A specialist energy consultancy

Noise Level Survey

Rover Way, Celsa Site

Celsa Group

14381-001-R0
20 August 2021

COMMERCIAL IN CONFIDENCE

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APPENDICES

1 Introduction

TNEI have been commissioned by Celsa Group Ltd to undertake a noise survey and assessment for submission to Natural Resources Wales (NRW). The survey is required to satisfy the noise related requirements of Environmental Permit EPR/TP3639BH (the Permit) for processes occurring within the Celsa site off Rover Way, Cardiff.

The Permit has been subject to a recent variation (V009 (May 2020)) to account for the inclusion of new permitted processes, namely Asphalt Plant and Slag Processing.

1.1 Noise Related Permit Conditions

The Permit contains two ongoing noise related conditions. Conditions 3.4.1 and 3.4.2 state:

- *"Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration."*
- *"The operator shall:*

a. *if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to noise and vibration, submit to Natural Resources Wales for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;*

b. *implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales."*

There are no immediate actions required to satisfy these conditions, however, the Permit Variation also additional requirements that are to be met through an *'Improvement Programme'*.

1.2 Improvement Programme Requirements

Table S1.3 of the Permit sets out the Improvement Programme and Reference IC8 of that programme sets out the noise requirements. This is detailed in Table 1-1:

Table 1-1: IC8 of Permit Table S1.3 Improvement Programme Requirements

Reference	Requirement	Date
IC8	Following completion of the asphalt plant and integrated scrap metal recycling centre, the Operator shall undertake noise monitoring at the nearest sensitive receptors. This shall include: • A full noise monitoring survey and assessment meeting the BS4142:2014 standard including details of local conditions e.g. meteorological conditions (wind direction). • 1/3rd octave and narrow band (FFT) measurements to identify any tonal elements or low frequency noise. • Reference to the World Health Organisation guidelines for community noise. • Reference to Noise Action Plan for Wales 2018-2023. Upon completion of the work, a written report shall be submitted to Natural Resources Wales. If rating levels likely to cause complaints or disturbance at sensitive receptors are detected as a result of the installation operation, the report shall include an assessment of the most suitable abatement techniques, an estimate of the cost and a proposed timetable for their installation.	Within 6 months of issue of variation V009, or as otherwise agreed in writing by Natural Resources Wales

In order to meet the above requirements, this report aims to;

- Quantify the operational sound levels at the nearest Noise Sensitive Receptor (NSR) locations, whilst the permitted processes are being carried out;
- Compare the measured sound levels against previously measured sound levels (TNEI, 2019) to determine any change in site-wide noise level output;
- Present a quantitative assessment, comparing the measured levels to guideline levels set by the World Health Organization (WHO);
- Undertake a noise character assessment, including identification of tonality; and,
- Where possible, present a BS 4142 assessment.

1.3 Nomenclature

Please note the following terms and definitions, which are used throughout this report:

- Emission refers to the sound level emitted from a sound source, expressed as either a sound power level or a sound pressure level;
- Immission refers to the sound pressure level received at a specific location from a sound source(s);
- SPL indicates the sound pressure level in decibels (dB);
- NML refers to any location where baseline sound levels have been measured (Noise Monitoring Location); and,
- NSRs are all identified receptors which are sensitive to noise (Noise Sensitive Receptors).

Unless otherwise stated, all noise levels refer to free field levels i.e. noise levels without influence from any nearby reflective surfaces.

In the interest of clarity, a Glossary of Terms is provided as Appendix A.

All Figures can be found in Appendix D.

All grid coordinates refer to the Ordnance Survey grid using Eastings and Northings.

2 Celsa Site Summary

2.1 Description of Operations

The Celsa site consists primarily of two areas of operation; one located to the north and the other to the south of Rover Way. A site layout is included in Appendix B that shows the location of the processes. The northern section of the site consists primarily of the Tremorfa Melt Shop, whilst the southern section of the site is used for slag crushing and screening, asphalt production and metal recycling operations.

2.2 Operational Times

Much of the site can operate on both weekdays and weekends. Both the Tremorfa Melt shop and the Metal Recycling site have the potential to operate 24 hours a day, seven days a week, although the Metal Recycling site is limited in terms of the amount of waste material it can process per day and as such currently only operates during the daytime. The slag crushing operations are limited to the hours of 07:00 to 17:00 and the Asphalt Plant is limited to the hours of 06:00 to 17:00.

2.3 Study Area

NSRs are properties, that are sensitive to noise and, therefore, require protection from nearby noise sources. Figure 1 included in Appendix D details the closest identified NSRs, which are all residential receptors.

The Study Area has been defined through the identification of the closest NSRs to the development. Specifically, the study area considers the closest NSRs only, on the assumption that if noise levels are within acceptable levels at the closest receptors, then it is reasonable to assume they will also be acceptable at more distant locations.

Three groups of residential NSRs have been identified. These are:

- NSR Group 1 - Residential properties to North of Celsa site on Willows Avenue
- NSR Group 2 - Residential properties to North/North East on Greenbay Road/Hind Close
- NSR Group 3 - Residential properties located within the traveller site to the east on Rover Way

3 Assessment Methodology

The following section considers each of the four requirements of the Improvement Program in turn, as detailed in Table 1-1, namely;

- Noise monitoring survey and BS 4142 assessment;
- Tonal analysis;
- Reference to WHO guideline noise levels; and,
- Reference to Noise Action plan for Wales 2018-2023.

3.1 Noise Monitoring Survey

BS 4142:2014 +A1:2019 '*Methods for Rating and Assessing Industrial and Commercial Sound*' is commonly used to assess the impacts of sound sources on nearby residential receptors. It is classed as a 'context' based assessment as it considers the existing noise environment at the receptors in the absence of the assessed sound source (whereas other assessment methods simply compare the assessed sound level to a set of fixed limits).

The assessment is based on the predicted or measured levels of a sound source compared to the measured background sound levels without the sound source present and uses, *"outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident".*

Specifically, the assessment is made by subtracting the measured background sound level from a calculated or measured 'Rating Level'.

BS 4142 uses the following definitions;

Ambient Sound: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far. Described using the metric, $L_{Aeq\ (t)}$.

Specific Sound Level: Equivalent continuous A-weighted sound pressure level (SPL) produced by the specific sound source at the assessment location over a given reference time interval, *Tr*. Described using the metric $L_{Aeq\ (t)}$. Also referred to in this report as the *Immission Level*.

Residual Sound Level: Equivalent continuous A-weighted SPL of the residual sound without the specific sound source(s) present at the assessment location over a given time interval, *T*. Described using the metric $L_{Aeq\ (t)}$.

Background Sound Level: A-weighted SPL that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*, measured using time weighting *F* and quoted to the nearest whole number of decibels. Described using the metric $L_{A90\ (t)}$.

Rating Level: The Specific Sound Level adjusted for the characteristics of the sound. The Rating Level is calculated by adding a penalty or penalties (if required) to the Specific Sound Level when the sound source contains audible characteristics such as tonal, impulsive or intermittent components. Described using the metric, $L_{Aeq\ (t)}$.

In order to establish the background sound level it is necessary to monitor noise levels in the absence of the sound source concerned. The simplest method to do this is to switch off the sound sources for part of the survey period. Unfortunately, due to the size of the Celsa site, the number of sound sources and the site's operational hours, this is not possible.

Alternative methods to establish a background sound level for a BS 4124 assessment are;

- Monitor background noise levels at proxy locations representative of the likely noise environment at the nearest NSRs, free from influence of noise from the Celsa site; or
- Monitor background sound levels during time periods when plant is not operational, for example weekends or night-time/early morning periods.

If neither option is available, then a BS 4142 assessment is not possible and alternative methods of assessment are required. In this case, alternative methods of assessment could be;

- Comparison of measured sound levels to pressure level surveys undertaken prior to the start of the permitted processes related to the asphalt plant, slag crushing and metal recycling;
- Comparison to fixed noise level limits, as opposed to context-based limits; or,
- A qualitative assessment based on subjective observations made on site.

