

# COG MOORS WWTW – PROPOSED ADVANCED ANAEROBIC DIGESTION (AAD) PLANT

## Noise Impact Assessment

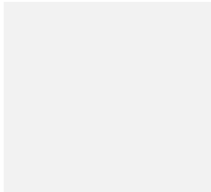
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# COG MOORS WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

## Noise Impact Assessment

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## VERSION CONTROL

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1	1 <sup>st</sup> August 2017	P Tallantyre	First Draft
2	1 <sup>st</sup> November 2017	P Tallantyre	Updated in accordance with final design

This report dated **01 November 2017** has been prepared for Welsh Water Capital Delivery Alliance (the “Client”) in accordance with the terms and conditions of appointment (the “Appointment”) between the Client and **Arcadis (UK) Limited** (“Arcadis”) for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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## Non-Technical Summary

Arcadis Consulting (UK) Limited have been commissioned by Dŵr Cymru Welsh Water Capital Delivery Alliance (CDA) to undertake a noise assessment for the proposed upgrade of the Cog Moors Wastewater Treatment Works (WwTW) at Dinas Powys to include an Advanced Anaerobic Digestion (AAD) facility.

The proposed AAD plant at the Cog Moors site would supplement the operation of the existing digesters (which would be refurbished) and would provide additional capacity to accept and treat sewage sludge arising from other WwTW facilities in South Wales, in accordance with DCWW's Sludge Strategy. The biogas produced by the proposed AAD plant would be used, via a combined heat and power (CHP) plant and boiler, to generate heat and renewable electricity for use on site or for export to the national grid. The sludge cake would be recycled to farmland as a high-value and sustainable fertiliser.

Within the scope of this study, baseline noise levels have been measured at a number of locations around the site representative of the closest noise sensitive receptors to the facility. Noise levels generated by the new AAD plant have been predicted and assessed in line with the impact assessment criteria as defined in British Standard 4142: 2014 *Method for Rating and Assessing Industrial and commercial sound* and referencing the guidance of BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings* and the World Health Organisation where appropriate.

The study concluded that where the Standard is appropriate noise associated with new AAD facility, inclusive of the mitigation specified within this report, would be at a level where BS4142 considers it to be “*an indication of the specific sound source having a low impact*”.

Additional consideration has been undertaken in accordance with BS8233 the World Health Organisation (WHO) guidelines for the overnight period. This assessment concludes that noise from the AAD would be predicted to be below the targets of BS8233 and the WHO Night Noise Guidelines, and as such considered to be acceptable with regard to amenity.

With the implementation of the specified design controls and associated mitigation, no significant issues relating to noise are anticipated.

# 1 Introduction

## 1.1 Project Introduction

Arcadis Consulting (UK) Limited (Arcadis) has been commissioned by Dŵr Cymru Welsh Water Capital Delivery Alliance (DCWW) to undertake a noise assessment for the proposed improvements to the existing Cog Moors Wastewater Treatment Plant (WwTW) at Dinas Powys.

This report and assessment is based upon background and ambient noise measurement surveys undertaken in the vicinity of the site during July 2017, during the proposed operational hours.

Details regarding the assessment methodology employed, together with the results of the survey undertaken, and the subsequent conclusions and recommendations drawn are presented within the following report.

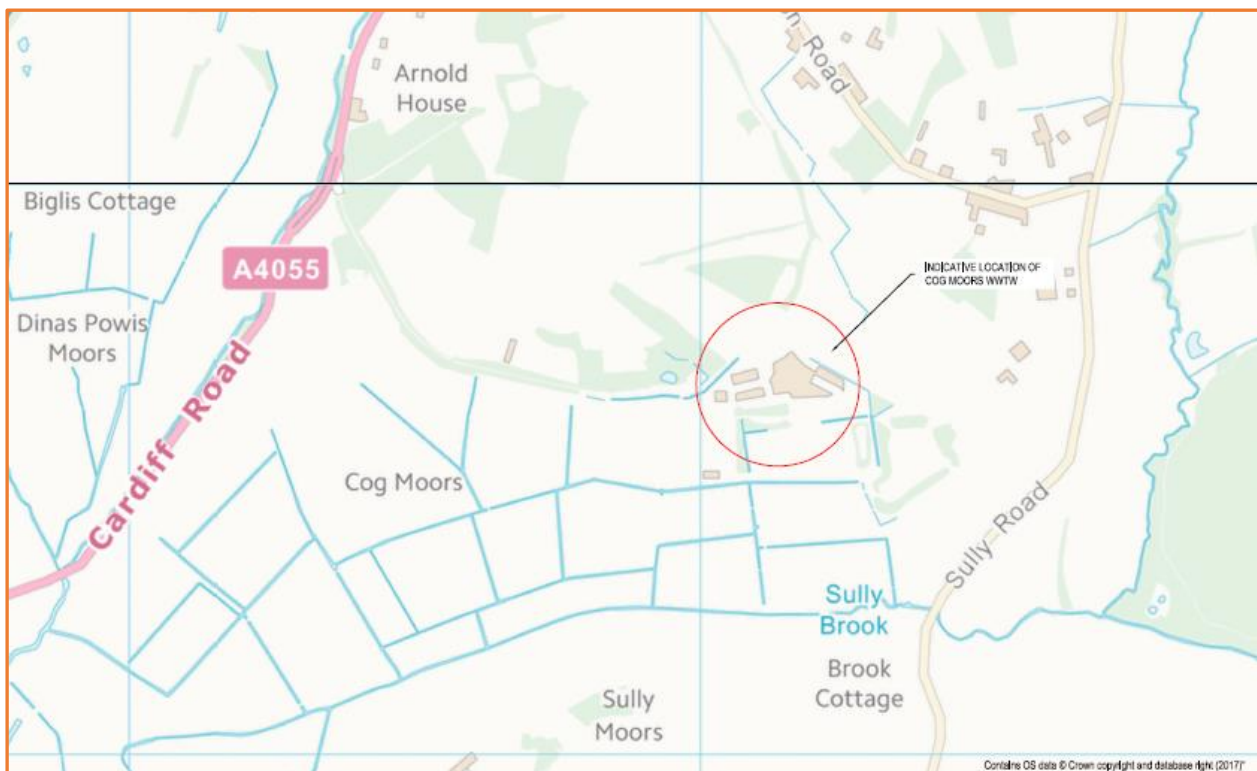
## 1.2 Site Location and Setting

The Cog Moors WwTW is an existing operational facility which is situated to the east of the A4055 Cardiff Road, approximately 2km east of Barry and 1km south of Dinas Powys. The current facility is centred at approximate grid reference ST 16026 69612.

The proposed AAD plant will operate in conjunction with the existing sewage sludge treatment facilities and is located to the eastern side of the existing Cog Moors facility. Part of the proposed AAD plant would be located within the existing operational area of the WwTW, with the balance of the proposed development on land immediately to the east of the existing WwTW, currently identified as areas of woodland, scrub and ruderal vegetation.

The site area is indicated approximately within the red circle on Image 1-1 below:

Image 1-1: Approximate Site Location Plan (North top).



### 1.3 Description of Development

The assessments undertaken within the scope of this report seek to consider the potential noise related impacts associated with DCWW's intention to install advanced anaerobic digestion (AAD) technologies at their facility at Cog Moor WwTW.

Wastewater treatment processes typically produce a treated liquid effluent (which is normally discharged to either a river or to the sea, in accordance with an appropriate discharge consent) and a sewage sludge (which is normally disposed of to agricultural land, following treatment). At Cog Moors WwTW, the sewage sludge that results from the treatment of wastewaters is currently treated by anaerobic digestion (AD), a process which releases biogas and is used to generate electricity on site, whilst the sewage sludge following digestion, (referred to as "sludge cake") is disposed of to farmland as a soil improver and fertiliser.

