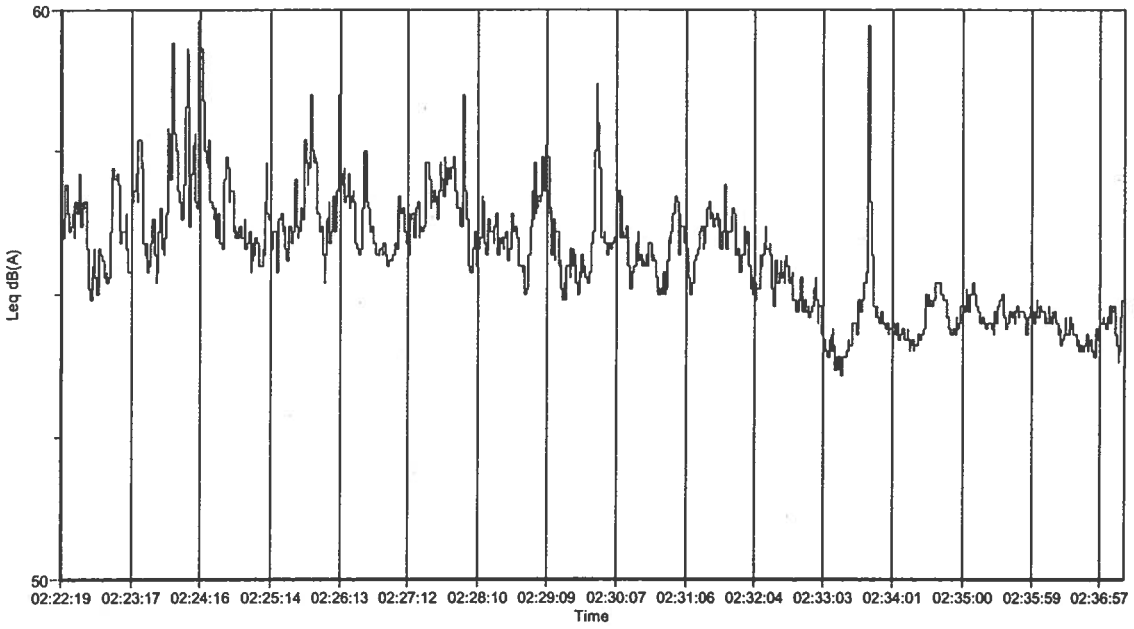
Position 5 - Car Park at rear of Factory Row

Date: 14/02/02 Time: 02:22:19

Run Time: 00:15:00
Range: 20-80 dB

Leq	55.9 dBA
Lepd	40.8 dBA
LAFTeq	56.2 dBA
LAFmax	60.2 dBA
Peak	85.2 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
58.4 dBA	56.7 dBA	55.5 dBA	54.1 dBA	53.9 dBA	53.6 dBA



Notes:

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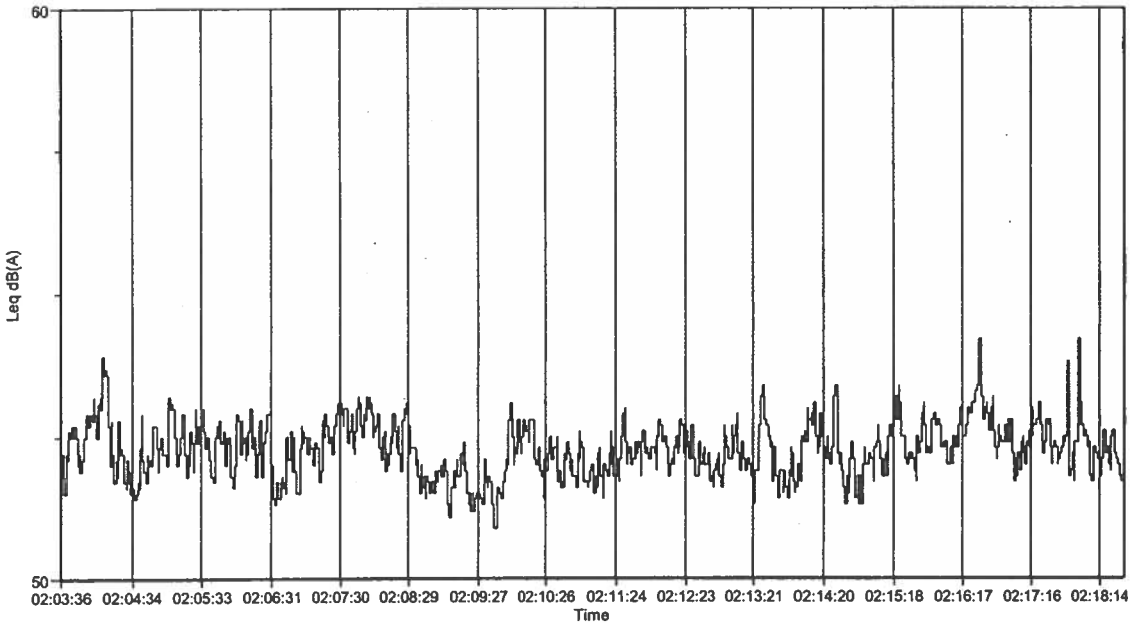
Position 6 - End of Factory Row (Old Gatehouse)