3.2 Tonal Analysis

BS 4142 presents three methods for tonal analysis: one subjective method and two objective methods. The subjective method can be used when the surveyor is present for the survey or through listening to audio recordings where the source of any dominant noise is clear. A tonal penalty should be added to the measured noise level, as follows;

- 2 dB where tonality is just perceptible;
- 4 dB where tonality is clearly perceptible;
- 6 dB where tonality is highly perceptible;

The two objective methods for determining the presence of a tone in BS 4142 are the 'One Third Octave Method' and the 'Reference Method'. Typically, the One Third Octave Method is used, with the Reference Method only used if the presence of tones is in dispute.

The One Third Octave method tests for the presence of a tone by comparing the (L_{ZeqT}) SPL for a particular frequency with adjacent one-third-octave bands. For a tone to be identified the time-averaged SPL in the one-third-octave band of interest is required to exceed the time-averaged SPLs of both adjacent one-third-octave bands by the following thresholds:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in middle-frequency one-third-octave bands (160 Hz to 400 Hz);
- 5 dB in high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

3.3 WHO Guidelines for Community Noise

In contrast to BS 4142, the World Health Organisation (WHO) provides a method of benchmark assessment. The '*Guidelines for Community Noise: 1999'* and '*Night Noise Guidelines for Europe: 2009*' recommend noise levels regardless of the current noise environment for urban and semi-urban areas.

The WHO suggest suitable noise levels for both outdoor and indoor living areas during the daytime and night-time and advise on the minimum noise levels before critical health effects, including annoyance, occur. These noise levels are set regardless of the noise type/source.

Similarly, BS 8233 '*Guidance on sound insulation and noise reduction for buildings'* presents guideline noise levels for daytime and night-time periods for a number of different building types; for residential developments these are based on the WHO levels.

Table 4 of BS 8233, represented here as Table 3-1, details single figure (dBA), guideline internal noise limit values for dwellings.

Table 3-1: Indoor ambient noise levels for dwellings (*BS8233:2014 Table 4*)

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

The WHO guidance (1999) suggests that an allowance of 15 dBA for the attenuation of a partially open window is reasonable to convert between internal and external noise levels and limits. Therefore, an assessment of internal noise levels can assume an external noise level limit of 15 dB above those values detailed within Table 3-1 i.e. to achieve the internal night-time guideline level of 30 dB $L_{Aeq(8hour)}$ with windows open the external noise level must not exceed 45dB $L_{Aeq(8hour)}$.

The WHO guidance also provides daytime guideline values for annoyance of 50 or 55 dBA, below which the majority of the adult population will be protected from becoming moderately or seriously annoyed, respectively. These guideline levels can be applied to garden and amenity areas.

3.4 Noise and Soundscape Action Plan for Wales 2018–2023

The Welsh Government, in 2018, published the Noise and Soundscape Action Plan 2018–2023 (NSAP), which outlines the Welsh public sector's strategic policy direction in relation to noise and soundscape management.

With regards to industrial noise the NSAP explains how noise from major industrial sources is regulated by Natural Resources Wales (NRW) through the Environmental Permitting Regulations 2016 (EPR). Paragraph 8.2.5 states;

"Under EPR, noise is regulated through the use of standard noise conditions and each site's environmental management plan, rather than through the use of specific limits. This provides greater flexibility for adaptation to a changing soundscape."

It is assumed that through meeting the requirements of the Permit's Improvement Plan i.e. NRWs approval of this report, and through ongoing compliance with Permit Conditions 3.4.1 and 3.4.2, the requirements of the NSAP will have been met.

3.5 Assessment Criteria

Considering all of the above, the assessment is made as follows:

1. Where possible, a qualitative assessment will be undertaken in accordance with BS 4142, taking into consideration the context of the development and the outcome of the quantitative assessment.
2. A comparison is made between the $L_{Aeq(15mins)}$ sound levels measured as part of the original baseline survey undertaken in 2019 and the sound levels measured in the latest 2021 survey;
3. A quantitative assessment is made against the fixed daytime and night-time guideline levels defined in BS 8233 (WHO);
4. A tonal assessment is undertaken in accordance with BS 4142, firstly applying the one third octave method and, if required, the reference method; and,

4 Sound Level Survey

An unattended sound level survey was undertaken starting at 00:00 on Friday 30th of April and continuing until the afternoon of Tuesday 4th of May 2021. Maintenance activities were occurring on the 3rd and 4th May and not all processes would have been carried out on these dates so survey data from these dates has been removed from analysis. Specifically, data has only been used between 00:00 30th April and 00:00 3rd May.

Noise monitoring equipment was installed at three Noise Monitoring Locations (NMLs) representative of the nearest NSRs. The NMLs were located as close as possible to the monitoring locations in the sound level survey undertaken by TNEI in 2019.

Because the site operates 24 hours a day it is not possible to establish background sound levels at the NMLs in the absence of Celsa activity, therefore, noise monitoring equipment was also installed at two proxy locations outside the sphere of Celsa's influence to establish background sound levels. Table 4-1 details the NMLs, which are also shown on Figure 1 (Appendix D).

Table 4-1: Noise Monitoring Locations (NMLs)

NML		Coordinates		Comments
NML01	Willows Avenue	321092	176572	Representative of closest NSRs to the North West on Willows Avenue
NML02	Rover Way	321769	176701	Representative of NSRs to the East within the traveller site on Rover Way.
NML03	Runway Road	321288	177052	Representative of closest NSRs to the North around Pengam Green and Tremorfa Park.
NML04	Cloughmore Surgery	320601	176526	Proxy location chosen to represent NSRs located close to NMLs 01 and 03
NML05	Rover Way Proxy	321701	177419	Proxy location chosen to represent NSRs located close to NML02 i.e. the Traveller Site

The equipment at NML03 was vandalised during the survey. Data collected up to23:00 on 1st of May is still valid and is used in the assessment but no data is available after this time period.

The equipment installed at NML05 was vandalised and damaged less than an hour after deployment, therefore no usable data is available from the survey to establish a background sound level for the Traveller Site.

The noise monitoring equipment at each NML consisted of a NTi Audio XL2 Sound Level Meter (SLM) fitted with an environmental windshield. All noise monitoring equipment (calibrator, SLM and microphone) used for the study are categorised as Class 1, as specified in IEC 61672-1 'Electroacoustics. Sound level meters. Specifications' (IEC, 2002). The equipment was calibrated on site at the beginning and end of the survey, with no significant deviations noted. Appendix C contains the equipment and laboratory calibration details. Each SLM was set to log in 15-minute periods and record audio throughout the survey.

Subjective observations made during installation of the equipment and by listening to audio recordings noted the following;

- At NML01, during the early morning the soundscape consists primarily of birdsong and occasional traffic passing on Seawall Road. Industrial noise (or similar) can be heard intermittently for short periods of time throughout the early morning (00:00 – 04:00). It is not known if this noise is attributable to the Celsa site as a number of other, smaller industrial units are in close proximity. From approximately 04:30, traffic flow increases on Seawall Road and continues steadily as the day progresses. Traffic noise is dominant throughout the day and industrial noise is not discernible for the majority of the time. Distant traffic noise is also audible, presumably from Rover Way to the south east.

- At NML02, the soundscape is heavily influenced by traffic noise from Rover Way from approximately 05:00 onwards, with the flow of traffic increasing as the day progresses. However, in the early morning period when the traffic is less heavy, birdsong is also audible on occasions. After approximately 06:30, it is difficult to discern any other sources of sound, as noise from passing and distant traffic is dominant. Noise emissions from the Celsa site were not identifiable at this location.

- At NML03, the soundscape consists primarily of distant traffic noise, but birdsong and nearby park and school activities were also heard. The occasional local resident movement (such as doors closing and cars starting etc) and local cars passing can be heard, as well as the occasional plane passing overhead. A dog barking could be heard on occasion. Noise emissions from the Celsa site were not identifiable at this location.

- At NML04, the soundscape consists primarily of birdsong (particularly in the early morning periods), distant and occasional local traffic, occasional trains passing by, resident movements (cars starting etc) and occasional planes passing overhead. Noise emissions from the Celsa site were not identifiable at this location, however, the influence of road traffic noise is also significantly less than at the other NMLs.

Listening to the audio recordings of each of the monitoring locations indicated that NML04 was not representative of NMLs 01, 02 and 03, therefore cannot not be used to establish a background sound level. Because of the vandalised equipment at NML05, it has not been possible to establish a background sound level at this location either.