The advanced anaerobic digestion plant (AAD) proposed at the Cog Moors site would supplement the operation of the existing AD facility (which would be refurbished), and would provide additional capacity to accept and treat sewage sludge arising from other WwTW in South Wales, in accordance with DCWW's Sludge Strategy.

The biogas produced by the proposed AAD plant would be used, via a combined heat and power (CHP) plant and boiler, to generate heat and renewable electricity for use on site or for export to the national grid. The sludge cake would be recycled to farmland as a high-value and sustainable fertiliser (AAD plant produces a significantly reduced volume of sludge cake from a similar volume of sewage sludge than a standard AD facility).

The residual liquors produced during the sludge treatment process would be returned to the WwTW inlet works for treatment.

#### **The Proposed Development**

The proposed AAD plant comprises a number of new process and infrastructure at the site, together with the demolition and modifications to some existing items of plant and equipment. Vehicular access to the proposed development would continue to be gained from the existing access off the A4055 via Green Lane.

The proposed development is shown on the Proposed Site Layout Plan (Drawing Ref: 4798-S-202-HYD-XX-XX-DR-XX-06109 rev P02), and within Image 1.2 below:





- A combined heat and power (CHP) plant to generate useable heat and electricity, which can be used on site, exported to the grid, or both;
- A UV plant to treat some of the final effluent water from the WwTW, to provide better quality process water, for the THP sludge preparation downstream of thermal hydrolysis;
- Tanks to hold sludge and liquor, resulting from the thickening and dewatering processes;
- A cake storage silo;
- Odour control equipment;
- New internal site access roads and drainage;
- Site clearance and earthworks and new fencing;
- New MCC equipment and control kiosks; and,
- Appropriate mitigation planting and ecological mitigation measures.

It is specifically noted that the information supplied to inform the noise assessment indicates that the facility does not operate at the same level during the daytime and overnight periods. Certain items of plant do not require to operate during the overnight period, and as such account of this has been taken within the noise assessment, with different predicted noise levels informing the daytime and overnight assessments.

## 1.4 Consultation

Within the scope of the application, Arcadis initiated a consultation exercise with the local planning authority (LPA), Vale of Glamorgan County Council. However, it is noted that the contact was made with a Shared Regulatory Services department serving Bridgend, Cardiff and the Vale of Glamorgan.

The consultation was undertaken with the Environmental Health Department between the 23<sup>rd</sup> May and 5<sup>th</sup> June 2017, and was specifically regarding the baseline noise monitoring protocol and the assessment methodologies to be employed. An email was sent to the Environmental Health department which covered the following points:

- Brief outline of the proposed development;
- Appropriate noise assessment methodology; and,
- Appropriate noise monitoring methodology including survey timings, durations and locations.

A response was received from Vale of Glamorgan on the 5<sup>th</sup> June 2017. The response cited that in general the LPA were accepting of the methodology proposed but emphasised the need to monitor as close as possible to Downside Farm (ref NML 1 herein), the closest residential receptor. Where possible the requests made by the Vale of Glamorgan have been implemented within the scope of this report and assessment.

## 1.5 Scope of Work

In order to assess the potential impacts arising from the proposed AAD technology at the Cog Moors WwTW a number of elements of work have been completed. These are as detailed below:

- Consultation with the LPA to discuss and agree appropriate assessment methodologies and protocols, as detailed above;

- Long term background and ambient noise surveys, with associated metrological monitoring, within the vicinity of the site to quantify the current prevailing noise climate;
- Assessment and consideration of noise generation associated with the new AAD technology on the amenity of the surrounding area; and,
- Where necessary, quantification of suitable acoustic mitigation measures and strategies that could be employed at the site to control noise.

## 2 Planning Policy and Guidance

### 2.1 Introduction

Within the following section of the report, detail will be presented relating to the guidance documents and assessment methodologies appropriate for noise associated with the new AAD facility at the Cog Moors WwTW site.

It is noted that whilst there is no specific guidance or British Standard directly relevant to the consideration of noise associated with AAD operations, however as the process involved is industrialised in nature those presented below and considered to be appropriate, and will provide a robust consideration of the operations and potential impacts.

### 2.2 National Policy & Guidance: Wales

#### 2.2.1 Planning Guidance (Wales), Technical Advice Note (TAN) 11: Noise - October 1997

With regard to noise in Wales Technical Advice Note (TAN) 11 is the appropriate policy guidance and whilst the document is referenced as 1997 it was last updated on the Welsh Government website on the 9<sup>th</sup> October 2013.

As such the guidance of TAN 11 will be referenced within the scope of this assessment as outlined below. In general, the guidance contained within TAN 11 considers the following:

- Outlines the considerations, relating to noise, to be borne in mind when determining planning applications for both developments which will generate noise and those that will be noise sensitive;
- Presents the Noise Exposure Category (NEC) method of determination for residential developments; and,
- Advises on the use of conditions and measures that could be implemented to minimise noise impacts.

TAN11 states the following with regard to development that has the potential to generate noise:

- 8. Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.*

Annex B of the TAN 11 specifically provides guidance with regard to planning policy relating to different sources and covers the consideration of noise generated by roads, railways, aircraft, military aerodromes, helicopters and heliports, industrial and commercial developments, wind turbines and wind farms, construction sites, recreational and sporting activities and landfill waste disposal sites.

Specifically, with regard to the consideration of industrial developments TAN 11 advises that assessment should be undertaken “*where the Standard is appropriate, using guidance in BS 4142: 1990*”, supplemented where necessary by consideration in accordance with BS8233 (TAN11 referenced the 1987 revision) to consider “*acceptable noise levels within buildings*”. It is noted that both the BS 4142 and BS 8233 British Standards have been revised to 2014 issues since the original release of the TAN11 document, as such

consideration within the scope of this report will be undertaken to the newer versions of the same Standards where appropriate.

Within Annex C of TAN11 guidance is provided with regard to appropriate planning conditions that can be used to control noise from noise generating developments.

## **2.2.2 BS 4142: 2014 ‘Methods for rating and assessing industrial and commercial sound’**

This British Standard (4142) provides a methodology for the rating and assessing of sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states the method to be appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and,
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The Standard is based around the premise that the significance of the impact of an industrial/ commercial facility can be derived from the numerical subtraction of the background noise climate level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated Rating level of the specific sound under consideration. This comparison will enable the impact of said sound to be concluded based upon the premise that typically “*the greater this difference, the greater the magnitude of the impact*”. This difference is then considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context; and,
- 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.

BS4142 further states that “*where the Rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact*” again depending upon the specific context of the site.

The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that “*not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact*”, thus implying that all sites should be assessed on their own merits and specifics.

The Standard quantifies the typical reference periods (for the purposes of the Standard) to be used in the assessment of noise:

Typical Daytime	07:00 – 23:00	1hr assessment period
Typical Night-time	23:00 – 07:00	15min assessment period

The Standard outlines a number of methods for defining appropriate “*character corrections*” within the Rating Levels to account for tonal qualities, Impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality, and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the Specific level.

The Subjective Method is based on the following corrections and has been used within the scope of this study as a result of the level of information available:

Table 2-1: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for “Other sound characteristics”	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable  +3 dB	If intermittency is readily identifiable  +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

The Objective Methods are based around the actual quantification of 1/3 Octave data for the sound under investigation where possible, and as a result of the level of information available relating to the facility have not been implemented herein.

However, the Standard states that the assessment methodology provided is not intended for the derivation of internal noise levels arising from sound levels outside or “*where background sound levels and rating levels are low*”, however, with regard to the latter no definition of “*low*” is provided<sup>1</sup>. Where these situations prevail, it is considered appropriate to reference the absolute guidance levels provided in British Standard BS 8233: 2014 *Guidance on Sound Insulation and Noise Reduction for Buildings* and the World Health Organisation ‘*Guidelines for Community Noise*’ and ‘*Night Noise Guidance for Europe*’.

