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Resources
Wales**

Noise Impact Assessment – AMG Resources Ltd, Nevill's Dock, Llanelli

Nick Jenkins

Rev No 2

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1. Forward

- 1.1. This report contains no personal or sensitive information.
- 1.2. This report considers the level of noise from AMG Resources Ltd, Nevill's Dock, Llanelli in accordance with BS4142 – Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.

2. Synopsis

- 2.1. One night of sound monitoring was undertaken at a nearby residential property over the evening, night and early morning of 10 and 11 July 2014. In addition background monitoring was performed during a lull in operations between 02:00 and 02:37hrs.
- 2.2. During the monitoring period, the complainant was asked to keep a noise diary. Four events were logged between 22:50hrs on Thursday 10 July and 03:40hrs Friday 11 July 2014.
- 2.3. BS4142 considers that complaints are likely when the rated noise level exceeds the Background noise level by around +10dB. This period of analysed data found that three of the events were around +10dB over the Background level which means that complaints are likely.

	Event Number	Working average dB(A)
Thursday 10 July	1	+9
Friday 11 July	2	+7
Friday 11 July	3	+12
Friday 11 July	4	+10

3. Background Information

- 3.1. AMG Resources Ltd is an installation permitted under the Environmental Permitting Regulations 2010 as amended. The site has been operational at its current location since 1911, where the Operator carries out the detinning of scrap tinplate by a chemical process and the recovery of the tin from the liquors used via an electrochemical operation.
- 3.2. Tinplate feedstocks, both from scrap or returned used steel cans, is shredded and magnetically separated from non-ferrous material from which the aluminium content is later recovered.
- 3.3. Since 1 January 2014 we have received 25 complaints regarding noise thought to be from the installation. These include reversing alarms; banging, clattering, bearing noises and revving engines. The complaints have been from 3 residential addresses. No noise complaints were previously reported to Natural Resources Wales/Environment Agency Wales since 2005.
- 3.4. There are 288 registered postal addresses within 500m of the site, and many of these will be residential properties potentially affected by noise from the site. In addition a scoping assessment has been submitted to Carmarthenshire County Council for a new primary school for the adjacent former Draka Enfield site.
- 3.5. The site is permitted to operate under EPR BM2381Q, which requires that:

The Operator shall, subject to the conditions of this Permit, control noise and vibration as described in the documentation specified in Table 2.9.1, or as otherwise agreed in writing by the Agency.

Table 2.9.1 : Noise and vibration		
Description	Parts	Date Received
Application	The response to question 2.9 given in section B2.9 of the application	28/12/01
Response to 1 st Schedule 4 Part 1 Notice (08/03/02)	Response to questions 14 - 19	19/04/02
Response to 2 nd Schedule 4 Part 1 Notice (22/07/02)	Response to questions 44 - 45	13/09/02

The response to question 2.9 is provided below:

2.9 NOISE AND VIBRATION

A full site noise survey has been carried out. Although a number of locations particularly in the west of the site, are in close proximity to domestic housing, the noise levels at the site boundary are either at reasonable levels, barely audible or inaudible. The high noise areas of the site are around the warehouse and weighbridge but both are well away from residential premises. As far as we are aware there has been only one complaint from members of the public with respect to noise. This was unsubstantiated following investigation by the Local Authority.

The responses to questions 14-19 are provided below:

NOISE & VIBRATION	
14.	↑
15.	↑
16.	See Drawing ES1303.N1
17.	↓
18.	↓
19. The following techniques and management practices are used on site to control noise:	
• Routine maintenance of plant ensures excessive noise is not created as a result of increased interaction between moving parts. • All fixed machinery is housed within buildings that offer significant noise attenuation. Where possible doors and windows are kept shut to enhance this property. • Where possible, plant is switched off when not in use. • Drop heights of materials (shredded cans, bales etc.) are as low as possible to avoid excessive noise. • Where possible, materials delivered to site are on pallets and unloaded by forklift, rather than being dropped off the lorries. • The workforce is considerate, especially at night, avoiding or minimizing shouting etc.	

The response to questions 44-45 are provided below:

NOISE	
44.	The fabric of the buildings that enclose fixed machinery comprises single skin corrugated steel sheets. The fabric is in poor condition in parts, with the majority in average condition. The cladding of the existing buildings can be expected to reduce the internal/external noise level by 5 - 10 dB(A).
45.	An initial noise monitoring survey was submitted with the original application in the form of ExCAL Report Section 2.9 – Noise Report. Any further assessments will take place at the same monitoring locations, using the same methodology and reporting format. We would propose that the assessments are carried out annually, though guidance from the Agency on this matter would be appreciated.

- 3.6. AMG's operational hours are continuous between 06:00hrs Monday to 06:00hrs Saturday.

4. Measurement Locations

- 4.1. A single continuous noise measurement was made at the rear garden of [location redacted], Llanelli between Thursday 10 July 2014 and Friday 11 July 2014.
- 4.2. The outlook of the monitoring location is directly towards the installation.
- 4.3. Continuous sound measurements were made between 16:38hrs and 23:59hrs on Thursday 10 July and between 00:00hrs and 15:00hrs on Friday 11 July. A Background assessment was undertaken during a lull in operations on Friday 11 July at 02:00hrs for 37 minutes.
- 4.4. The microphone was set at a height of 1.5m and at a location greater than 1m from a reflective façade (as shown in Figure 1). The integrated weather station was set up adjacent to the sound level meter to replicate weather conditions at the microphone.
- 4.5. The BS4142 standard is a relative standard. It compares the noise levels between the operational and closed site. So the use of a façade will not affect the outcome.
- 4.6. Nevill's Dock used to be a heavily industrialised area but the adjacent Draka Enfield factory (north east) has been demolished (2010) but the scrap yard to the west of the installation is operational during daytime hours and regulated by Natural Resources Wales. The scrap yard did not have any impact on the measured events. Site location map is presented in Figure 2.



Figure 1 – Photo of measurement location including the microphone and integrated weather station

Figure 2 – Site location



5. Equipment and Meteorology

- 5.1. The noise measurements were made using a Bruel & Kjaer 2250 sound level meter. The noise meter was field calibrated before use to 1kHz at 94dB and the calibration was checked afterwards and found to be acceptable. The full details of the equipment, including serial numbers and calibration dates, are shown in Appendix 1.
- 5.2. The noise meter was set to record the entire monitoring period at a 100ms resolution including LAeq, LZmax and 1/3 octaves.
- 5.3. The entire period of monitoring was also recorded as audio in order to enable playback and a positive identification of any noise sources. The bit depth was set to 16 bit (which provides a 94dB dynamic range).
- 5.4. An integrated 6 parameter weather station model MMM-0256-A was sited adjacent to the SLM and was used to measure:

- Wind speed
- Wind direction
- Precipitation
- Atmospheric pressure
- Temperature
- Relative humidity

- 5.5. The wind direction was predominantly from the North during the monitoring period (290°). This reduces the noise level experienced in the monitoring location whilst winds from the south eastern quadrant (135°) would result in a higher level. This assessment does not therefore represent the 'worst case' scenario in terms of noise levels.
- 5.6. The weather data is presented in Appendix 2. Weather data was assessed from an integrated weather station close to the sound level meter location. This data is indicative of the wind direction and speed at the microphone position. During the monitoring period the wind speed was consistently below 5m/s and consistently below 0.5m/s during the four events. No wind induced microphone noise was audible in the analysed periods of noise.
- 5.7. There was no precipitation during the monitoring period.
- 5.8. The microphone was covered with a B&K 4198 outdoor microphone cover which provides enhanced weather protection, particularly against wind induced microphone noise.