5 Noise Impact Assessment (NIA)

It is not possible to undertake a full BS 4142 assessment as background sound levels could not be established. Therefore, the assessment of noise moves to the second stage of the assessment criteria described in Section 3.5.

The comparison between the 2019 and 2021 surveys considers only "early morning" (06:00-07:00) and daytime periods between 07:00-15:00 as the 2019 survey was not undertaken continually over 24-hours. In the 2019 survey, data was measured in 5-minute periods and reported as such, however, for the purposes of this comparison, the 2019 data has been logarithmically summed and time corrected to obtain equivalent $L_{Aeq(15\text{-}minute)}$ levels.

It should be noted that throughout the report reference to "Thursday Night" pertains to the period between 23:00 on Thursday 29th of April until 07:00 on Friday 30th of April, which coincides with the description of night-time in BS 4142 of 23:00 – 07:00. This applies similarly to "Friday night" and "Saturday night".

The daytime period is between 07:00-23:00 and hence Friday, Saturday and Sunday will be used to refer to these periods.

5.1 NML01 – Willows Avenue (Representative of NSR Group 1)

5.1.1 Comparison of $L_{Aeq(15mins)}$ Levels

Table 5-1: Comparison of 2019 and 2021 $L_{Aeq(15\text{-}minute)}$, dB, levels at NML01

Measurement Location		Measurement period											
		Weekend: Early Morning			Weekend: Daytime			Weekday: Early Morning			Weekday: Daytime		
ID	Descriptor	2019	2021	(+/-)	2019	2021	(+/-)	2019	2021	(+/-)	2019	2021	(+/-)
NML01	Willows Avenue	62	67	+5	62	68	+6	62	64	+2	64	65	+1

For all of the time periods shown, the measured 2021 noise levels at NML01 were higher than the 2019 levels and further analysis is required to determine whether this is related to an increase in noise output from the Celsa site.

5.1.2 Determination of a Specific Sound Level

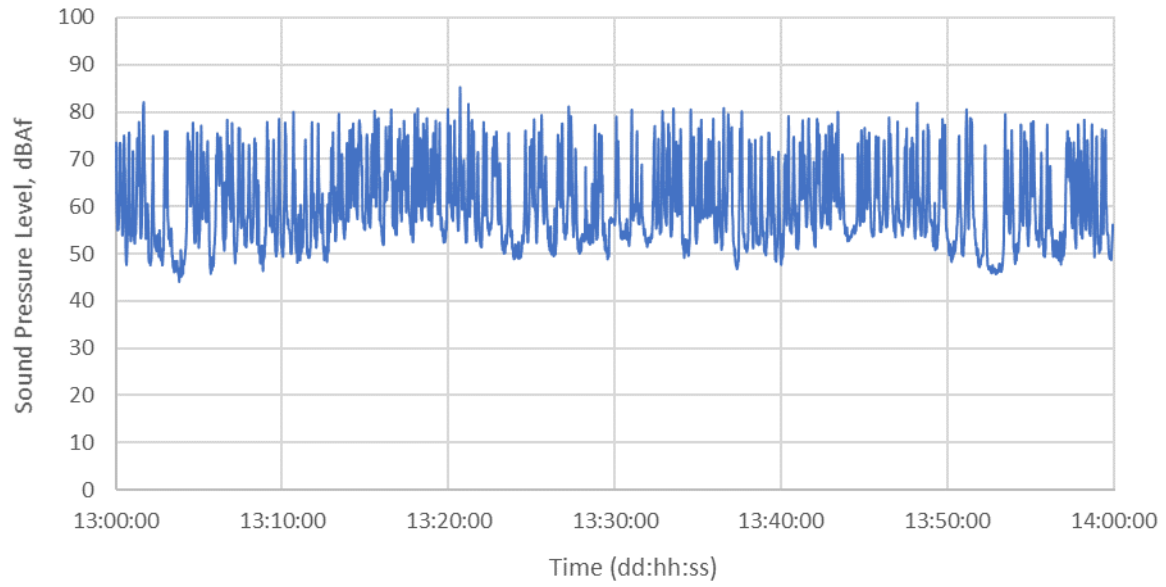
5.1.2.1 Daytime

The 2021 daytime noise levels were 67 dB $L_{Aeq\ (16\text{-}hour)}$, 66 dB $L_{Aeq\ (16\text{-}hour)}$ and 64 dB $L_{Aeq\ (16\text{-}hour)}$ for 30th April (Friday) , 1st May (Saturday) and 2nd May (Sunday) respectively, with the arithmetic mean value of 66 dB $L_{Aeq\ (16\text{-}hour)}$ representing the daytime periods (07:00-23:00) throughout the duration of the survey. Analysis of 1-second resolution noise data measured at this location across the entire survey period showed the daytime noise levels range from 41 dBA to 100 dBA.

The recorded audio files indicate the presence of industrial noise (or similar) at this location during the daytime, however, the dominant noise source was from passing road traffic. An example of the influence from road traffic is illustrated in Image 5-1, which presents a sample of the measured noise

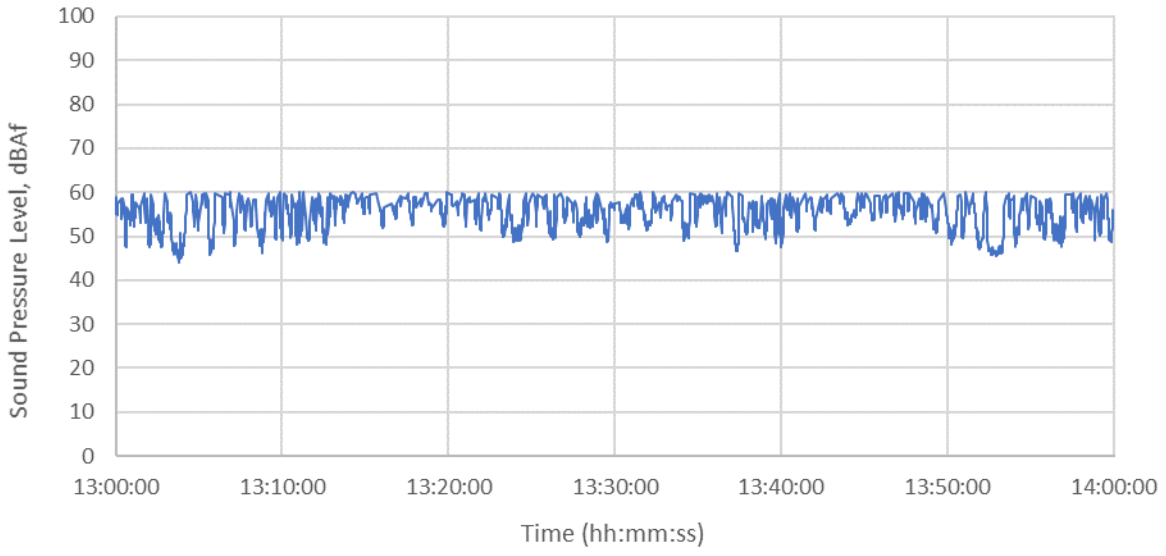
level in a time history graph for 13:00 - 14:00 Friday 30th April. This level of local road traffic noise is typical of the soundscape at this location during the daytime period for each day of the survey.

Image 5-1: NML Time History Sample, Daytime, 1 Second Resolution, dBA



Filtering of peak noise events for the same time sample, in an attempt to reduce the influence of road traffic noise, results in the graph shown as Image **5-2**. In this case, 60 dBA has been chosen as a cut off value.

Image 5-2**: NML Time History Sample, Daytime, Filtered 1 Second Resolution, dBA**



Even with filtering the time history graph still shows considerable fluctuation of noise levels, however, such fluctuations are not consistent with the noise output of the Celsa site, as observed during site visits and through listening to the audio recordings.