### 2.2.3 BS8233: 2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’

The BS8233 Standard is mainly concerned with building design from an acoustic standpoint. It does however contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings.

An extract of Table 4 of BS8233 which presents this data specific for residential dwellings is reproduced in Table 2-2 below:

<sup>1</sup> Within the 1997 revision of the BS4142 Standard “(very) low” was defined as a background level of below 30dB L<sub>A90</sub> and a Rating level below approximately 35dB L<sub>A,T</sub>.

Table 2-2: Indoor Ambient Noise Levels for Dwellings (Table 4: BS8233-2014)

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

Within BS8233 Note 7 to the above table details that “Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved”.

With regard to external noise levels the Standard states that “For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,T}$ , with an upper guideline value of 55 dB  $L_{Aeq,T}$  which would be acceptable in noisier environments”. However, the Standard recognises that these levels are not achievable in all situations and further states that “In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited”.

The internal values detailed within the scope of BS8233: 2014 generally accord well with the recommendations of the World Health Organisation on the same topic.

## 2.2.4 World Health Organisation

The World Health Organisation’s (WHO) ‘Guidelines for Community Noise’ (1999) discusses the issue of community noise and provides health-based noise guidelines. With regard to external noise levels the document states within section 4.2.7 relating to annoyance responses that:

*“During the daytime, few people are seriously annoyed by activities with  $L_{Aeq}$  levels below 55dB; or moderately annoyed with  $L_{Aeq}$  levels below 50dB. Sound pressure levels during the evening and night should be 5-10dB lower than during the day...”*

For night-time noise sources the WHO guidelines recommend a night-time (23.00-07.00) noise level of 45 dB  $L_{Aeq,8h}$  ‘outside bedroom windows’ and on a sleep disturbance basis (for intermittent or impulse noise) the guidelines state that ‘For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB  $L_{Amax}$  more than 10-15 times per night.’

This internal maximum noise limit for bedroom is further presented as an external façade limit of 60 dB  $L_{AFmax}$ , outside bedrooms with windows open to avoid sleep disturbance.

More recently in the ‘Night Noise Guidelines for Europe’ (WHO, 2009) the WHO recommends an  $L_{night}$ , outside of 40 dB as the Night Noise Guidelines (NNG) target to protect the public, including the most vulnerable groups including children, the elderly and the chronically ill. The document further categorises an external value of 55dB as an interim target for countries where the NNG cannot be achieved in the short term.

### 3 Noise Monitoring Survey

This section of the report describes the specifics of the background and ambient noise surveys undertaken in the vicinity of the Cog Moors WTW site.

As detailed below surveys were undertaken on the basis of both long term unattended and shorter term attended surveys. It is note that as a result of site specific issues and access permissions the monitoring may not have been undertaken in the exact locations identified to Vale of Glamorgan during the consultation, however, the locations selected were considered to be entirely representative of the noise climate of the area and acceptable for the purposes of assessment.

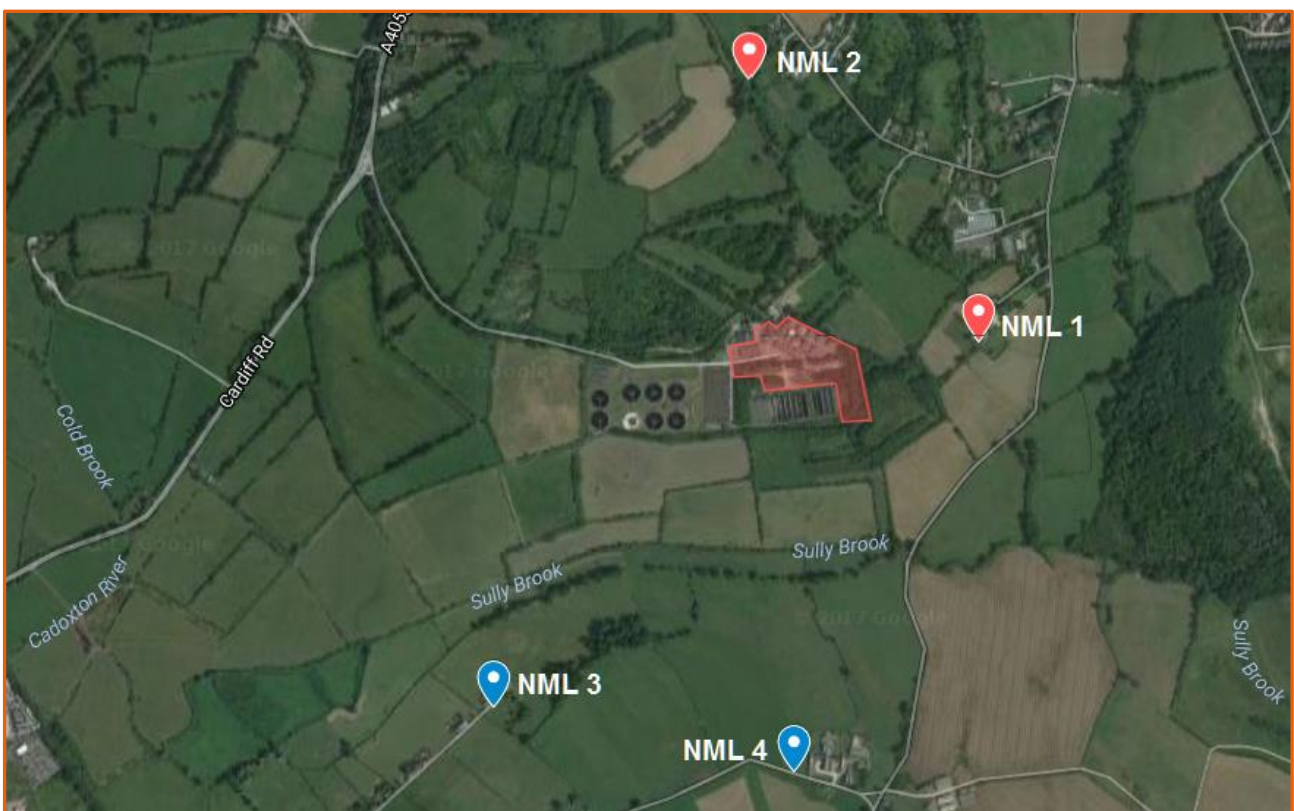
Noise monitoring and meteorological monitoring was undertaken as below:

- Between the 7<sup>th</sup> and 10<sup>th</sup> July 2017; and,
- Between the 14<sup>th</sup> and 20<sup>th</sup> July 2017.

#### 3.1 Survey Details

In order to determine the existing noise climate in the sensitive external areas of the adjacent residential properties both unattended and attended surveys were undertaken. The noise surveys were undertaken during both weekday and weekend periods at the locations detailed within Image 3-1 below. The red balloons detail long term survey positions and the blue balloons short term:

Image 3-1: Baseline Survey Locations



(Image Source: Imagery ©2017 Bluesky, DigitalGlobe GeoEye Getmapping plc, Infoterra Ltd & Bluesky, The Geoinformation Group, Map data ©2017 Google)



**NML1: Downs Farm** (Long Term) - Grid Ref: ST 16532 69654 – Sound Level Meter (SLM) positioned in the garden to the west of the property. The microphone was positioned at an approximate height of 1.5m above local ground level in a position at request of the resident.

**NML2: Warren House** (Long Term) - Grid Ref: ST 16098 70165- SLM positioned on public footpath to the south of the property to the north of the Cog Moors WwTW site. The microphone was positioned at an approximate height of 1.5m above local ground level.