6. Methodology

- 6.1. The site is required to control noise and vibration as per their environmental permit. Section 2(1) of the Environmental Permitting Regulations 2010 defines "pollution" as:
- Any emission as a result of human activity which may –*
(a) be harmful to human health or the quality of the environment
(b) cause offence to a human sense
(c) result in damage to material property, or
(d) impair or interfere with amenities and other legitimate uses of the environment.
- 6.2. The methodology defined in BS4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas" can be used to estimate the likelihood of complaints. This can be used as an indicator for whether an operation will 'cause offence to a human sense' or 'impair or interfere with amenities'.
- 6.3. BS4142 is likely to underestimate the impact from impulsive noise sources such as scrap tin handling but is still considered the most appropriate standard in this scenario.

6.4. BS4142 compares the noise level that is emanating from the site to the Background noise level when the site isn't operating. It then adds a 5dB penalty for noise that is tonal or impulsive (which would draw attention). A level difference of around +10dB or more indicates that complaints are likely, and a difference of around +5dB is of marginal significance.

6.5. Regarding the Specific noise level, BS4142 states:

6.3.8 Take the measurement of the specific noise level over a time interval, T_m , which reflects all significant temporal and level variations of the specific noise.

NOTE. If the noise is steady, a short sample measurement will be sufficient. If it is cyclic or intermittent or varies randomly, a longer sample will be required to characterize it. It may be necessary to investigate the noise over relatively long periods to select an appropriate, representative measurement time interval.

6.3.11 If the specific noise fluctuates at random, use the following procedure. Select the measurement time interval to give a reliable estimate of the equivalent continuous A-weighted sound pressure level over the reference time interval. Measure the equivalent continuous A-weighted sound pressure level, LA_{eq,T_m} , correct for the influence of residual noise and assign the result to the specific noise level.

From the description of complaints I consider AMG to be a randomly fluctuating noise source and so it was assessed over a longer time in order to give the most reliable estimate of the noise from the site.

6.6. Regarding the Background noise level, BS4142 states:

7.1.3 Make measurements during periods when the background noise level is typical of the background noise when the specific noise source is or will be operating, but is not actually operating at the time of measurement.

6.7. To assess the Residual and Background noise levels a 37 minute monitoring period was used during the monitoring period, while the site was not operational, which was thought to be during a shift handover/break.

6.8. During the noise monitoring I found the regular and dominant noise to be from scrap tin handling. The local traffic noise was not significant and there was no noise arising from other industrial and commercial units. AMG was the dominant noise source during the measured events.

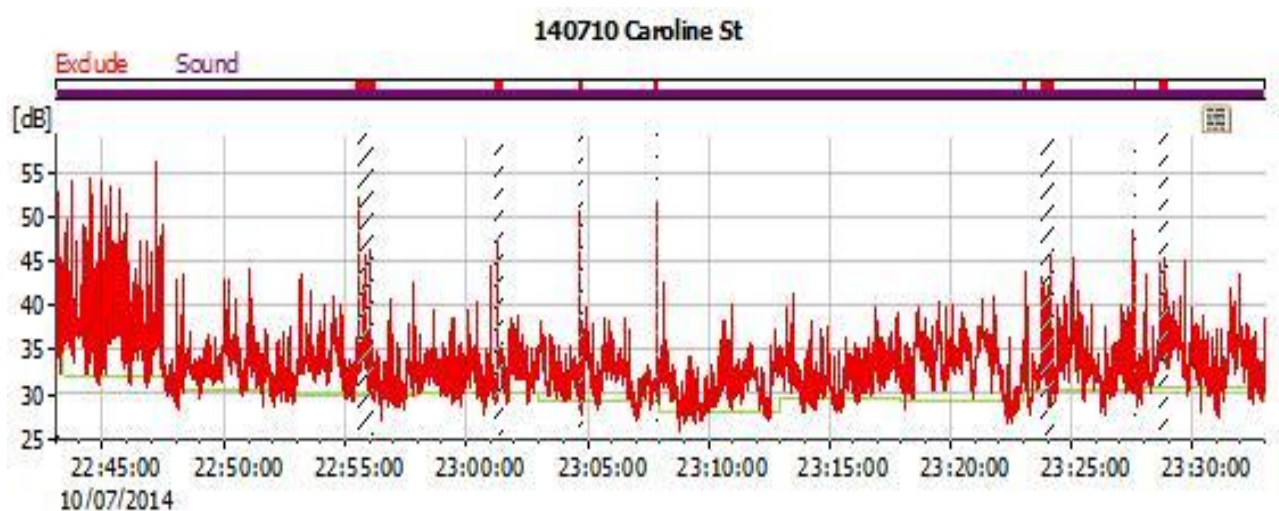
6.9. Listening to the audio recordings I found that site noise was generally present during the times that the complainant logged the noise. The dominant noise was the crash of scrap metal being handled, bearing whine and the sound of diesel engines.