For the purposes of this assessment, a Specific Sound Level has been derived by arithmetic mean averaging all of the 1-second resolution noise data below the threshold of 60 dBA across the three 16-hour daytime periods. The resulting level of 53 dB has been adopted as the $L_{Aeq\ (16\text{-}hour)}$ noise immission

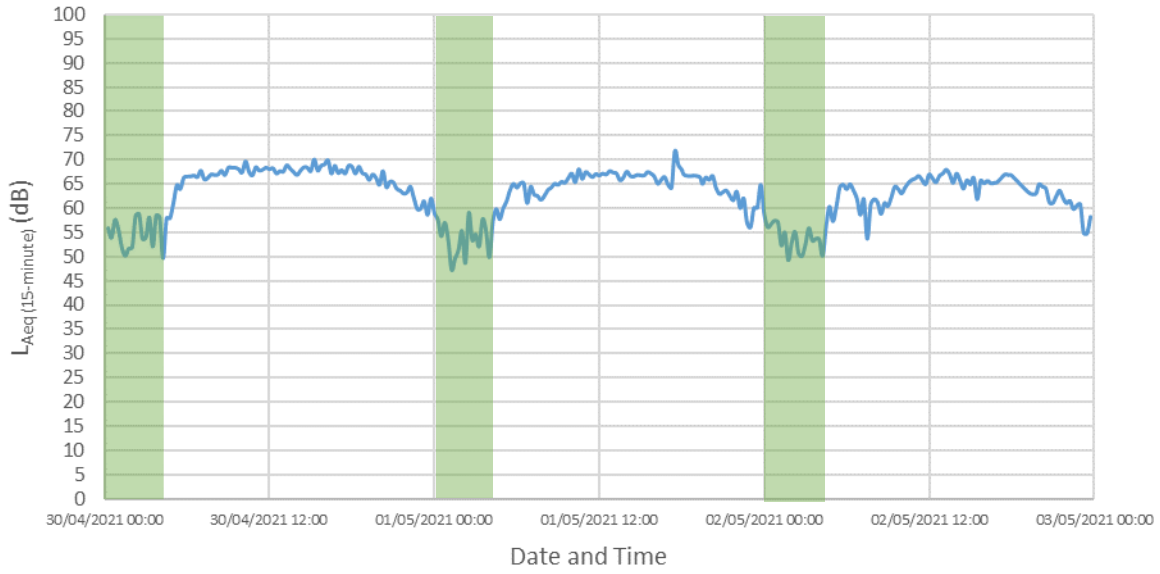
level, however, it should be noted that this is still likely an overestimate of the true daytime Specific Sound Level from the Celsa site, given the presence of other sound sources such as distant road traffic, other neighbouring industrial units and general urban noise.

5.1.2.2 Night-time

The measured night-time noise levels for Thursday, Friday and Saturday were 61 dB $L_{Aeq\ (7\text{-}hour^{1})}$, 60 dB $L_{Aeq\ (8\text{-}hour)}$ and 60 dB $L_{Aeq\ (8\text{-}hour)}$, with the arithmetic mean value of 60 dB $L_{Aeq(t)}$ representing the night-time period (23:00-07:00) across the duration of the survey. Despite traffic flows decreasing during the night-time period, road traffic noise still contributed to the overall night-time noise level, particularly between 23:00 - 00:00 and 04:00 – 07:00.

Image 5-3 shows the $L_{Aeq(15\text{-}minute)}$ time history graph across the entire duration of the survey. The green highlighted areas show the periods between 00:00-04:00 where measured noise levels are at their lowest. This is assumed to be related to a decrease in road traffic levels as well as a general reduction in urban noise during the early morning hours.

Image 5-3: LAeq(15-minute) time history graph at NML01

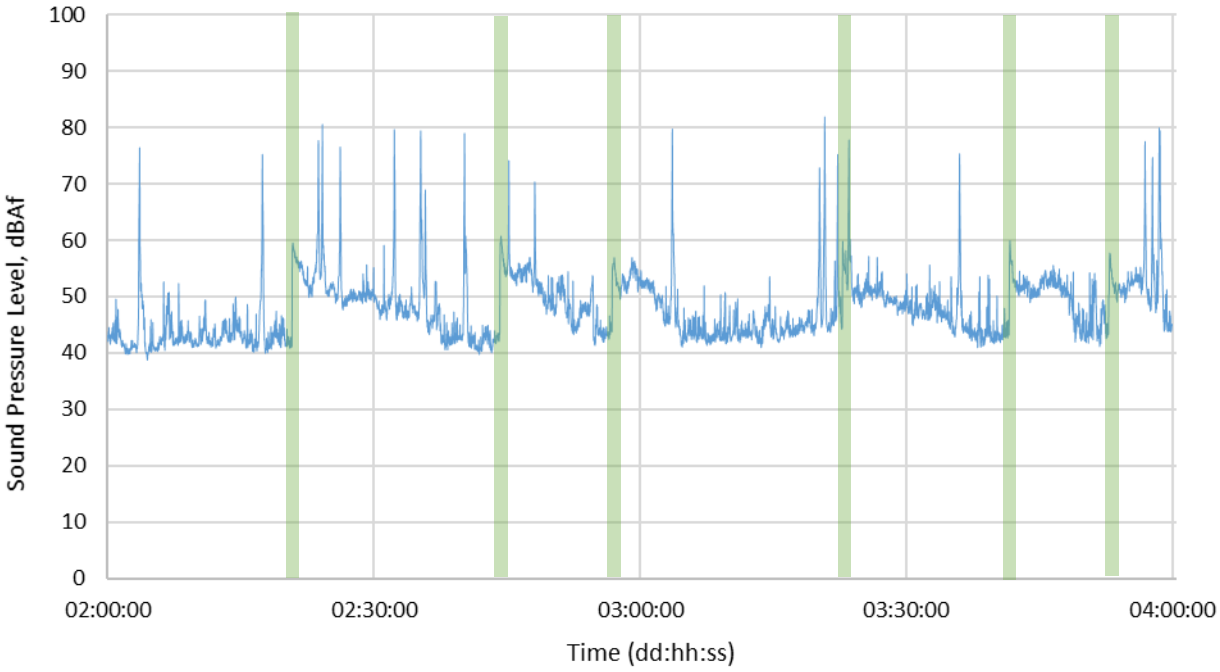


As the periods between 00:00-04:00 are those most unaffected by the influence of other noise sources, it is assumed that the measured levels during these time periods will best represent noise levels attributable to industrial activity at night. The $L_{Aeq\ (15\text{-}minute)}$ noise levels measured between 00:00-04:00 for each day were logarithmically time corrected to obtain equivalent 8-hour levels. This resulted in levels of 53 dB $L_{Aeq\ (8\text{-}hour)}$, 52 dB $L_{Aeq\ (8\text{-}hour)}$ and 52 dB $L_{Aeq\ (8\text{-}hour)}$ for Thursday, Friday and Saturday respectively, with the arithmetic mean average level being 52 dB $L_{Aeq\ (8\text{-}hour)}$.

It should be noted that the presence of an intermittent sound source has affected overall noise levels and an example of this for a two-hour period between 02:00-04:00 on Friday 30th of April is displayed in Image 5-4:

[1] Shortened by 1 hour due to 00:00 survey start time

Image 5-4: Time History Graph Illustrating Intermittent Noise Level Increases (30th April, 02:00-04:00)



Listening back to the audio files confirms that the sporadic peaks of >70dBA are related to passing traffic and can be ignored, however, the regular increases in noise levels shown on the graph, (highlighted in green) are due to an item of plant periodically switching on and then slowly reducing in noise output. This is noticeable between 00:00 until 04:00 across all three night-time periods for approximately 10-20 minutes at a time. When the plant switches on, the SPLs are seen to increase from a level of approximately 40 to 45 dBA to approximately 60 dBA. Although this intermittent plant operation may be occurring outside these times periods, other noise sources, such as road traffic, would mask this noise level variation.

It is hard to discern from the audio what type of plant is causing the noise or whether it emanates from the Celsa site. It is noted that several other industrial units are located nearby on Seawall Road that could also be the source of the noise and further investigation is recommended.

Reviewing the 1 second time history data between 00:00 and 04:00 suggests that industrial noise levels would be in the region of 43 dB $L_{Aeq\ (8\text{-}hour)}$, as opposed to 52 dB $L_{Aeq\ (8\text{-}hour)}$ in the absence of the intermittent sound source,.

5.1.3 NML01 Summary of Specific Sound Levels

The assumed Specific Sound Level at NML01 is 53 dB $L_{Aeq(16\text{-}hour)}$ during the daytime and 52 dB $L_{Aeq(8\text{-}hour)}$ at night.