**NML3: Ashby Road** (Short Term) - Grid Ref: ST 15587 68960 - SLM positioned on the road in front of the property to the south west of the Cog Moors WwTW site (north of the A484). The microphone was positioned at an approximate height of 1.5m above local ground level.

**NML4: Cog Farm** (Short Term) - Grid Ref: ST 16161 68821- SLM positioned on roadside (Cog Road) to the south of the Cog Moors WwTW site as a result of access limitations to the rear. The microphone was positioned at an approximate height of 1.5m above local ground level.

The noise monitoring surveys were undertaken over the following periods at each location to cover both weekday and weekend periods.

- NML 1: 7 days continuously between the 14<sup>th</sup> and 20<sup>th</sup> July 2017;
- NML 2: 4 days continuously between the 7<sup>th</sup> and 10<sup>th</sup> July 2017;
- NML 3: Short term attended surveys between the 7<sup>th</sup> and 10<sup>th</sup> July 2017; and,
- NML 4: Short term attended surveys between the 7<sup>th</sup> and 10<sup>th</sup> July 2017.

The short term surveys at locations NML 3 and NML 4 were undertaken on an attended basis to cover the following time periods:

- Daytime Period between 07:00 and 18:00, for up to 2 hours per location. Both Weekday and Weekend;
- Evening Period between 20:00 and 23:00, for up to 30 minutes per location. Both Weekday and Weekend; and,
- Overnight Period between 00:00 and 04:00, for up to 30 minutes per location. Both Weekday and Weekend.

## 3.2 Weather

The monitoring surveys were both undertaken in conjunction with a specific meteorological survey quantifying information relating to wind speed, wind direction, temperature, humidity and rainfall data.

It is specifically noted that data will be excluded from the analysis as a result of average wind speeds above 5m/s and any rainfall occurring during any given 15 minute survey period.

This is considered further within Section 4.1.

### 3.3 Monitoring Equipment

The monitoring of noise was undertaken in line with the guidance set out within BS7445: 2003. The sound level meters were programmed to monitor over 15-minute intervals during the daytime and overnight periods in parallel with the meteorological monitoring equipment which was also set to a 15 minute resolution.

The noise monitoring equipment used was set to record the following statistical parameters:

- $L_{Aeq}$  in dB
- $L_{A90}$  in dB
- $L_{A10}$  in dB
- $L_{Amax}$  in dB

The meteorological monitoring equipment used was set to record the following parameters:

- Precipitation using a Doppler radar system, providing amount in mm, rate and type;
- Wind speed ( $ms^{-1}$ ) and direction (degrees) using 4 ultrasonic sensors and a built-in compass which automatically locates north for the purpose of setting the direction measurements;
- Temperature ( $^{\circ}C$ );
- Barometric Pressure (hPa);
- Relative Humidity (%);
- Dew point ( $^{\circ}C$ )

The following monitoring equipment was used for both noise and weather in order to undertake the survey work in the vicinity of the site.

Table 3-2: Noise Monitoring Equipment

Equipment	Manufacturer	Type	Serial Number	Calibration Due Date
<b>Noise Monitoring Equipment</b>				
Sound Level Meter	Rion	NL62	00120010	30 <sup>th</sup> March 2019
		NA28	01070574	7 <sup>th</sup> June 2019
Calibrator	Rion	NC-74	50541131	4 <sup>th</sup> July 2018
<b>Meteorological Monitoring Equipment</b>				
Meteorological Station	Lufft	WS600 (Hire Unit)	1079	N/A

The following set-up parameters were used on the noise monitoring equipment used during all of the noise measurements undertaken:

Time Weighting: Fast  
 Frequency Weighting: "A"

The noise meters used within this assessment were locally calibrated using an electronic calibrator prior to commencement and upon completion of each survey, no significant drift in calibration was observed. The calibration documentation for the equipment used can be provided upon request.

## 4 Noise Survey Results

This section of the report summarises the results of the noise and meteorological monitoring survey undertaken within the scope of this assessment. The full monitoring data for noise is available in Appendix A of this report.

### 4.1 Meteorological Monitoring Survey Results

The meteorological data amassed during the survey period has been analysed in order that periods with inclement weather can be excluded from the survey on the basis of the following:

- Any periods (15 minute) of Rainfall greater than 0mm; and,
- Average wind speed of 15 minutes exceeding 5m/s<sup>-1</sup>.

Within the analysis of the dataset monitored a total of 95 x 15-minute periods have been excluded from the analysis as a result of precipitation as defined above. No (0) periods required to be removed from the dataset as a result of excessive wind speed.

The meteorological dataset used in the analysis, amassed on the Cog Moors WwTW site, can be provided upon request.

### 4.2 Noise Monitoring Survey Results

Presented within Table 4-1 below is a summary of the noise levels monitored at locations NML 1 to NML 4 as detailed within Section 3.1 and presented on Image 3-1 of this report.

Given the proposed operational hours of the facility following commissioning, as detailed within Section 1.4 of this report, it has been considered necessary to present the averaged noise levels measured during:

- Normal weekday daytime period (07:00 – 23:00);
- Weekend daytime period (07:00 – 23:00); and,
- Overnight period (23:00 to 07:00).

However, with regard to the BS4142 assessment forming the basis of this study further analysis of the measured baseline datasets during these periods has been undertaken and is presented within Section 6.2.

The entire baseline noise dataset is provided in Appendix A for information purposes.

The data is presented as the averaged 15-minute levels during the relevant assessment periods.

Table 4-1: Measured Noise Level Data

Location	Period (hh:mm)		Interval Time "T" (hh:mm:ss)	Average Measured Noise Levels			
				L <sub>Aeq, T</sub>	L <sub>Amax, T</sub>	L <sub>A90, T</sub>	L <sub>A10, T</sub>
NML1	Weekday Daytime	07:00 – 23:00	00:15:00	51.4	58.9	32.5	41.2
	Saturday Daytime		00:15:00	44.2	54.4	35.1	40.0
	Sunday Daytime		00:15:00	49.5	58.7	32.4	39.1
	Night time	23:00 – 07:00	00:15:00	35.1	46.2	29.6	34.0
NML2	Weekday Daytime	07:00 – 23:00	00:15:00	49.5	60.4	36.5	42.7
	Saturday Daytime		00:15:00	45.9	61.5	29.4	39.8
	Sunday Daytime		00:15:00	42.3	60.3	31.8	39.7
	Night time	23:00 – 07:00	00:15:00	36.1	49.2	28.3	33.4
NML3	Weekday Daytime	07:00 – 18:00	00:15:00	42.8	59.5	38.5	44.3
	Weekday Evening	20:00 – 23:00	00:05:00	40.1	54.0	36.4	41.7
	Sunday Daytime	07:00 – 18:00	00:15:00	41.8	58.8	35.0	44.3
	Sunday Evening	20:00 – 23:00	00:05:00	40.6	53.5	37.8	42.3
	Night time	23:00 – 07:00	00:05:00	40.0	52.3	35.5	40.4
NML4	Weekday Daytime	07:00 – 18:00	00:15:00	62.6	83.6	39.1	60.5
	Weekday Evening	20:00 – 23:00	00:05:00	58.3	79.3	33.8	47.6
	Sunday Daytime	07:00 – 18:00	00:15:00	62.3	83.9	36.5	56.5
	Sunday Evening	20:00 – 23:00	00:05:00	54.9	66.9	36.2	44.9
	Night time	23:00 – 07:00	00:05:00	52.2	64.0	28.3	38.2

### 4.3 Subjective Field Notes

As detailed within Section 3.0 of this report the baseline and ambient noise survey were undertaken on a part attended and part unattended basis, however, notes were taken during the setup of the equipment and at key points throughout the long-term survey period to quantify the prevailing noise climate.