7. Noise Monitoring Data

Event 1 - Thursday 10 August 2014 22:30-23:30hrs

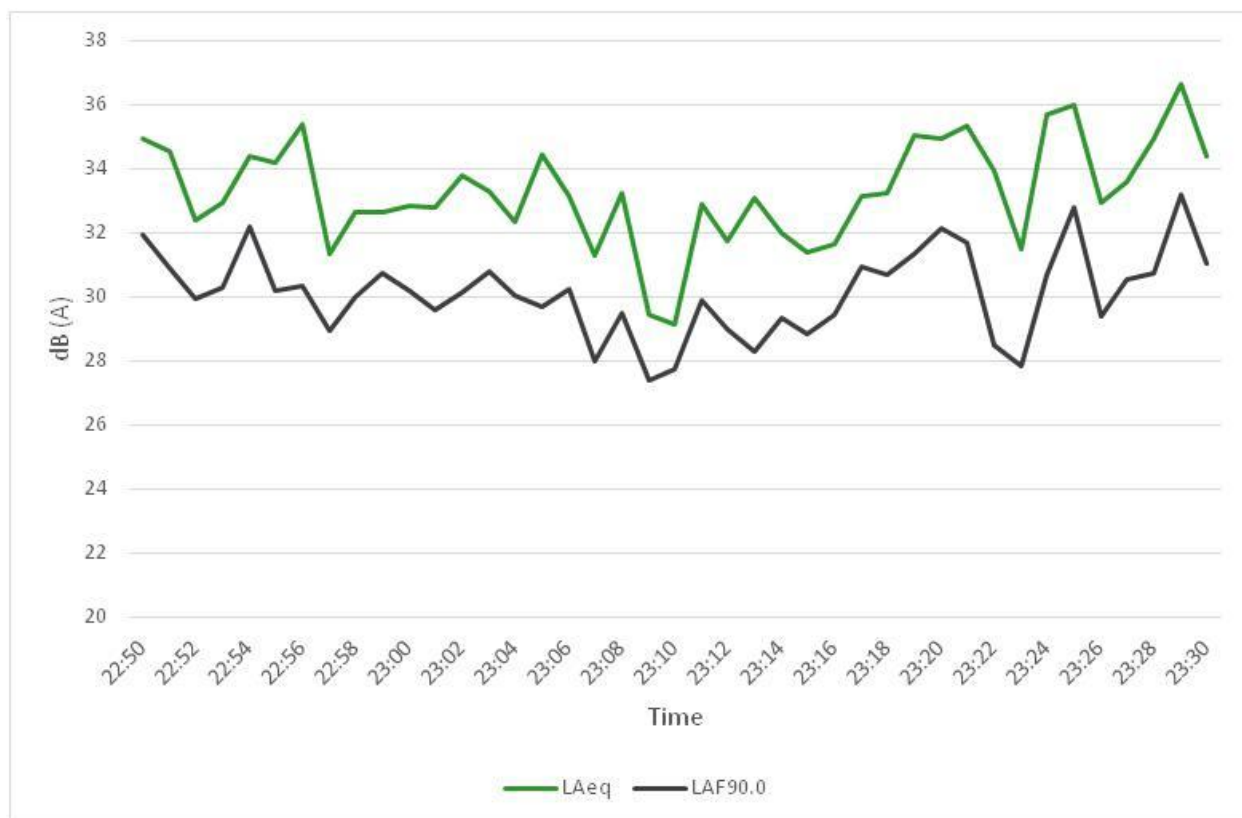
- 7.1. The recording was played back from 22:30hrs. The start of the recording is dominated by sound in the house and the frequent squawk of the house bird. The sound of a distant diesel engine can be heard from around 22:48hrs when noise from within the house stops. The analysis of Event 1 therefore commenced at 22:48hrs and continued until 23:30hrs. During this time of audible site activity the average noise level was 33.6dB(A)_(Leq, 42min) and was dominated by onsite vehicle movements, banging and a bearing whine. The peaks in the graph above 50dB (A) are associated with noise from noise next to the microphone and not operational noise i.e. dog barking, movement in the garden etc. These have been excluded from the analysis.
- 7.2. The raw data for the period 22:48-23:30hrs is presented below in Figure 3 with the 100ms Leq in red, and the 5 minute L90 in green.

**Figure 3: Noise monitoring data 22:48-23:30hrs
Thursday 10 July 2014. Raw data**



- 7.3. The same period but at a 1 minute resolution is presented in Figure 7 below:

**Figure 4: Noise monitoring data 22:50-23:30hrs Thursday 10 July 2014
1 minute resolution**

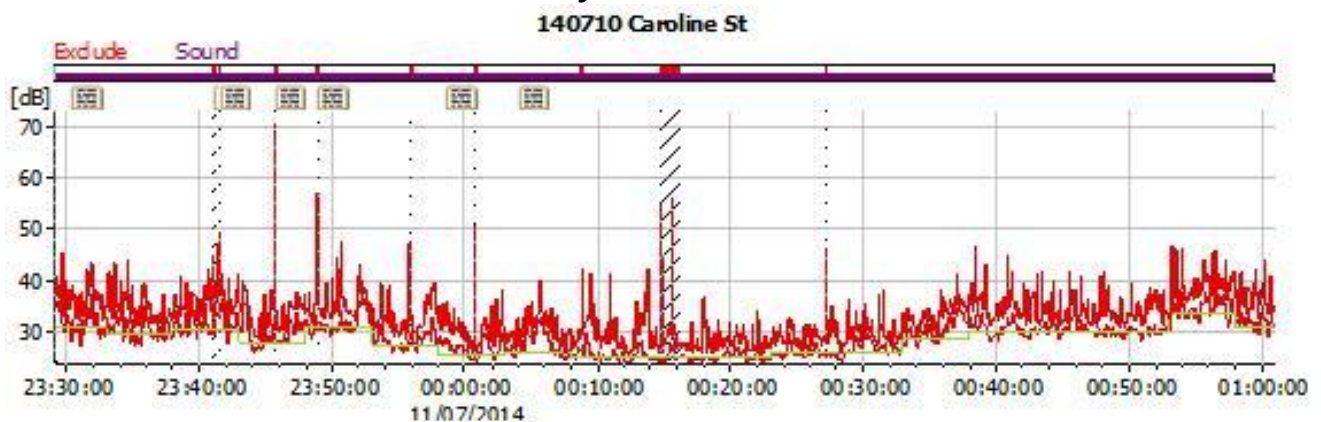


- 7.4. Figure 4 shows that the sound level in the first event is in the range of 29-36dB(A) Leq.

Event 2 - Thursday 10 July – Friday 11 July 2014 23:30 – 01:00hrs

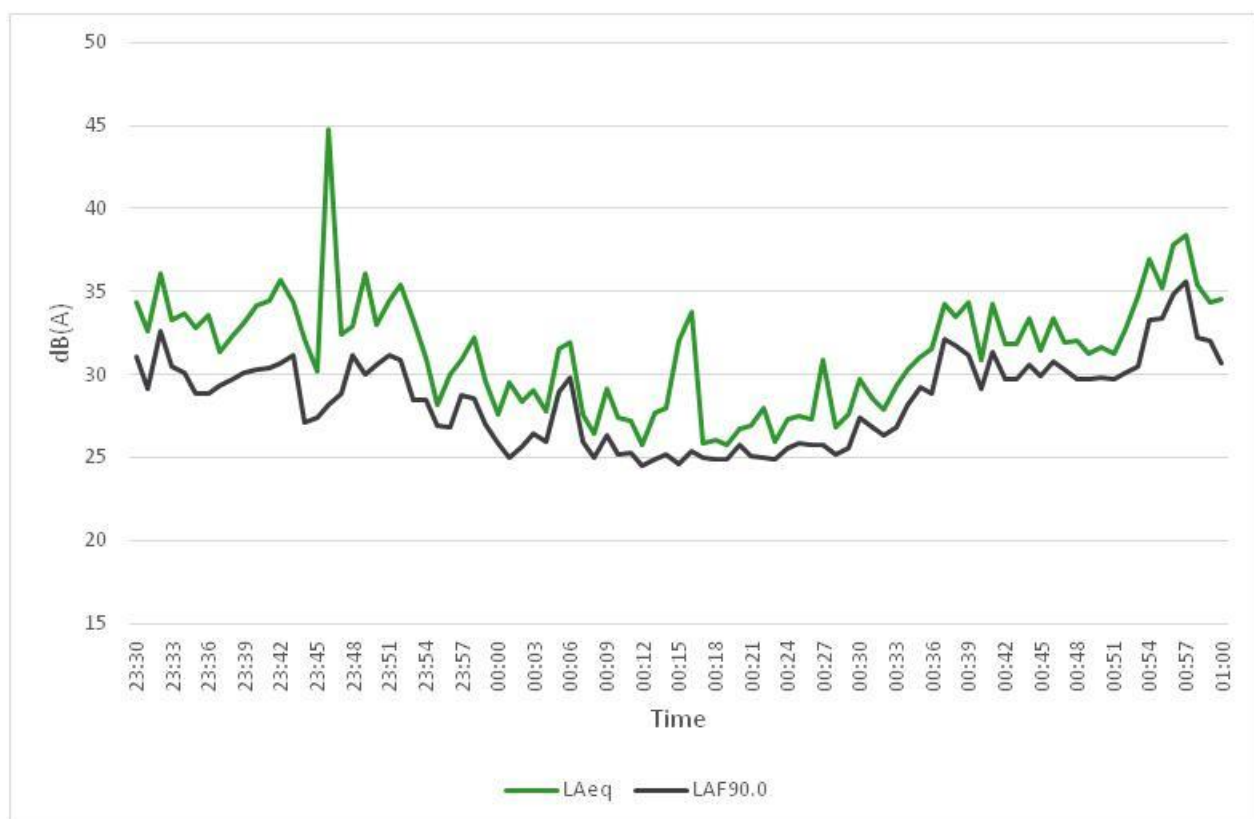
- 7.5. From 23:30 to 23:54hrs the soundscape was dominated by the sound of operational noise from the installation including diesel engines, scrap tin loading and whine from a bearing. From 23:54 – 00:32hrs the sound from the installation is almost inaudible. The sound in this period is from occasional household noise including dogs barking and noise next to the microphone. At 00:32hrs the operational noise starts again and the engine noise, scrap movement and whine of bearing continues into the next logged event. This average LAeq of this event is 33.3dB(A)_(Leq, 90mins) and an L90 of 25.9dB(A).
- 7.6. The raw data for the period 23:30 - 01:00 is presented below in Figure 5.