During the night-time, an item of plant has been identified that operates intermittently, which periodically increases the noise levels. If this item of plant is discounted from the measurements, then the night-time Specific Sound Level is likely to reduce to approximately 43 dB $L_{Aeq\ (8\text{-}hour)}$. It is not known if this noise source is associated with the Celsa site or from other premises and further investigation is recommended.

5.2 NML02 – Rover Way (Representative of NSR Group 3)

5.2.1 Comparison of $L_{Aeq(15mins)}$ Levels

Table 5-2: Comparison of 2019 and 2021 $L_{Aeq(15\text{-}minute)}$, dB, levels at NML02

Measurement Location		Measurement period											
		Weekend: Early Morning			Weekend: Daytime			Weekday: Early Morning			Weekday: Daytime		
ID	Descriptor	2019	2021	(+/-)	2019	2021	(+/-)	2019	2021	(+/-)	2019	2021	(+/-)
NML02	Rover Way	70	77	+7	74	77	+3	76	73	-3	75	75	0

For two of the assessed time periods (weekends), the measured 2021 noise levels at NML02 were higher than the 2019 levels. Further analysis is required to determine whether the higher levels are related to an increase in noise output from the Celsa site.

5.2.2 Determination of a Specific Sound Level

5.2.2.1 Daytime

The measured daytime noise levels were 76 dB $L_{Aeq\ (16\text{-}hour)}$, 75 dB $L_{Aeq\ (16\text{-}hour)}$ and 74 dB $L_{Aeq\ (16\text{-}hour)}$ for Friday, Saturday and Sunday respectively, with an arithmetic mean value of 75 dB $L_{Aeq\ (16\text{-}hour)}$ representing the daytime period (07:00-23:00) across the duration of the survey. Listening to audio recordings confirms that the dominant noise source at the monitoring location during the day is road traffic, due to the proximity of the monitoring location to Rover Way, and it is more prominent at this location in comparison to NML01. As with NML01, the measured $L_{Aeq\ (16\text{-}hour)}$ level cannot be assumed to equal to the Celsa site specific sound level due to the presence of other noise sources.

Subjective observations on site or through listening to audio recordings at NML02 failed to clearly identify the presence of any noise that was likely attributable to Celsa site because of the presence of road traffic, of which there is a consistent heavy flow on Rover Way. Accordingly, it has been determined that the operations from the Celsa site are not influencing this location during the daytime and a Specific Sound Level cannot be determined.

5.2.2.1 Night-time

The measured night-time noise levels were 72 dB $L_{Aeq\ (8\text{-}hour)}$, 70 dB $L_{Aeq\ (8\text{-}hour)}$ and 69 dB $L_{Aeq\ (8\text{-}hour)}$ for Thursday, Friday and Saturday respectively, with the arithmetic mean value of 70 dB $L_{Aeq\ (8\text{-}hour)}$ representing the night-time period (23:00-07:00) across the duration of the survey. As with the daytime, listening to night-time audio recordings provided no clear indication of noise emissions from the Celsa site being audible at NML02.

Analysis of the measured 1-second resolution noise data shows the night-time noise levels range from 36 dBA to 94 dBA across the entire survey period, with the higher noise levels once again attributable to passing vehicles, as traffic continues to flow throughout the night, albeit at a reduced rate. As a further assessment step, audio recorded during the period in which the intermittent plant noise was audible at NML01 was listened to see if the same noise was audible at NML02, but nothing discernible was identified. As for daytime, it has been determined that the operations from the Celsa site are not influencing this location during the night-time and a Specific Sound Level cannot be determined.

5.2.3 NML02 Summary of Specific Sound Levels

The soundscape at NML02 is heavily influenced by passing traffic at almost all times of the day. During the daytime, as confirmed by listening to audio recordings and subjective observations, traffic flows are near constant, and therefore no specific sound from the Celsa site is audible. Similarly, during the night-time, even during periods when road traffic levels were low, listening to the recorded audio could not discern any specific sound that is likely attributable to the Celsa site.

5.3 NML03 – Runway Road (Representative of NSR Group 2)

5.3.1 Comparison of $L_{Aeq(15mins)}$ Levels

Table 5-3: Comparison of 2019 and 2021 $L_{Aeq(15\text{-}minute)}$, dB, levels at NML03

Measurement Location		Measurement period											
		Weekend: Early Morning			Weekend: Daytime			Weekday: Early Morning			Weekday: Daytime		
ID	Descriptor	2019	2021	(+/-)	2019	2021	(+/-)	2019	2021	(+/-)	2019	2021	(+/-)
NML03	Runway Road	44	51	+7	47	50	+3	50	52	+2	52	55	+3

For all of the time periods shown, the measured 2021 noise levels at NML03 were higher than the 2019 levels and further analysis is required to determine whether this is related to an increase in noise output from the Celsa site.

5.3.2 Determination of a Specific Sound Level

5.3.2.1 Daytime

The measured daytime noise levels were 56 dB $L_{Aeq\ (16\text{-}hour)}$ and 54 dB $L_{Aeq\ (16\text{-}hour)}$ for Friday and Saturday respectively, with the arithmetic mean value of 55 dB $L_{Aeq\ (16\text{-}hour)}$ representing the daytime period (07:00-23:00) across the duration of the survey. Listening to audio recordings confirms that the dominant noise source at the monitoring location during the day is distant road traffic (most likely from Rover Way to the south). As with NML01 and NML02, the measured $L_{Aeq\ (16\text{-}hour)}$ level cannot be adopted as the Celsa site specific noise level due to the presence of other noise sources.

As with NML02, listening back to audio recordings and subjective observations at NML03 failed to clearly identify the presence of any noise emissions that were likely attributable to the Celsa site. This is due partly to the presence of distant road traffic noise but also likely to the increased distance between the Celsa site and this monitoring location (approximately 400m). The location is also influenced by local traffic and resident movements throughout the daytime, as well as noise from the nearby park and school. Therefore, it was not possible to establish a daytime Specific Sound Level for the Celsa site at NML03.

5.3.2.2 Night-time

No night-time noise level for Saturday night is available due to the equipment being vandalised. The measured night-time noise levels were 48 dB $L_{Aeq\ (8\ hour)}$ for both the Thursday and Friday. This level represents the night-time period (23:00-07:00) across the duration of the survey. As with the daytime, listening to night-time audio recordings provided no clear indication of noise emissions from the Celsa

site being audible at NML03. Therefore, it was not possible to establish a night-time Specific Sound Level for the Celsa site at NML03.

5.3.3 NML03 Summary of Specific Sound Levels

The soundscape at NML03 during the day is influenced by distant traffic, most likely from Rover Way. There are also several other sound sources in the area associated with a residential area. During both the daytime and night-time, no Specific Sound Level could be obtained for the Celsa site.

5.4 WHO Assessment

A comparison of both the measured and assumed Specific Sound Levels has been made against the guideline levels detailed in Table 3-1 for each NML. 15 dB has been added to allow for the attenuation of a partially open window.

Table 5-4: Comparison Against WHO Guideline Levels

NML	Sound Level Descriptor	Noise Level, dB		Guideline Levels, dB		Margin, dB (+/-)	
		Daytime ($L_{Aeq(16\text{-}hour)}$)	Night-time ($L_{Aeq(8\text{-}hour)}$)	Daytime ($L_{Aeq(16\text{-}hour)}$)	Night-time ($L_{Aeq(8\text{-}hour)}$)	Daytime	Night-time
NML01	Measured Level	66	60	50	45	+16	+15
	Assumed Celsa Site Specific Sound Level	53	52, 43*	50	45	+3	+8, -2*
NML02	Measured Level	75	70	50	45	+25	+25
	Assumed Celsa Site Specific Sound Level	N/A	N/A	50	45	N/A	N/A
NML03	Measured Level	55	48	50	45	+5	+3
	Assumed Celsa Site Specific Sound Level	N/A	N/A	50	45	N/A	N/A

*Represents the periods during which the intermittent plant noise source is not operational.

At NML01, noise levels exceed the WHO guideline levels for both daytime and night-time. When considering the noise level attributable from Celsa alone it can be seen that the Celsa Specific Sound Level is more than 10 dB below the overall daytime noise level. As such, noise from the Celsa site is having a negligible impact on the overall daytime sound level.

During the night time, two assumed Specific Sound Levels have been derived (with and without intermittent plant) for the Celsa site. When including the intermittent plant, the WHO guideline levels are exceeded. Without the intermittent plant the noise levels remain below the WHO guideline levels. As such we would recommend that further investigation is undertaken to determine the source of this intermittent noise and whether appropriate noise control measures can be adopted.