Date: 14/02/02 Time: 02:03:36

Run Time: 00:15:00
Range: 20-80 dB

Leq	52.3 dBA
Lepd	37.3 dBA
LAFTeq	52.7 dBA
LAFmax	56.5 dBA
Peak	84.3 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
53.3 dBA	52.7 dBA	52.0 dBA	51.3 dBA	51.2 dBA	50.9 dBA



Notes:

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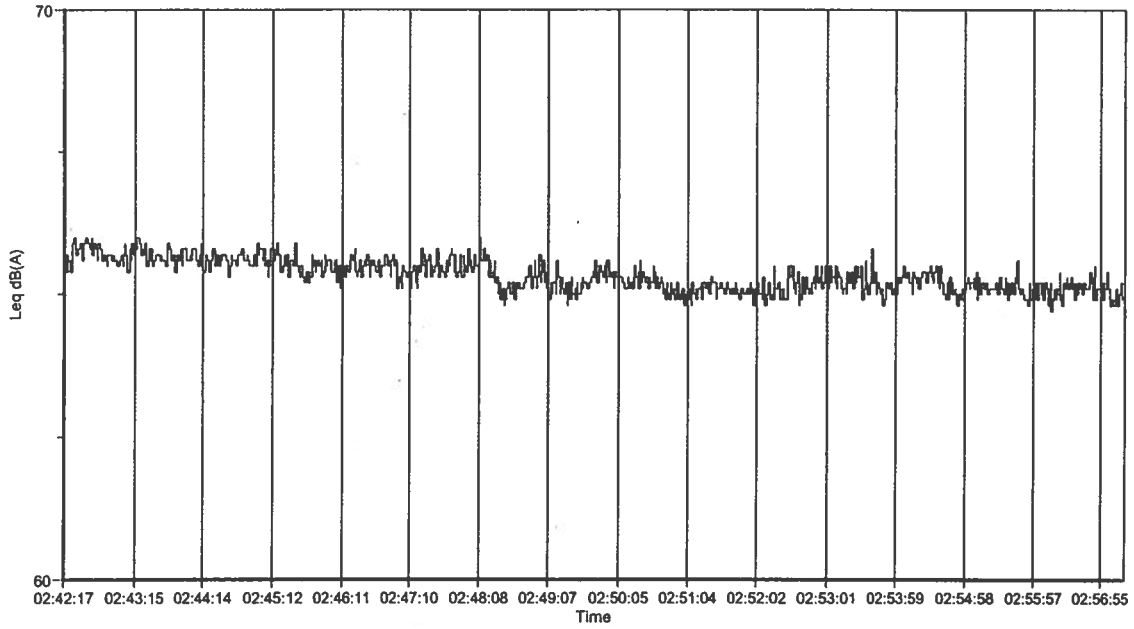
Position 7 - Southeast Boundary (Binder Plant)

Date: 14/02/02 Time: 02:42:17

Run Time: 00:15:00
Range: 20-80 dB

Leq	65.4 dBA
Lepd	50.3 dBA
LAFTeq	65.7 dBA
LAFmax	67.5 dBA
Peak	88.2 dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
66.1 dBA	65.8 dBA	65.3 dBA	64.9 dBA	64.8 dBA	64.6 dBA



Notes:

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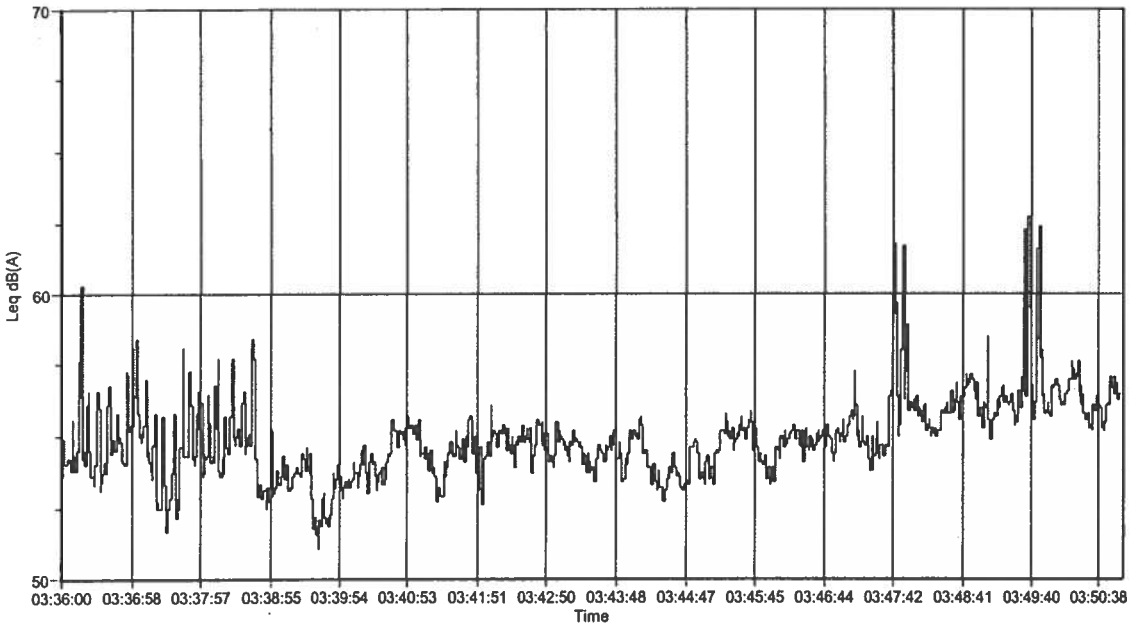
Position 8 - Northeast Commercial Entrance/Exit (Night-time)

Date: 14/02/02 Time: 03:36:00

Run Time: 00:15:00
Range: 20-80 dB

Leq	55.2^dBA
Lepd	40.2^dBA
LAFTeq	57.4 dBA
LAFmax	67.4^dBA
Peak	86.6^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
59.3^dBA	56.3^dBA	54.5^dBA	53.1^dBA	52.6^dBA	51.7^dBA



Notes:

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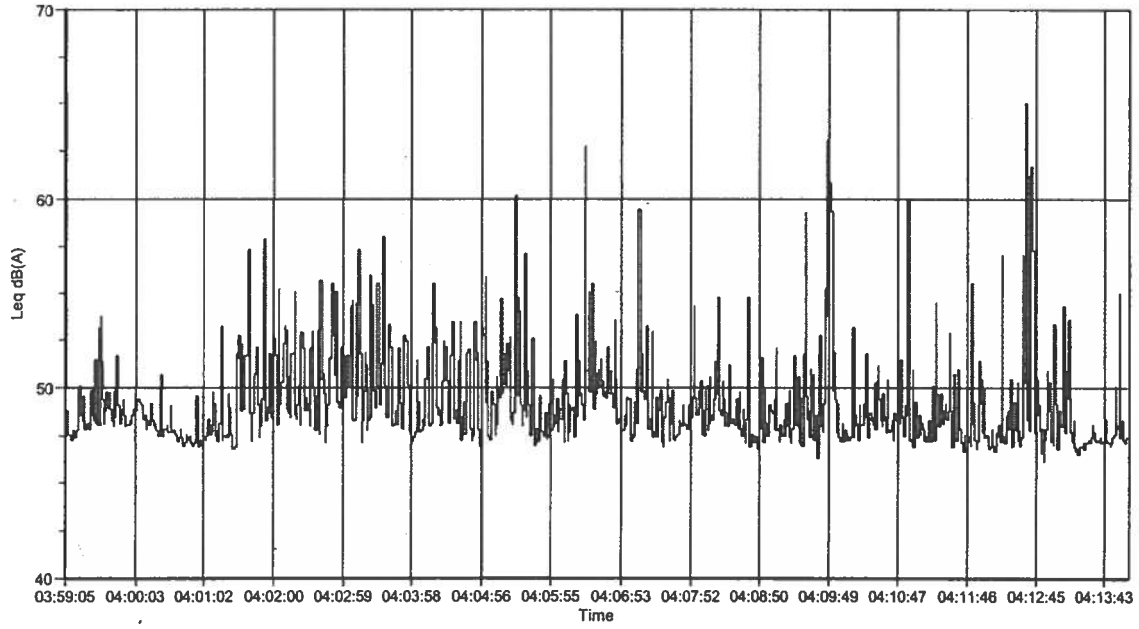
Position 9 - North Boundary (Batch Plant)