- At NML1, the climate was noted to be dominated by natural and agricultural noise. There was noted to be some birdsong noise and some audible noise from the existing elements of the WwTW facility at the rear of the property.
- At NML2, the climate was again noted to be dominated by agricultural and residential noise. There was also some birdsong and nearby agricultural noise.
- At NML3, the climate was noted to be dominated by residential generated noise. There was noted to be some distant road traffic noise as well as agricultural noise but no audible noise from the WwTW facility to the north of the property.
- At NML4, the climate was noted to be dominated by road traffic movements on Cog Road. There was also some birdsong from hedgerows on the roadside.

These noise contributors were noted in conjunction with natural noises and human activity noise within the general area.

## 5 Predictive Noise Modelling Assessment

This section of the report will detail the calculation methodologies used, along with the assumptions embodied within the noise modelling aspect of the study.

### 5.1 Noise Modelling Protocols

The noise model was constructed within the commercially available Braunstein + Berndt GmbH computer noise mapping software SoundPLAN 7.4.

Within the scope of this modelling exercise acoustic propagation has been calculated in accordance with the following methodology:

- ISO 9613-2: *Acoustics – Attenuation of sound during propagation outdoors: Part 2: General method of calculation.*

### 5.2 Foundation of the Model

The noise model was constructed utilising the following information:

- Detailed site layout information in the form of OS Vector mapping;
- Dŵr Cymru Welsh Water Capital Delivery Alliance drawing 4798-S-202-HYD-XX-XX-DR-XX-06109 rev P02;
- Commercial 3D OS Panorama Digital Terrain Model information; and,
- Noise data provided by the Design Engineers for the proposed plant and equipment as presented within Appendix B.

### 5.3 Modelling Assumptions

Within the scope of the construction of the noise model certain information was required to be assumed associated with the operational characteristics of the facility. All assumptions embodied within the scope of the modelling exercise are as detailed below.

#### 5.3.1 Noise Levels

Arcadis have been informed that the only noise generating equipment proposed at the site within the scope of the new facility would be as listed on the drawing presented within Appendix B.

Of the plant listed on the drawing:

- All elements will be operational during the daytime period.
- Certain plant items would not be operational during the overnight period, including:
  - Pre THP Silo A
  - Pre THP Silo B
  - Pre-Digestion Dewatering Building
  - Pre-Digestion Centrifuge Feed Pumps
  - Liquors Balance Tank Pumps

- Export Silo A Installation
- Export Silo B installation
- Post Digestion Dewatering Building
- Poly Make Up Plant and Dosing Skid Installation Building
- Poly Silos Package
- Liquor Balance Tanks.
- Additionally, certain plant items would only operate for a very limited time period, including:
  - Low Level Waste Gas Burner (2 hours in any 24hr period)
  - Biogas Holder Air Fan (10 mins in an hour)

### ***Building Envelope Construction***

The information supplied with the design drawing in Appendix B indicates that the noise reduction attributable to the building façades would achieve a composite reduction of 25dB. This has been assumed within the noise models.

It has been assumed that any features, including windows or doors (personnel and vehicle access), within the façades of the buildings would perform to an acoustic attenuation value of no less than the surrounding wall/roof constructions as detailed above to prevent acoustic weak spots.

Furthermore, the construction of the buildings would need to be of a good quality to ensure that there are no gaps between (or within) panels, junctions, eaves or ridge such to create acoustic weak spots.

### ***Vehicle Access***

From the information available it is not envisaged that the AAD facility, once operational, will alter vehicle activity significantly at the site from that already occurring, and that access will remain via the current route.

As such no assessment of vehicle activity noise has been undertaken within the scope of this study as it will not change significantly from that currently experienced within the area.

## **5.4 Inherent Mitigation Provision**

The information presented within the drawing in Appendix B identifies noise levels associated with the main plant items necessary as part of the AAD facility. The noise levels quantified on the drawing accord with the standard requirements of DCWW.

However, through the iterative process of the noise assessment it is apparent that the noise levels presented on the drawing would result in unacceptable impacts on the noise climate of the area and as such additional mitigation is required to be built into the design of the facility. The noise assessment has identified that through specific design measures the noise generation of the plant associated with the AAD facility would need to accord with:

- The Building structures identified as generating no more than 55dB @ 1m would remain unchanged;
- All external plant identified on the drawing as generating 80dB @ 1m would require to be further mitigated/attenuated by design measures or screening to achieve a noise level of no greater than 75dB @ 1m, with the exception of the plant detailed specifically in point 3 below; and,
- The following identified plant and equipment would require further mitigated/attenuated by design measures or screening to achieve a noise level of no greater than 70dB @ 1m.

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

- Plant item 21: Disinfected Final Effluent Booster Pumps;
- Plant item 06: Cake imports Facility;
- Plant item 22: Liquors Balance Tank Pumps;
- Plant items 25: Export Silos A and B Installations;
- Plant items 07: Pre THP Silos A and B; and,
- Plant item 17: Portable Water Booster Pump-set.



## 6 Noise Impact Assessment

In this section of the report the results of the noise modelling assessment will be compared to the noise climate of the area in order to conclude the envisaged noise impacts of the proposed AAD Technology.

As previously stated, the impacts associated with the proposed AADT plant would be assessed in line with the following document/methodology:

- BS4142:2014 *Methods for rating and assessing industrial and commercial sound*.

It is noted that BS4142 stipulates that the methodology is not suitable for assessing noise within buildings (from external sources) or in areas with low background noise climates (when facility noise is also low). Given this, where necessary additional consideration of the potential noise impacts based upon absolute levels will be made where necessary. The BS4142: 2014 assessment has therefore been augmented by an additional assessment in line with the following guidance where necessary:

- BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings*; and,
- World Health Organisation Guidelines.

It is noted that the AAD facility will operate at a different level/output during the daytime and overnight periods. As such multiple noise model scenarios have been constructed to account for this, one for the daytime period and one for the overnight, and are discussed and presented separately within Section 6.3 below.

### 6.1 Character Corrections

Within the methodology of BS 4142 it is necessary to calculate a “Specific” external noise level at each receptor location from the operations under consideration. This “Specific” noise level then requires converting to a “Rating” level in order to take account of tonal or noticeable characteristics of the source noise.

Noise generated by plant and equipment contained within purpose built, and acoustically specified buildings would be controlled to a degree where noticeable characteristics would be controlled. However, as certain plant items are external the following has been concluded with regard to suitable character corrections for the operations. The Subjective Method from BS 4142 has been used in this case as a result of the information available:

Table 6-1: BS 4142 Character Corrections

Characteristic	Subjective Perception	Justification	BS 4142 Correction
Tonality	Just	Noise from the new elements of the facility relates primarily to plant noise. For all plant and equipment located within purpose-built buildings noise generated within would be controlled into the environment by the façade envelope of the building. However, external plant would not be controlled in this manner and at the separation distances involved could be “Just” perceptible in the noise climate.	+2
Impulsivity	None	Aside from the plant that switches off during the overnight period the facility would generally run at a constant level during the daytime and night time periods.	+0
Other Characteristics	None	No ‘other’ characteristics have been identified associated with the site.	+0
Intermittency	Possible	Aside from the plant that switches off during the overnight period the facility would generally run at a constant level during the daytime and night time periods.	+0
<b>Total Character Correction</b>			<b>+ 2</b>

Within the scope of the assessment produced the predicted “Specific” sound levels from the site operations have therefore been corrected as detailed below:

- + 2dB.