For NMLs 02 and 03 the measured levels exceed the daytime and night-time WHO guideline levels, however, this was not found to be attributable to the Celsa site.

5.4.1 Tonal Assessment

At NML01 during the day there is no measured data that can be analysed without some sort of influence from traffic or urban noise; therefore, an objective assessment cannot be undertaken. Subjective observations however, through listening to the audio recordings, indicates no presence of tones during the daytime.

At NML01 during the night-time, an objective assessment has been undertaken considering data measured on Friday 30th of April between 00:00-04:00. Two assessment s have been carried out, one with and one without the identified intermittent sound source. The time periods analysed are highlighted in the time history graph shown in Appendix C. The one-third octave band method of tonal detection indicates no presence of tones.

It was not possible to obtain a specific sound level for the Celsa site at NML02 and NML03, therefore it is not possible to undertake an objective tonal assessment, however, subjective observations indicated no presence tones at these locations during both the daytime and night-time.

To summarise, no tones have been identified at any of the NMLs for either daytime or night-time periods.

6 Conclusion

TNEI were commissioned by Celsa Group Ltd to undertake a noise survey and assessment for submission to NRW. The survey is required to satisfy the noise related requirements of Environmental Permit EPR/TP3639BH for processes occurring within the Celsa site off of Rover Way, Cardiff. The Permit has been subject to a variation to account for the inclusion of new permitted processes, namely Asphalt Plant and Slag processing.

The permit includes both noise related conditions and an Improvement Programme with noise related requirements. There were no immediate actions required to satisfy the ongoing permit conditions, however this assessment has been undertaken to satisfy the Improvement Programme. The requirements included a noise monitoring survey, BS4142 assessment, tonal analysis, and reference to both WHO guideline noise levels and the Noise Action Plan for Wales 2018-2023.

TNEI undertook a noise survey from Friday 30th of April until Tuesday 4th of May. Data obtained on the 3rd and 4th of May was not used as the maintenance was being undertaken at the Celsa site on these days, therefore, noise output would be atypical. Noise was measured at five separate locations; three of which were the same as a 2019 survey undertaken by TNEI. Two additional locations were used to act as proxy locations to determine background sound levels in absence of noise from the Celsa site. At one location. the equipment was vandalised. At the second location the lack of road traffic noise meant that the proxy location was not appropriate. Therefore, background sound levels could not be obtained and a full BS4142 assessment could not be undertaken.

Detailed analysis on NML01, NML02 and NML03 was undertaken, including a review of the sound level time history graphs and the recorded audio files to quantify the noise output from the Celsa site.

At NML01 (Willows Avenue), the analysis identified industrial plant noise present at night that may be attributable to the Celsa site. Primarily, an intermittent sound source was found to operate throughout the early hours of the morning. This sound source may operate intermittently throughout the day, but this cannot be determined due to the influence of local traffic noise at other times.

When the intermittent sound source is operational, the noise levels assumed to be attributable to the Celsa site exceed the WHO guideline levels by 8 dB, therefore, it is recommended that the source of this noise is identified. If the sound source belongs to the Celsa site appropriate mitigation measures should be investigated in accordance with Best Available Techniques (BAT).

No exceedance of the WHO levels occurred during the night-time when the intermittent plant noise was not present.

No exceedance of the WHO levels occurred during the daytime at NML01.

Although the measured levels were above the WHO guideline levels at NML02 and NML03, no noise emissions from the Celsa site could be identified.

An objective tonal assessment has been carried out on the measured noise levels at NML01 for the night-time period. No tones were identified. A subjective tonal assessment was undertaken for other NMLs and time periods. Again, no tones were identified.

To conclude; the local soundscape is heavily influenced by road traffic, both during the day and at night. On Willows Avenue, there is evidence that intermittent plant is increasing noise levels at night and further investigation is required, however, at all other locations and times the Celsa site is not contributing significantly to the overall ambient noise level. Beyond identifying (and controlling if possible) the item(s) plant to the north of the site that is contributing to increased noise levels on Willows Avenue, no other noise control measures are recommended.

Appendix A – Glossary of Terms

Attenuation: the reduction in level of a sound between the source and a receiver due to any combination of effects including: distance, atmospheric absorption, acoustic screening, the presence of a building façade, etc.

Background Sound Level: the sound level rarely fallen below in any given location over any given time period, often classed according to daytime, evening or night-time periods. The LA90 indices (see below) are typically used to represent the background sound level.

Broadband Noise: noise with components over a wide range of frequencies.

Decibel (dB): the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in sound level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound level.

dB(A): the ear has the ability to recognise a particular sound depending on its pitch or frequency. Microphones cannot differentiate sound in the same way as the ear, and to counter this weakness the sound measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) weighting is internationally accepted and has been found to correspond well with people's subjective reaction to sound levels and noise. Some typical subjective changes in sound levels are:

- a change of 3dB(A) is just perceptible;
- a change of 5dB(A) is clearly perceptible;
- a change of 10dB(A) is twice (or half) as loud.

Directivity: the property of a sound source that causes more sound to be radiated in one direction than another.

Emission: the sound energy emitted by a sound source (e.g. a wind turbine).

Frequency: the pitch of a sound in Hz or kHz. See Hertz.

Ground Effects: the modification of sound at a receiver location due to the interaction of the sound waves with the ground along its propagation path from source to receiver. Described using the term 'G', and ranges between 0 (hard ground), 0.5 (mixed ground) and 1 (soft ground).

Hertz (Hz): sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

Immission: the sound pressure level detected at a given location (e.g. the nearest dwelling).

Isopleth: a line on a map connecting points of equal value, for example air pressure, noise level etc.

Noise: unwanted sound

Lw: is the sound power level. It is a measure of the total sound energy radiated by a sound source and is used to calculate sound levels at a distant location. The *LWA* is the A-weighted sound power level.

Leq: is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the

ambient noise encompassing all noise at a given time. The LAeq, T is the A-weighted equivalent continuous sound level over a given time period (T).

L90: index represents the sound level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background sound level. The LA90,10min is the A-weighted background sound level over a ten-minute measurement sample.

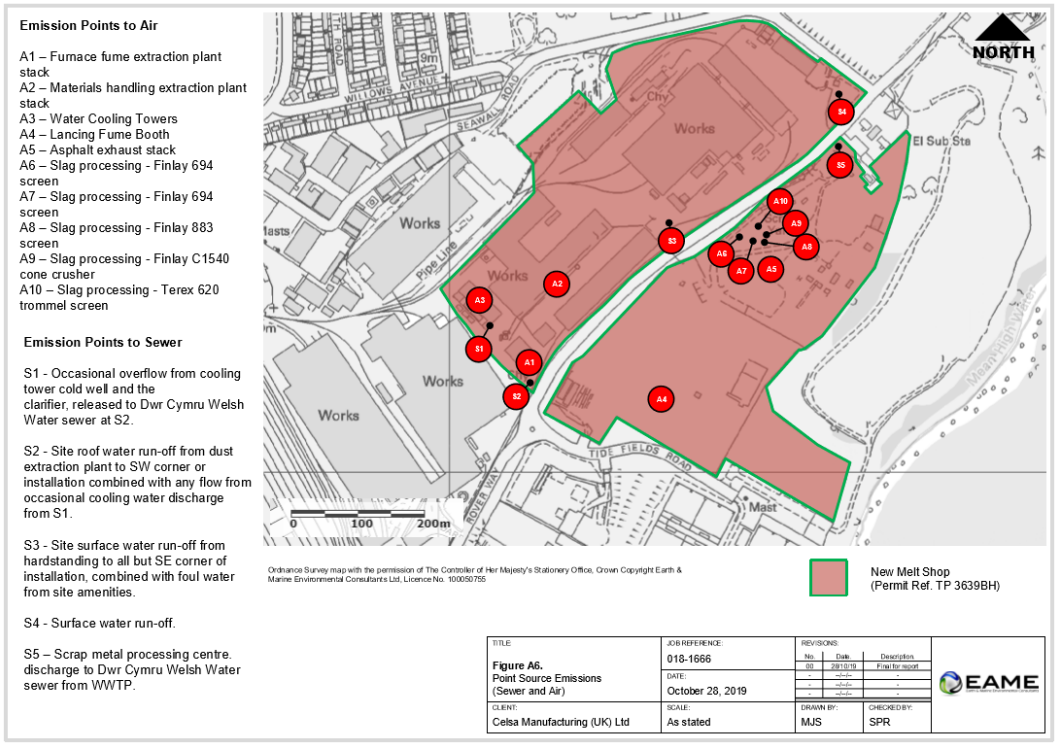
Sound Level Meter: an instrument for measuring sound pressure level.