Date: 14/02/02 Time: 03:59:05

Run Time: 00:15:00
Range: 20-80 dB

Leq	50.6^dBA
Lepd	35.5^dBA
LAFTeq	58.5 dBA
LAFmax	71.1^dBA
Peak	85.8^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
57.9^dBA	51.8^dBA	47.9^dBA	46.8^dBA	46.5^dBA	46.1^dBA



Notes:

Printed: 27/03/02 10:33:09

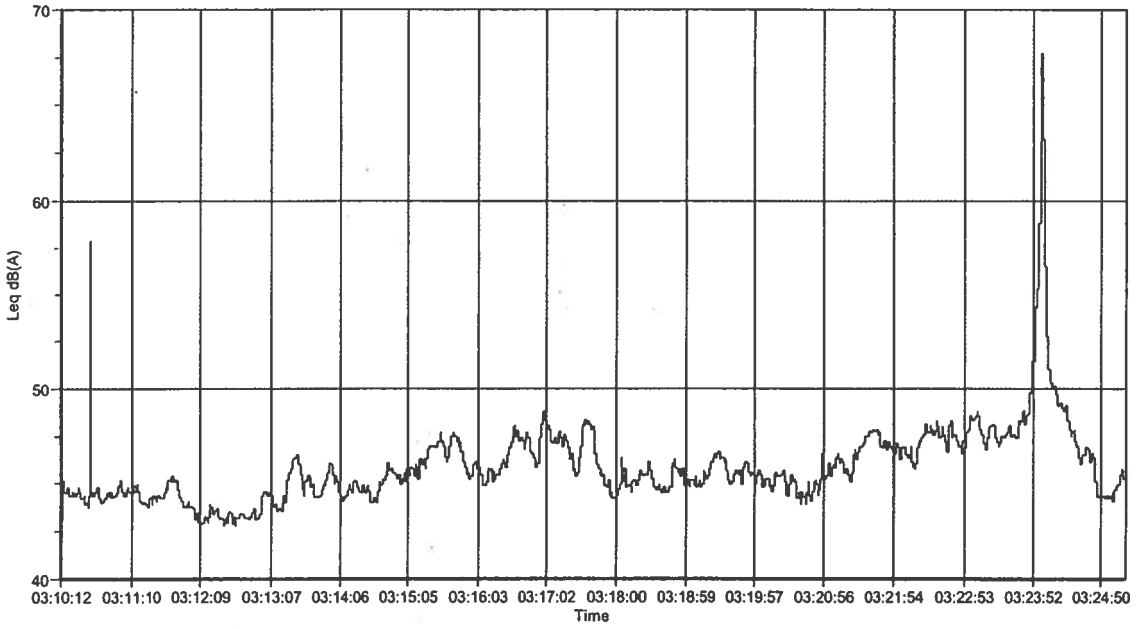
Position 10 - The Shires

Date: 14/02/02 Time: 03:10:12

Run Time: 00:15:00
Range: 20-80 dB

Leq	47.5^dBA
Lepd	32.5^dBA
LAFTeq	50.5 dBA
LAFmax	68.9^dBA
Peak	83.8^dBC

L1.0	L10.0	L50.0	L90.0	L95.0	L99.0
51.9^dBA	47.6^dBA	45.2^dBA	43.7^dBA	43.1^dBA	42.5^dBA



Notes:

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