Figure 5: Noise monitoring data 23:30 – 01:00hrs Thursday 10 and Friday 11 July 2014. Raw data



- 7.7. The shaded area and yellow boxes above the data are comments made during the playback of the sound event. These include noise next to the microphone, dog barking etc. These have been excluded from the analysis.
- 7.8. The period 23:30 – 01:00 hrs, at a 1 minute resolution is presented in Figure 6 below:

**Figure 6: Noise monitoring data 23:30 – 00:00hrs Thursday 10 July 2014
1 minute resolution**

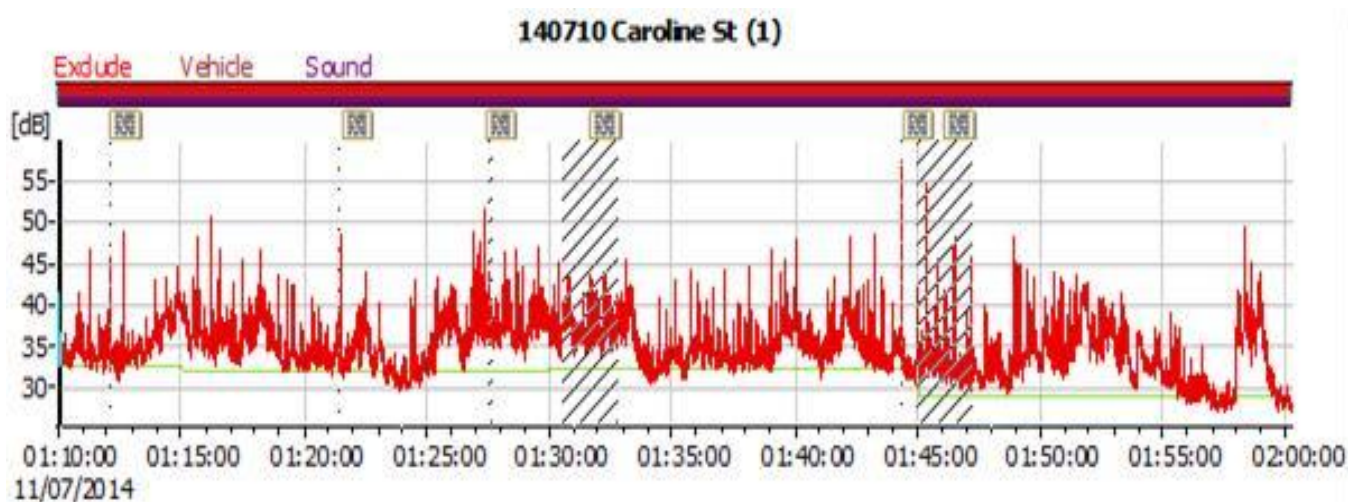


- 7.9. Figure 6 shows that the sound in the second event is in the range of 25-45dB(A)_(Leq, 1 min).

Event 3 - Friday 11 July 2014 01:10 – 02:00hrs

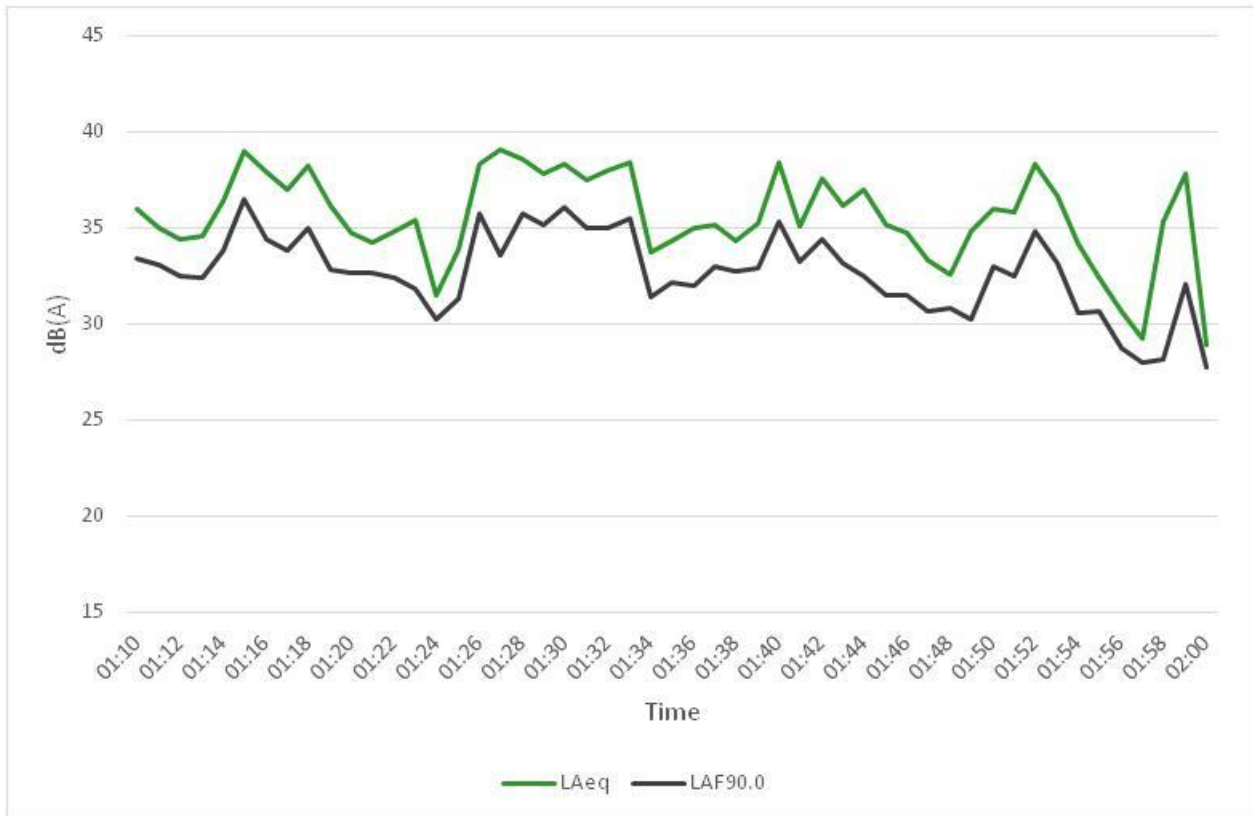
- 7.10. There is a continuation of sound from Event 2 into event 3 including bearing whine which is dominant in the start of the event. There are also frequent bangs/clatters from the site which correspond to the description provided by the complainant i.e. skittle noise. These can be elevated up to 45dB(A) as impact noise. Noise starts to increase at around 01:25hrs and continues until 01:34hrs. Occasional operational noise is audible which includes the movement of scrap metal. The highest peaks in the graph are identified as noise next to the microphone. Operational noise starts again around 01:49hrs and continues until almost 02:00hrs where it is expected that a change of shift occurs. The sound from the installation continues to be low until 02:37hrs when the whining noise and diesel engines start again. The average LAeq for this third event is 36.0dB(A) and L90 30.8dB(A).