Sound Pressure Level: a measure of the sound pressure at a point, in decibels.

Tonal Noise: noise which covers a very restricted range of frequencies (e.g. a range of ≤20 Hz). This noise is subjectively more annoying than broadband noise.

Appendix B – Development Details

Schedule 7 - Site plan



Appendix C – Calibration Certificates

CERTIFICATE OF CALIBRATION

ISSUED BY	Gracey & Associates	BSI CERTIFICATE	FS 25913
DATE OF ISSUE	08 September 2020	CERTIFICATE NUMBER	2020-0823
DATE OF CALIBRATION	25 August 2020		
CALIBRATION INTERVAL	12 months		PAGE 1 OF 1

Gracey & Associates
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Upper Dean PE28 0NQ
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Fax: 01234 252332
www.gracey.com

TEST ENGINEER
Jamie Bishop

APPROVING SIGNATORY
Greg Rice

Equipment **NTi XL2, s/n: a2a-08116-e0**
Description Hand Held Acoustic Analyser - Class 1, NTi Audio

Customer Gracey & Associates

Standards
IEC 61672 Class 1

Conditions

Atmospheric Pressure	98.8 kPa
Temperature	22.6 °C
Relative Humidity	51.9 %

Calibration Reference Sources

Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
Druck DPI 141	479	06-Aug-20	HP 34401	3146A29376	11-Feb-20
Vaisala HMP23	S2430007	03-Aug-20			

Notes

We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to reference sources calibrated to National Standards. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2015 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection.
The uncertainties are for a confidence probability of not less than 95%.

Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

This model of sound level meter submitted for periodic testing successfully completed the applicable pattern-evaluation tests given in IEC 61672-2. The pattern approval certificate is available at www.nti-audio.com/XL2.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL2-TA	S/N	A2A-18475-E0
Firmware	V4.21		
Reference Level Range	mid		
Microphone Model	M2230		
Preamplifier	MA220	S/N	9378
Microphone Capsule	MC230A	S/N	A19093
Performance class	Class 1		
Customer Inventory Nr.			

Customer

Date 13 October 2020

Certificate UK-20-072

Results **PASSED**
(for detailed report see next pages)

Operator

David Young

Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

This model of sound level meter submitted for periodic testing successfully completed the applicable pattern-evaluation tests given in IEC 61672-2. The pattern approval certificate is available at www.nti-audio.com/XL2.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL2-TA	S/N	A2A-18928-E0
Firmware	V4.21		
Reference Level Range	mid		
Microphone Model	M2230		
Preamplifier	MA220	S/N	9785
Microphone Capsule	MC230A	S/N	A20919
Performance class	Class 1		
Customer Inventory Nr.			

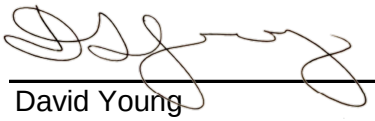
Customer

Crimson Remote Services Ltd
38 Potter Street
Worksop
Nottinghamshire
S80 2AQ

Date 26 April 2021

Certificate UK-21-029

Results **PASSED**
(for detailed report see next pages)

Operator 
David Young

CERTIFICATE OF CALIBRATION

ISSUED BY	Gracey & Associates	BSI CERTIFICATE	FS 25913
DATE OF ISSUE	15 June 2020	CERTIFICATE NUMBER	2020-0610
DATE OF CALIBRATION	15 June 2020		
CALIBRATION INTERVAL	12 months		PAGE 1 OF 1

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TEST ENGINEER
Greg Rice

APPROVING SIGNATORY
Greg Rice

Equipment **NTi XL2, s/n: a2a-13015-e0**
Description Hand Held Acoustic Analyser - Class 1, NTi Audio

Customer Gracey & Associates

Standards
IEC 61672 Class 1

Conditions

Atmospheric Pressure	100.9 kPa
Temperature	23.1 °C
Relative Humidity	49.0 %

Calibration Reference Sources

Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
Druck DPI 141	479	29-Oct-15	HP 34401	3146A29376	11-Feb-20
Vaisala HMP23	S2430007	04-Nov-15			

Notes

We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to reference sources calibrated to National Standards. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2015 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection.
The uncertainties are for a confidence probability of not less than 95%.

CERTIFICATE OF CALIBRATION

ISSUED BY	Gracey & Associates	BSI CERTIFICATE	FS 25913
DATE OF ISSUE	19 January 2021	CERTIFICATE NUMBER	2021-0242
DATE OF CALIBRATION	15 January 2021		
CALIBRATION INTERVAL	12 months		PAGE 1 OF 1

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TEST ENGINEER
Jamie Bishop

APPROVING SIGNATORY
Greg Rice

Equipment **NTi XL2, s/n: a2a-08079-e0**
Description Hand Held Acoustic Analyser - Class 1, NTi Audio

Customer Gracey & Associates

Standards
IEC 61672 Class 1

Conditions

Atmospheric Pressure	102.4 kPa
Temperature	21.2 °C
Relative Humidity	30.3 %

Calibration Reference Sources

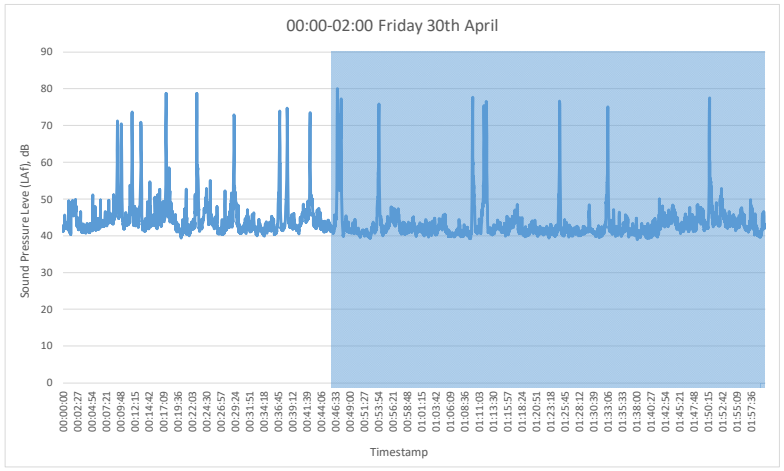
Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
Druck DPI 141	479	06-Aug-20	HP 34401	3146A29376	11-Feb-20
Vaisala HMP23	S2430007	03-Aug-20			