## 6.2 Baseline Noise Climate Analysis

With regard to the baseline noise climate used within the scope of any BS4142 assessment, the Standard states that:

*“In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.*

*Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.”*

The background (L<sub>A90</sub>) data collected during the noise surveys has therefore been analysed to determine the modal value<sup>2</sup> recorded at each of the monitoring locations. This has been done separately for each location

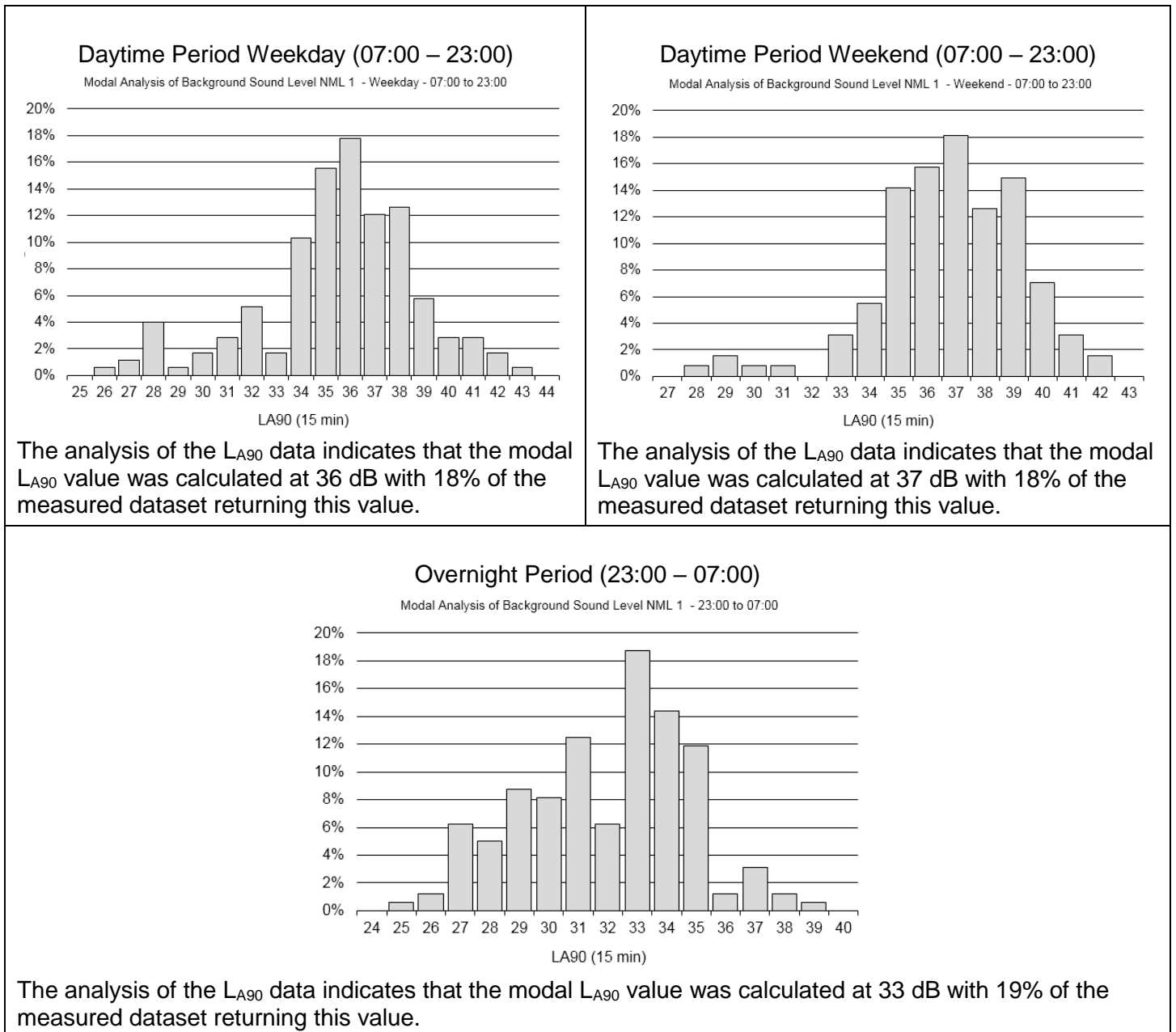
<sup>2</sup> The statistical definition of the “mode” is the value that appears most often in a set of data.

during the weekday and weekend periods for the daytime and overnight periods separately. This will ensure that noise is considered suitably across the entire 24hr period.

The BS4142 assessment undertaken within the scope of this report has been undertaken against the Mode of the measured data as detailed within the graphs below.

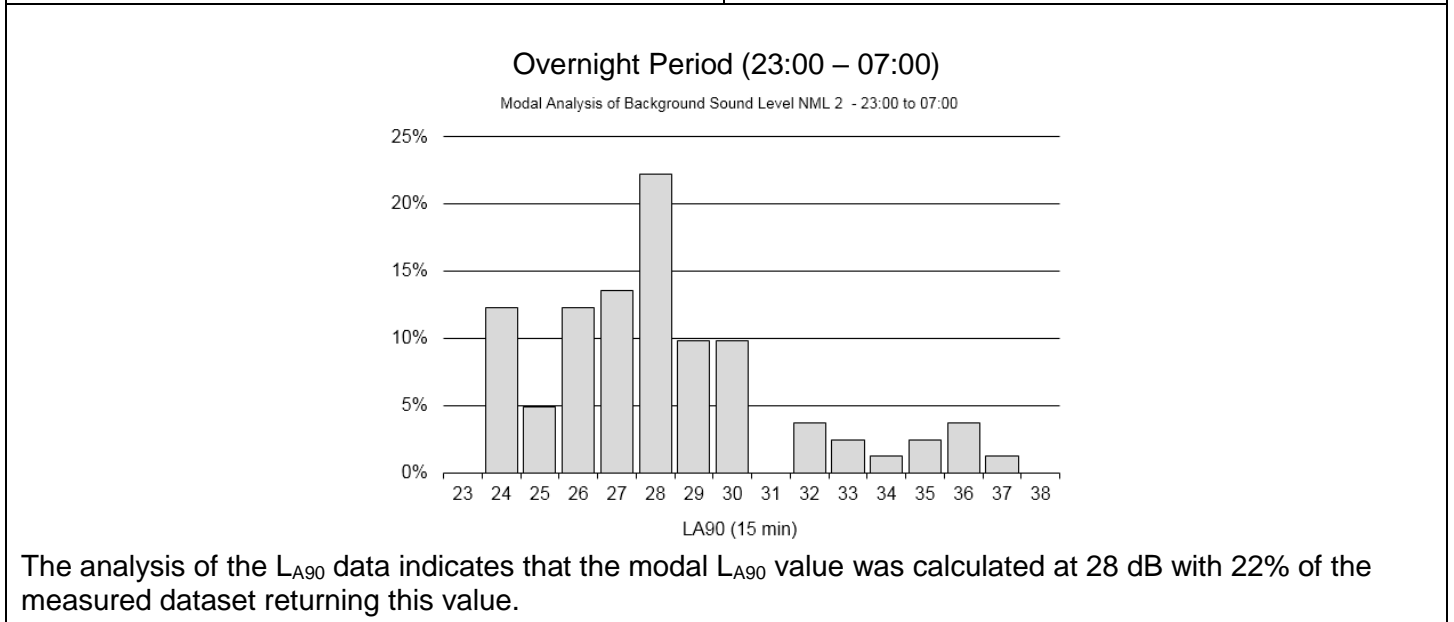
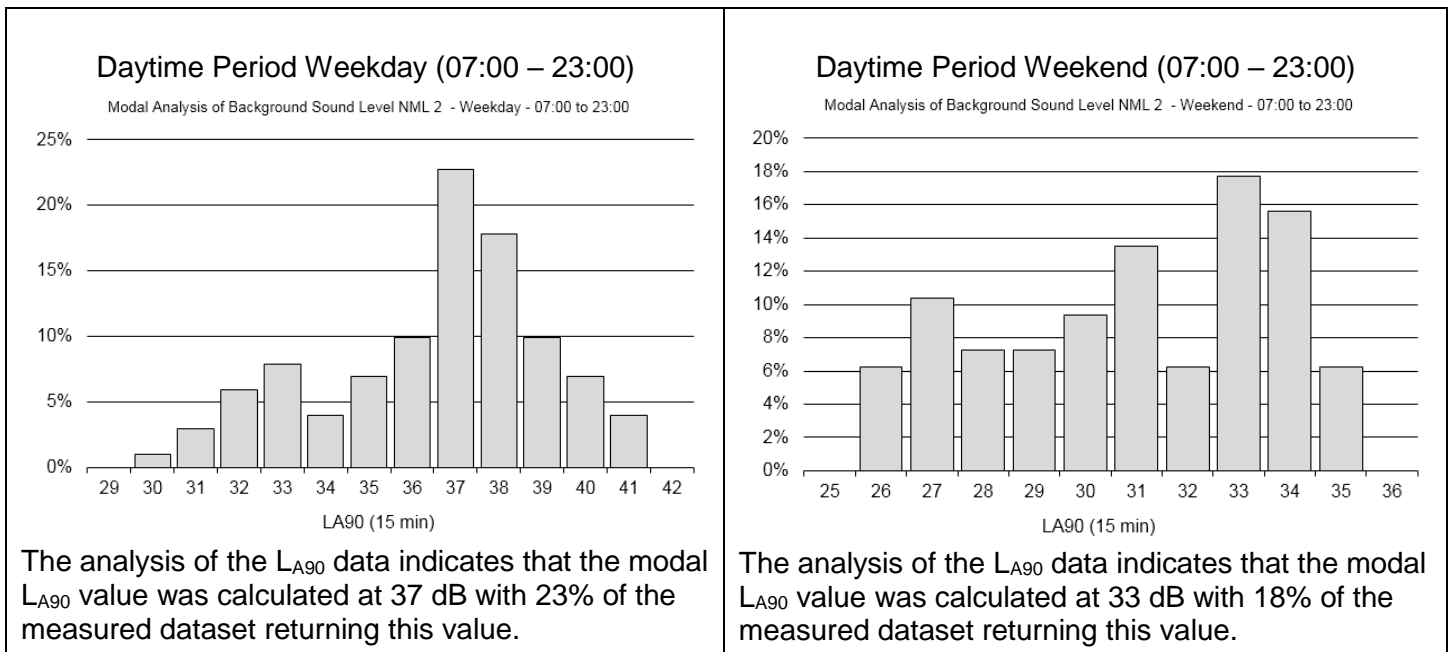
### 6.2.1 Noise Monitoring Location NML1