Figure 7: Noise monitoring data 01:10 – 02:00hrs Friday 11 July 2014. Raw data



- 7.11. The shaded areas and the associated yellow boxes (comments) above the data are related to extraneous noises which were not from AMG i.e. noise next to the microphone.
- 7.12. The period 01:10 – 02:00 hrs, at a 1 minute resolution is presented in Figure 8 below:

**Figure 8: Noise monitoring data 01:10 – 02:00hrs Friday 11 July 2014
1 minute resolution**

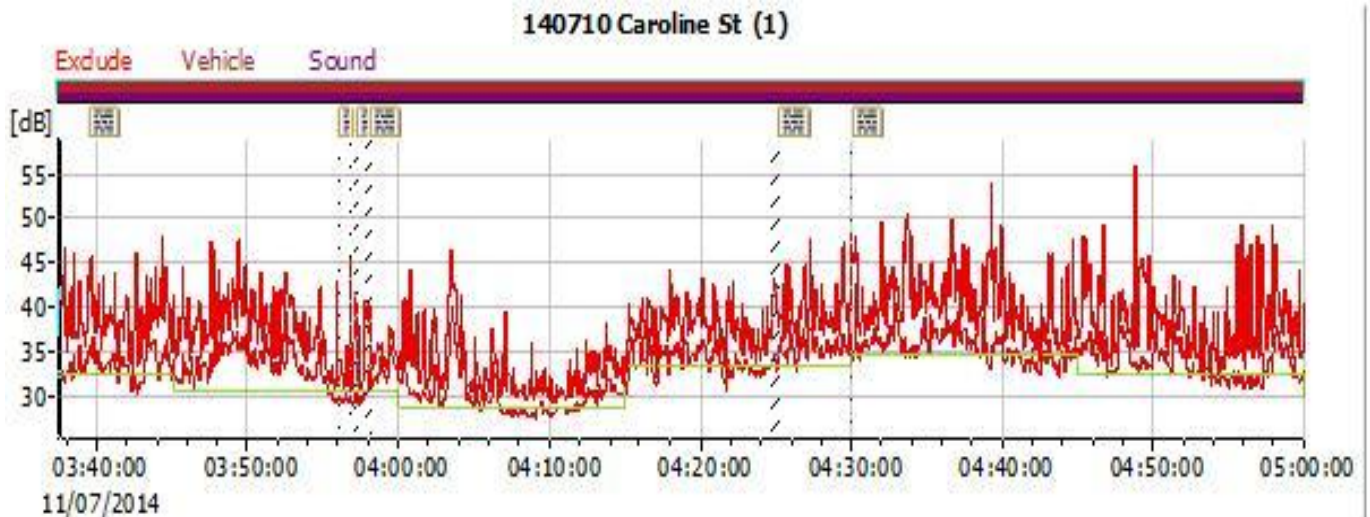


- 7.13. Figure 8 shows that the sound in the third event is in the range of 29-39dB(A)_(Leq, 1 min).

Event 4 - Friday 11 July 2014 03:30 – 04:30hrs

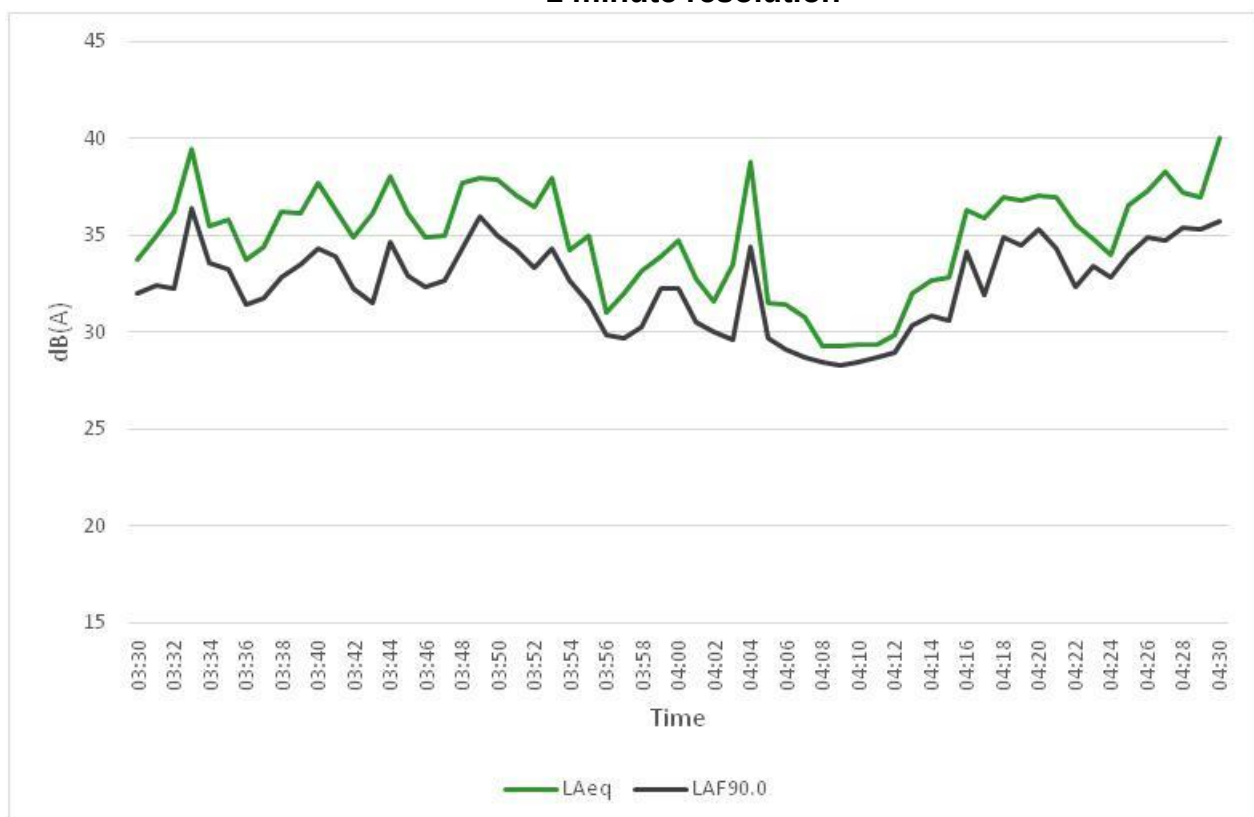
- 7.14. Operational noise is evident at the start of the recording which continues until 03:55hrs. In the quieter periods where the sound from the site is not audible, seagulls are. The dawn chorus starts around 03:57hrs and very rarely a car will pass or a plane goes over head which raises the ambient noise level. Operational noise recommences around 04:45 until 05:10hrs and at 05:24hrs the house bird begins to sing. The average LAeq for this event is 35.2dB and L90 of 29.6dB(A).