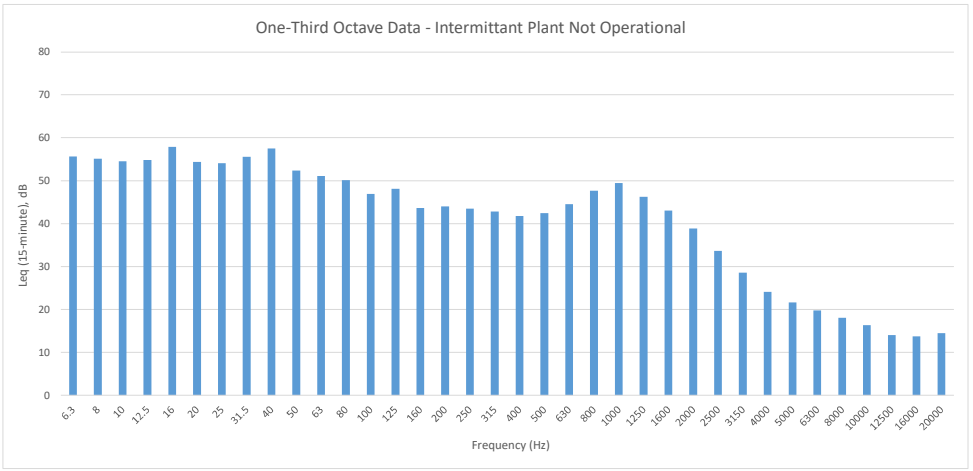
Notes

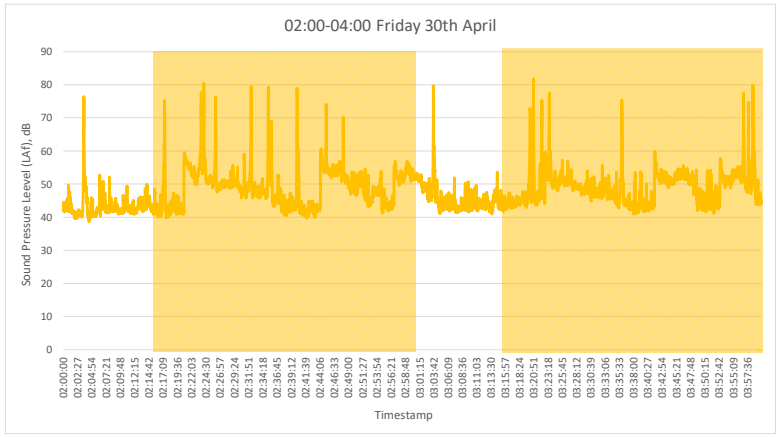
We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to reference sources calibrated to National Standards. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2015 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection.
The uncertainties are for a confidence probability of not less than 95%.

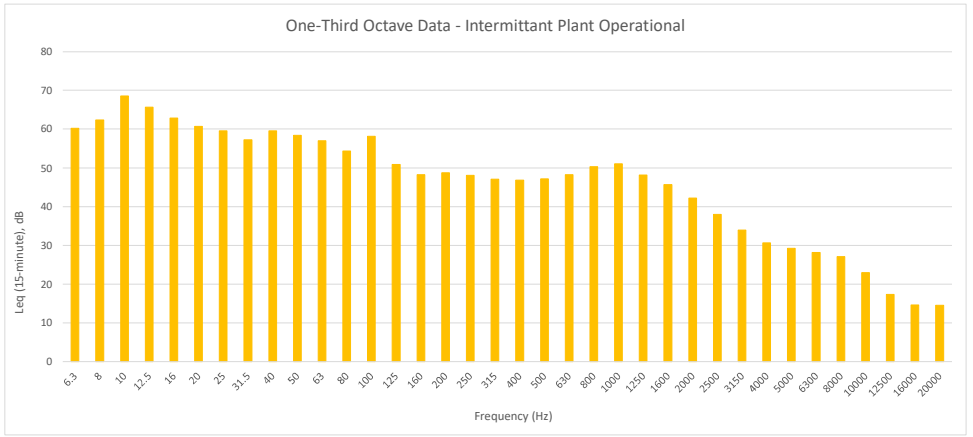
Appendix D – Tonal Assessment Data

One-Third Octave Band Tonal Assessment Method Graphs - NML01 Willows Avenue (Night-time)

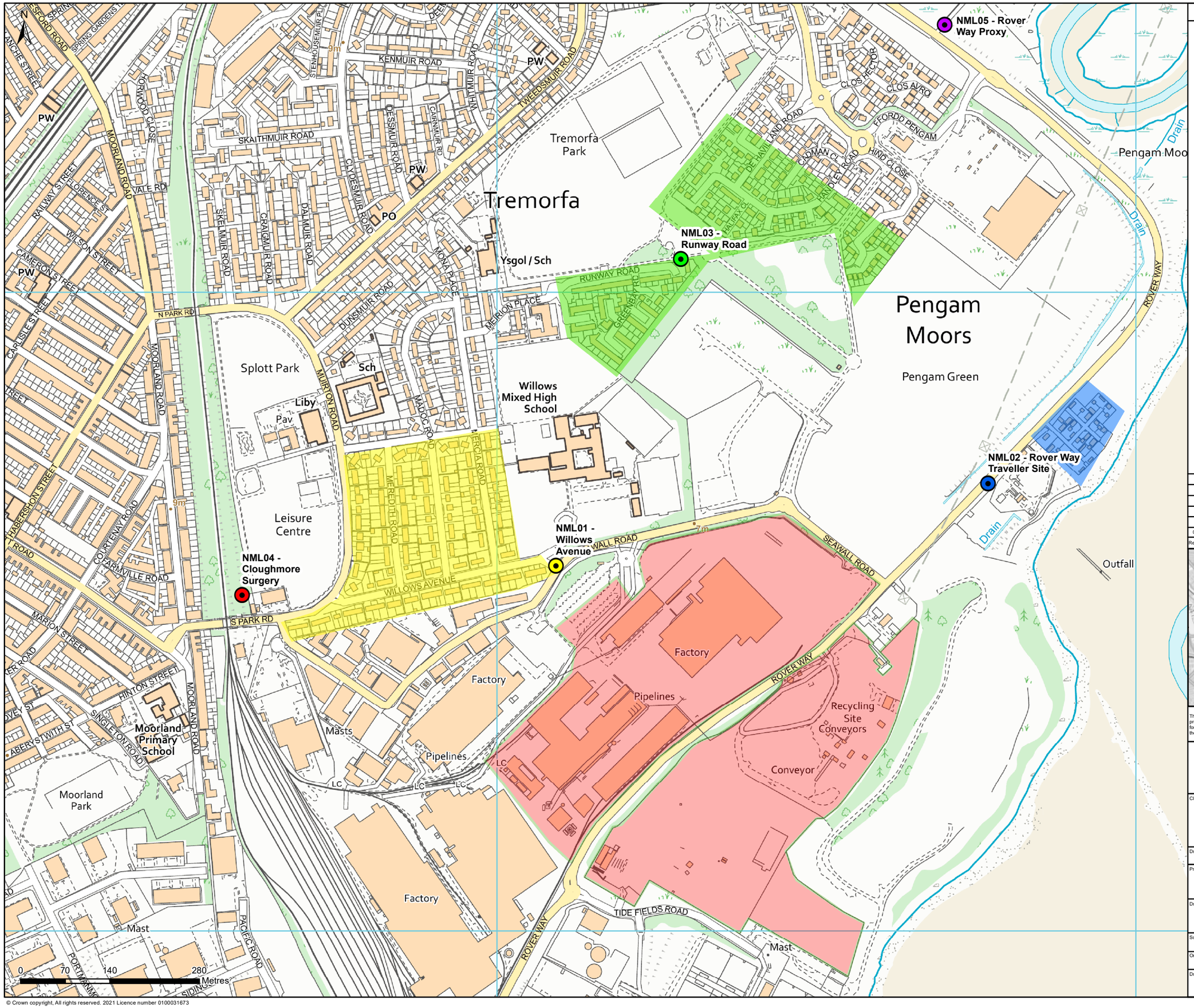








Appendix E – Figure



NOTES

Legend

- Celsa Site Boundary

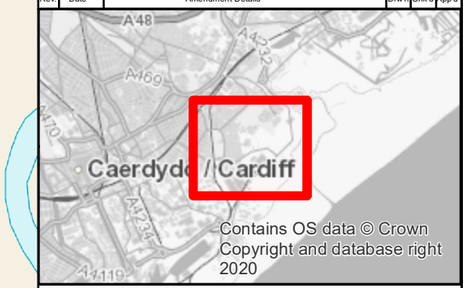
Noise Monitoring Locations (NMLs)

- NML01 - Willows Avenue
- NML02 - Rover Way Traveller Site
- NML03 - Runway Road
- NML04 - Cloughmore Surgery
- NML05 - Rover Way Proxy

Nearest Noise Sensitive Receptors (NSRs)

- NSRs represented by NML01
- NSRs represented by NML02
- NSRs represented by NML03

Rev.	Date	Amendment Details	Drwn	Chk'd	App'd
0	27/07/202	For information	EW	JS	JS



tnei

Client: CELSA GROUP

Drawing Status: FOR INFORMATION

Project Title: CARDIFF CELSA SITE NOISE LEVEL SURVEY

Drawing Title: FIGURE 01 - NOISE MONITORING LOCATIONS AND STUDY AREA

Scale	Designed	Drawn	Checked	Approved
1:5,500	EW	EW	JS	JS
Original Size	**Date**	**Date**	**Date**	**Date**
A3	28/07/2021	28/07/2021	28/07/2021	28/07/2021

Drawing Number: 14381-002

Revision: 0