The statistical analysis of the background ( $L_{A90}$ ) noise data at NML1 is presented on the graphs below:



### 6.2.2 Noise Monitoring Location NML2

The statistical analysis of the background (L<sub>A90</sub>) noise data at NML2 is presented on the graphs below:



### 6.2.3 Noise Monitoring Locations NML 3 and NML 4

As these locations were surveyed on the basis of short term attended measurements there is insufficient information to provide a meaningful modal analysis of the dataset. As such the averages presented below would be used for these locations calculated from the information presented within Table 4-1.

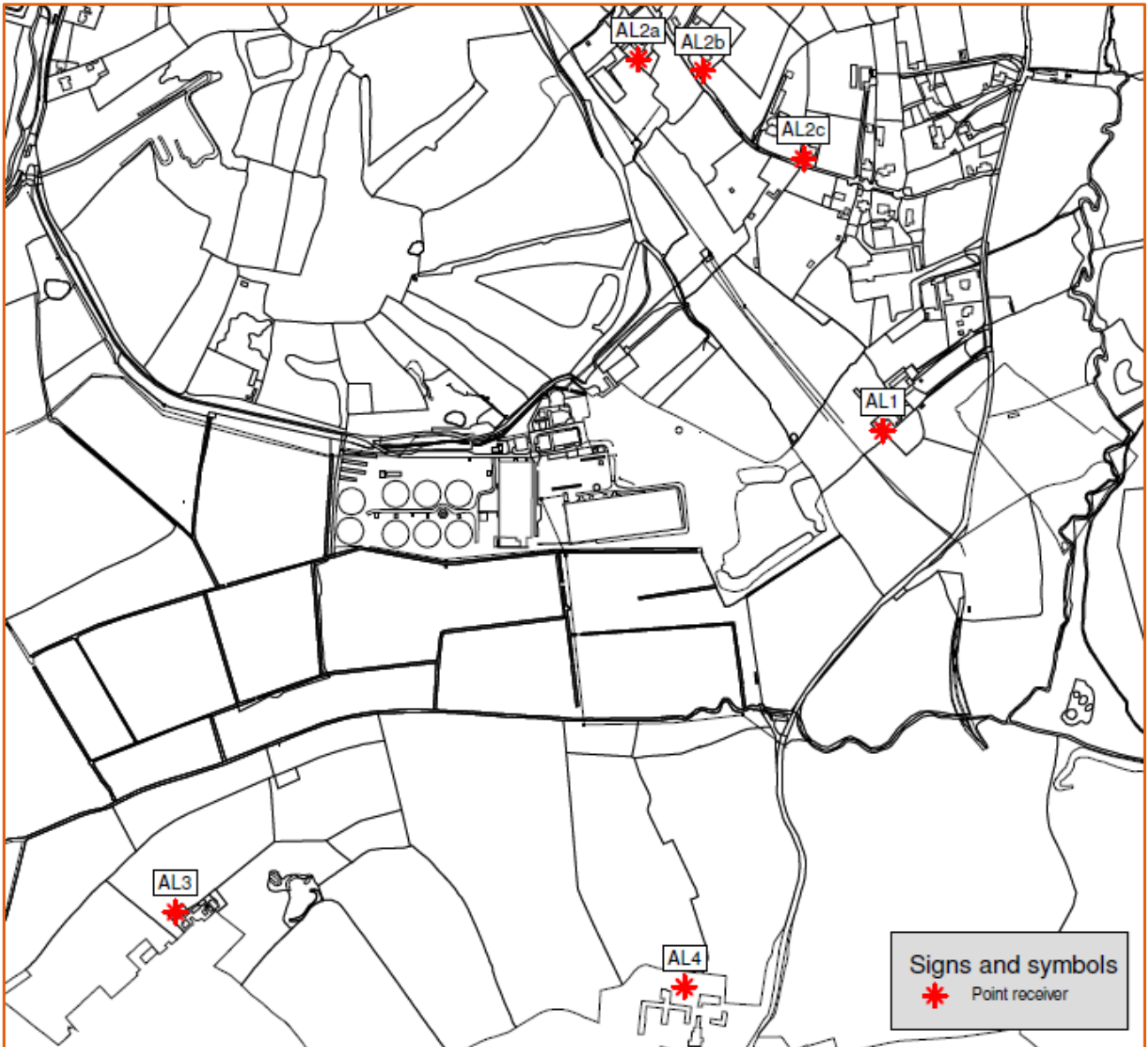
Location	Period (hh:mm)	Interval Time “T” (hh:mm:ss)	Average Measured
			L <sub>A90, T</sub>
NML3	Weekday Daytime	00:15:00	37.5
	Weekend Daytime	00:15:00	36.4
	Night-time	00:15:00	35.5
NML4	Weekday Daytime	00:15:00	36.5
	Weekend Daytime	00:15:00	36.4
	Night-time	00:15:00	28.3

### 6.3 External Noise Assessment

In the interest of presenting a comprehensive assessment 6n.o (six) assessment locations have been considered within the scope of this report.

The assessment locations considered are presented graphically on Image 6-1 below.