Figure 9: Noise monitoring data 03:30 – 04:30 hrs Friday 11 July 2014. Raw data



- 7.15. The shaded areas and the associated yellow boxes (comments) above the data are related to extraneous noises which were not from AMG i.e. seagulls, vehicles etc.
- 7.16. The period 03:30 – 04:30 hrs, at a 1 minute resolution is presented in Figure 10 below:

**Figure 10: Noise monitoring data 03:30 – 04:30hrs Friday 11 July 2014
1 minute resolution**

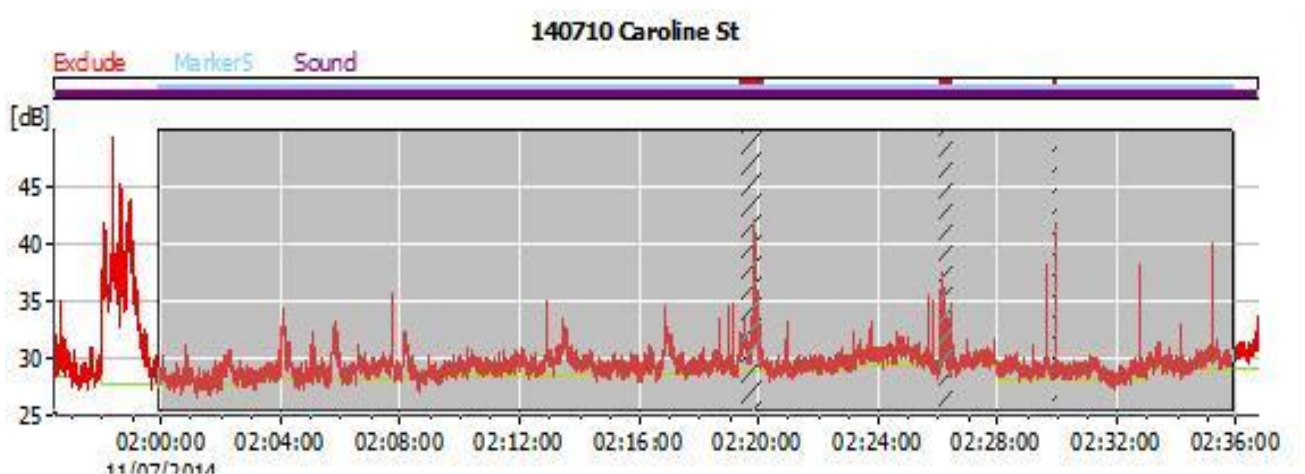


- 7.17. Figure 10 shows that the sound in the fourth event is in the range of 30-40dB(A)_(Leq, 1 min).

Residual & Background Levels - Leq and L90

- 7.18. Between 01:59hrs and 02:36hours, a lull in the sound levels from the operations at the site was evident. This 37 minute period can be used as a Residual and Background level assessment (See Figure 11 below). The LAeq for this break in operations is 29.5dB and L90 of 28.2dB(A).

Figure 11: Noise monitoring data displaying the lull in onsite operations 01:59 – 02:36hrs Friday 11 July 2014



- 7.19. The grey area of Figure 11 above shows the lull in operational sound from 01:59 to 02:36hrs. From 02:36hrs the sound levels increase again as work recommences onsite. The peaks above 35dB(A) are attributed to a passing vehicle; seagulls and noise next to the microphone and have been excluded from the analysis.

8. Noise Impact Assessment

- 8.1. The summary of the noise levels found during monitoring is presented in Table 1. Measurements made when the site is operational are termed Ambient or Measured whilst those when it is not operational are termed Residual noise levels. The L90 when the site is not operational is termed the Background noise level. BS4142 requires that these levels are rounded to the nearest whole decibel.

Table 1: Summary of noise data for BS4142 Summary of noise data

	Site operational	Site not operational	
		Leq	L90
Thurs 10 Jul	34dB(A)		
Thurs 10 Jul	33dB(A)		
Fri 11 Jul	36dB(A)		
Fri 11 Jul	35dB(A)	30dB(A)	28dB(A)

- 8.2. The event average BS4142 assessments are presented in Table 2. This shows an average daily rated site noise level +7dB(A) to +12dB(A) greater than the Background. BS4142 considers this to mean that on three of the events complaints are likely.

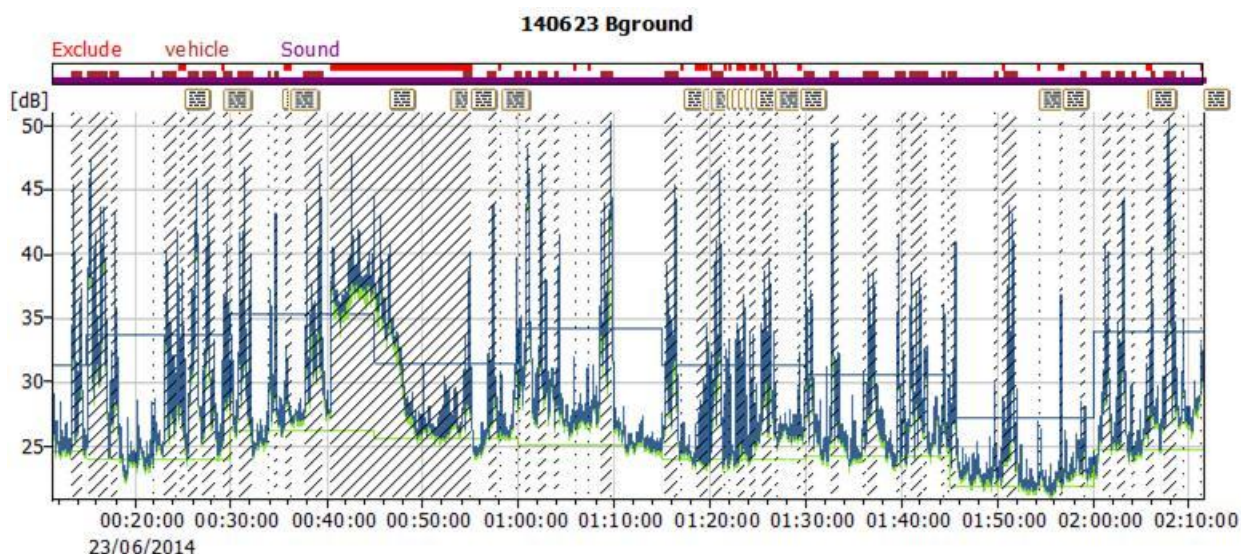
Table 2: Event average BS4142 assessments

	Event 1	Event 2	Event 3	Event 4
Measured noise level	34	33	36	35
Residual noise level	30	30	30	30
Measured minus Residual	+4	+3	+6	+5
Correction	-2	-3	-1	-2
Corrected measured level	32	30	35	33
Specific noise level from site	32	30	35	33
Acoustic correction feature	+5	+5	+5	+5
Rated noise level	37	35	40	38
Background noise level	28	28	28	28
Rating over Background	+9	+7	+12	+10

- 8.3. In addition to the Background monitoring undertaken during the lull in operations, a 2 hour manned assessment was made on 23 June 2014 during the weekend shut down of the installation. This commenced at 00:11hrs and continued until 02:11hrs on the Monday morning. Post analysis of the recording was made to exclude any extraneous sounds at the location. This included vehicles; a cooling fan on the adjacent social club, dogs barking etc. Of the 2 hours of recording over an hour was excluded due to these identified sounds.

- 8.4. The monitoring location was on the playing fields at the south east end of Caroline Street grid reference SS 50289 99171 and was approximately 125 metres from the boundary of the installation. The meter was calibrated prior to and checked flowing the measurement period. It was set up in accordance with the requirements of BS4142 and the weather conditions were complaint with the standard i.e. <5m/s with no precipitation.

Figure 12: Noise monitoring data displaying the Background data with exclusions 23 June 2014



- 8.5. Figure 12 above shows the LAeq levels (blue fluctuating line) and the L90_(5 minutes) as the green straight line. The shaded areas are where data has been excluded from the assessment with the text boxes above the graph as reminders of the excluded data.
- 8.6. The results of the Background assessment were 25.9dB LAeq_(60mins) with an L90 of 22.8dB.
- 8.7. The scope of BS4142 states that:

The method is not suitable for assessing noise measured inside buildings or when the background and rating noise levels are both very low.

NOTE: For the purpose of this standard, background noise levels below about 30dB and rating levels below about 35dB are considered to be very low.

- 8.8. With Residual levels measured at 26dB and Background levels (L90) at 23dB these would be considered very low and outside of the current scope of BS4142. It is thought that the levels were set due to the limited accuracy of noise meters below this threshold but in the draft of BS4142:2014, it is expected that these levels will be reduced. The levels considered to be very low are now likely to be background levels below about 25dB and rating levels below about 30dB.
- 8.9. If Table 2 is redrawn with the lowest possible Background level allowed under the redraft of BS4142:2014 i.e. 25dB we will see the following changes. It has to be

remembered that the measured Background L90 was 23dB and the level we have use in this table are 2dB above this:

Table 3: Event average BS4142 assessments with reduced Background level

	Event 1	Event 2	Event 3	Event 4
Measured noise level	34	33	36	35
Residual noise level	30	30	30	30
Measured minus Residual	+4	+3	+6	+5
Correction	-2	-3	-1	-2
Corrected measured level	32	30	35	33
Specific noise level from site	32	30	35	33
Acoustic correction feature	+5	+5	+5	+5
Rated noise level	37	35	40	38
Background noise level	25	25	25	25
Rating over Background	+12	+10	+15	+13

9. Next Steps

- 9.1. BS4142 considers that complaints are likely when the rated noise level exceeds the Background noise level by around +10dB. Three of the four logged events exceeded the Background noise level by around +10dB.
- 9.2. In light of the noise impact assessment, AMG Resources Ltd should now provide evidence that they are compliant with their permit condition for noise, in particular they will need to provide clarification of the following:
 - That all fixed machinery is housed within buildings that offer 'significant' noise attenuation i.e. a reduction in noise level by 5-10dB(A)
 - That routine maintenance of plant is undertaken to reduce any abnormal sounds

We would expect this evidence to be presented to Natural Resources Wales no later than **end of November 2014**.

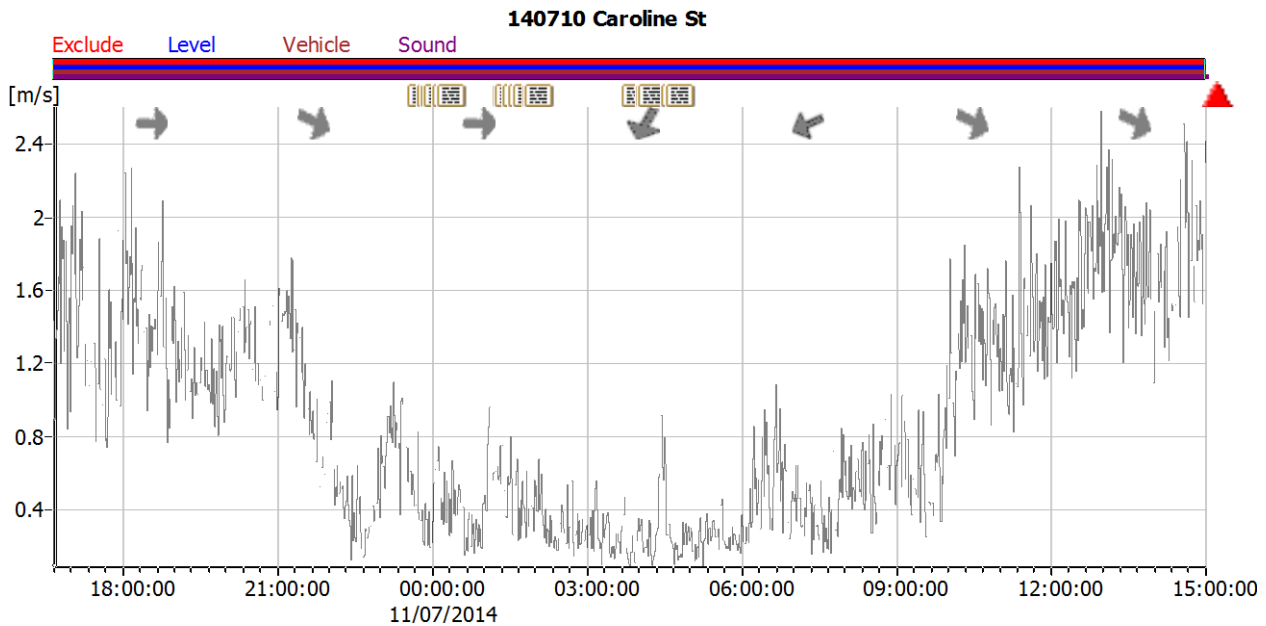
- 9.3. Where noise complaints are received by Natural Resources Wales we encourage operators to produce a noise management plan and it is recommended that AMG Resources Ltd use Environment Agency's Horizontal Guidance Note for Noise¹ to assist in the completion of such a plan.

¹ <https://www.gov.uk/government/publications/environmental-permitting-h3-part-2-noise-assessment-and-control>

Appendix 1: Equipment and calibration details

Equipment	Serial number	Calibration date	Calibration due
Brue! & Kjaer 2250 SLM	2626161	28/01/14	28/01/16
Brue! & Kjaer calibrator	2615248	26/09/13	26/09/14
Brue! & Kjaer microphone type 4189	2621156	28/01/14	28/01/16

Appendix 2: Weather data



The above graph shows the average wind direction as arrows and the average wind speed (m/s) as the grey line. There is a noticeable decrease in the speed from around 22:30hrs until 10:00hrs. The average wind speed for the total monitoring was 1.4m/s and the predominant wind direction was 290°.

Appendix 3: Complainant's Noise Log

Noise Diary

Incident reference number BM2381Q

Name, address and contact details (telephone numbers, e-mail) of person reporting noise complaint.

Caroline St, Llanelli

Name, address and details of alleged noise source

AMG Resources Ltd, Nevill's Dock, Llanelli

Date	Time	Duration	Description of description of noise (e.g., hiss, hum, rumble, continuous, intermittent)	Weather Conditions e.g. dry, rain, fog, snow.	Wind conditions e.g. SW, light, steady, strong, gusting, calm
10-7-14	10-5pm	ongoing	Banging Revving, punching. TIPPING noise scraping.	Calm.	
" " "	11-30pm	ongoing	TIPPING Banging	Calm.	
11-7-14	1-10am	2-00 am	" Squealing Banging TIPPING Engine Noise.	Calm	
11-7-14	3-24am ~~3-11pm~~	~~3-11am~~ ongoing	" "	Calm	

Appendix 4: Glossary of acoustic terminology

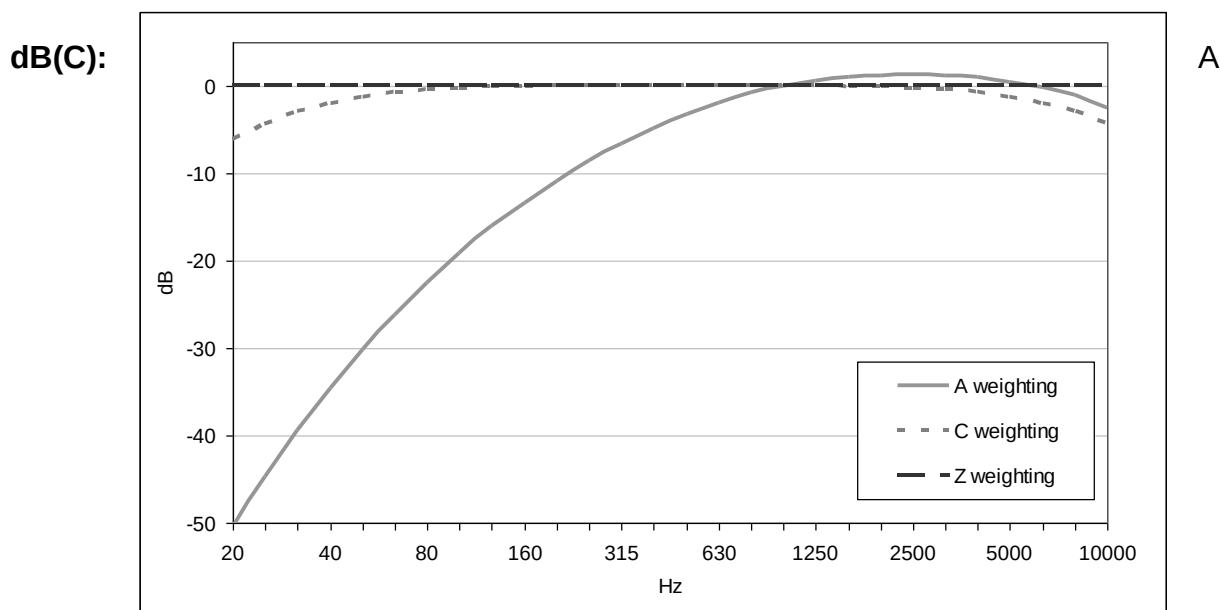
1/3 octave: Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one-third of an octave each. An octave is taken to be a frequency interval, the upper limit of which is twice the lower limit (in Hertz).

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. Unlike the residual noise, the ambient noise includes the contribution from the specific noise.

Background Noise Level, L_{90,T}: The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the **L_{90,T}**. It is often used to show how quiet a location is in the absence of **specific noise source** under investigation.

dB (decibel): The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure (0.00002 N/m²). 0 dB is the threshold of hearing, 140 dB is the threshold of pain. A change of 1 dB is detectable only under laboratory conditions. A change of 10 dB corresponds approximately to halving or doubling the loudness of sound.

dB(A): A measure of the overall noise level of sound across the audible frequency range (20Hz - 20,000Hz) with a frequency weighting (i.e. 'A' –weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies. The background noise level in a living room may be about 40 dB(A), normal conversation about 60 dB(A), heavy road traffic at 60mph about 80 dB(A), the level near a pneumatic drill about 100 dB(A).



measure of the overall level of sound across the whole frequency range with the 'C' frequency which is virtually linear between 50Hz and around 5kHz. It is often used to measure industrial noise sources that have a large low frequency component.

dB(Z): An unweighted or Zero weighted measure of the overall level of sound across the whole frequency range.

Façade Level: Noise levels at locations 1m from the façade of a building are described by the term Façade Levels and are subject to higher noise levels than those in open areas (free-field conditions) due to reflection effects. This reflection may increase the noise level by up to 3dB.

FFT: (Fast fourier transform) a method of narrow band frequency analysis that allows a very high resolution investigation of the exact noise frequencies present.

Hz (Hertz): The unit of sound frequency in cycles per second

Impulsive noise: A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.

Leq,T: The average sound level in dB containing the same acoustic energy as the fluctuating sound level over time period T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. Leq,T can be measured directly with an integrating sound level meter.

Noise: Unwanted sound. Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a subject exposed to it, or any sound, that could to cause actual physiological harm to a subject exposed to it, or physical damage to any structure exposed to it, is known as noise.

NR: Noise Rating curves, similar to Noise Criteria (NC) curves, form a set of noise criteria given in octave bands.

Noise-sensitive location: Any dwelling, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity, which for its proper enjoyment requires the absence of noise at nuisance levels.

Rating level L_{Ar} T: The equivalent continuous 'A'–weighted sound pressure level of an industrial noise during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound.

Residual noise: The noise level in the area in the absence of the noise source under investigation.

SEL: Sound Exposure Level (also described as L_{AE}). Quantifies the total acoustic energy over the time interval of the event over the equivalent of one second. This means that a doubling of either the duration of the event or the noise energy both result in an increase of 3dB of the SEL.

Sound power level and sound pressure level: Any source of noise has a characteristic sound power, a basic measure of its acoustic output (like the wattage of a lightbulb), but the sound pressure levels it gives rise to depend on many external factors. These include the distance and orientation of the receiver, the temperature and velocity gradients in the medium, and the environment. Sound power, on the other hand, is a fundamental physical

property of the source alone, and is therefore an important absolute parameter, which is widely used for rating and comparing sound sources.

Specific noise level: The equivalent continuous 'A'–weighted noise level produced by the source under investigation (that is, the specific noise source) over a period (T) as measured at the assessment point (usually a noise-sensitive receptor) $L_{eq, T}$.



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