Image 6-1: BS4142 Assessment Locations



It is necessary to make an assumption relating to the background noise climate at the assessment locations presented within Image 6-1 above as not all were subject to specific monitoring.

For reference, the matrix below relates the Assessment Location (AL) to the relevant baseline noise monitoring data.

Table 6-1: Assessment Location/ Monitoring Location Matrix

Assessment Location	Relevant Monitoring Location
AL1	NML 1
AL2a	NML 2
AL2b	
AL2c	
AL3	NML 3
AL4	NML 4

Where multiple locations are presented within Image 6-1 and Table 6-1 under the same AL number, prediction of noise has been undertaken from the AAD plant to all locations, with the BS4142 assessment based upon the receptor returning the highest predicted noise level.

### 6.3.1 Weekday Daytime Period

Weekday daytime (07:00 – 23:00) operation of the AAD facility would include the following operations:

- Operation of all identified static plant within the AAD facility (As per section 5.3.1).

With regard to the operation of the AAD, a noise model scenario has been constructed to predict the propagation of noise generated within the facility into the surrounding area and the numerical output of the model used to inform the assessment presented within Table 6-2.

As a result of the time period in question the predictions have been undertaken to ground floor level (1.5m AOD) to reflect the noise impact on the sensitive portion of the dwellings during this time period. It is reiterated that with regard to receptor AL2 the highest level predicted at either AL2a, AL2b or AL2c has been assessed and is identified within the table.

Table 6-2: Daytime BS4142 Noise Assessment

Assessment Location	Average (Modal) Measured $L_{90, 60mins}$ 'Background' noise level $x^{(1)}$ , dB	Predicted BS 4142 Specific Noise Level $^1$ , dB	Corrected BS 4142 Rating Level $^1$ , dB	Difference, dB
<b>Weekday Daytime Period</b>				
AL1	36	34 (34.0)	36	+/-0
AL2c	37	29 (28.8)	31	-6
AL3	38	21 (20.9)	23	-15
AL4	37	25 (25.1)	27	-10

Notes:

<sup>(1)</sup> Noise levels rounded to nearest whole dB in accordance with the guidance of BS 4142

It can be seen from the table above that noise arising from the daytime operation of the new AAD facility within the Cog Moors WwTW site would be rated by BS4142 as being:

**Weekday Daytime** - between -15dB and +/-0dB relative to the existing background noise climate of the area, depending upon assessment location. Results of these magnitudes would be classified by BS 4142 as being “*an indication of the specific sound source having a low impact*” as a result of the relationship of the predicted noise to the existing baseline noise climate of the area.

As such it is concluded that no further acoustic mitigation would be necessary at the site above that already specified within Section 5.4 to be required within the design of the facility and the specification of the plant and equipment.

### 6.3.2 Weekend Daytime Period

The weekend daytime (07:00 – 23:00) operation of the AAD facility would include the following operations:

- Operation of all identified static plant within the AAD facility (As per section 5.3.1).

With regard to the operation of the AAD, a noise model scenario has been constructed to predict the propagation of noise generated within the facility into the surrounding area and the numerical output of the model used to inform the assessment presented within Table 6-3.

As a result of the time period in question the predictions have been undertaken to ground floor level (1.5m AOD) to reflect the noise impact on the sensitive portion of the dwellings during this time period. It is reiterated that with regard to receptor AL2 the highest level predicted at either AL2a, AL2b or AL2c has been assessed and is identified within the table.



Table 6-3: Weekend BS4142 Noise Assessment

Assessment Location	Average (Modal) Measured $L_{90, 60mins}$ 'Background' noise level $x^{(1)}$ , dB	Predicted BS 4142 Specific Noise Level $^1$ , dB	Corrected BS 4142 Rating Level $^1$ , dB	Difference, dB
<b>Weekend Daytime Period</b>				
AL1	37	34 (34.0)	36	-1
AL2c	33	29 (28.8)	31	-2
AL3	36	21 (20.9)	23	-13
AL4	36	25 (25.1)	27	-9

Notes:

<sup>(1)</sup> Noise levels rounded to nearest whole dB in accordance with the guidance of BS 4142

It can be seen from the table above that noise arising from the daytime operation of the new AAD facility during the weekend period within the Cog Moors WwTW site would be rated by BS4142 as being:

**Weekend Daytime** - between -13dB and -1dB below the existing background noise climate of the area, depending upon assessment location. Results of these magnitudes would be classified by BS 4142 as being “an indication of the specific sound source having a low impact” as a result of the relationship of the predicted noise to the existing baseline noise climate of the area.

As such it is concluded that no further acoustic mitigation would be necessary at the site above that already specified within Section 5.4 to be required within the design of the facility and the specification of the plant and equipment.

### 6.3.3 Overnight Assessment

Overnight (23:00 – 07:00) operation of the AAD facility would include the following operations:

- Operation of all identified static plant within the AAD facility (As per section 5.3.1) with the exception of the plant listed as not operating during the overnight period.

With regard to the operation of the AAD, a noise model scenario has been constructed to predict the propagation of noise generated within the facility into the surrounding area during the overnight period, and the numerical output of the model used to inform the assessment presented within Table 6-4.

As a result of the time period in question the predictions have been undertaken to first floor level (4.0m AOD) to reflect the noise impact on the sensitive portion of the dwellings during this time period. It is reiterated that with regard to receptor AL2 the highest level predicted at either AL2a, AL2b or AL2c has been assessed and is identified within the table.

Table 6-4: Overnight BS4142 Noise Assessment

Assessment Location	Average (Modal) Measured $L_{90, 60mins}$ 'Background' noise level $x^{(1)}$ , dB	Predicted BS 4142 Specific Noise Level $^1$ , dB	Corrected BS 4142 Rating Level $^1$ , dB	Difference, dB
<b>Overnight Period (23:00 – 07:00)</b>				
AL1	33	31 (31.1)	33	+/-0
AL2c	28	28 (28.0)	30	+2
AL3	36	19 (19.0)	21	-15
AL4	28	25 (24.7)	27	-1

Notes:

<sup>(1)</sup> Noise levels rounded to nearest whole dB in accordance with the guidance of BS 4142

It can be seen from the table above that noise arising from the overnight operation of the new AAD facility within the Cog Moors WwTW site would be rated by BS4142 as being:

**Overnight** - between -15dB and +2dB relative to the existing background noise climate of the area, depending upon assessment location. Results of these magnitudes would be classified by BS 4142 as being “an indication of the specific sound source having a low impact” as a result of the relationship of the predicted noise to the existing baseline noise climate of the area.

Further consideration of the predicted noise from the new AAD facility in accordance with the guidance proposed within the WHO Night Noise Guidelines for Europe concludes that the predicted facility noise would, in all cases, be significantly below the 40dB  $L_{night}$  Night Noise Guidelines target to protect the public (including the most vulnerable of society), and as such should not be considered to be detrimental to the amenity of the area.

In addition, it is noted specifically that:

- With regard to assessment locations AL 1, 2 and 4 the baseline noise levels quantified at NML 1, NML 2 and NML 4 respectively would be classified by BS4142 as being low. As such it is questionable as to whether the typical relationships underpinning the BS4142 assessment methodology apply to these locations; and,
- During this overnight assessment period, it is reasonable to assume that occupants of the nearby residential properties would be residing within the properties rather than being outside in sensitive external spaces such as gardens. The limitations of the BS4142 assessment protocol details that the Standard is not suitable for assessing noise within buildings.

As such additional assessment has been undertaken in line with the guidance detailed within BS8233 and the WHO Guidelines, assuming a bedroom on the façade overlooking the site. Within this assessment the limitations of BS8233 with regard to the implementation of the design criteria values of Table 5 are noted and acknowledged. Specifically, BS 8233 states that it “applies to external noise as it affects the internal acoustic

environment from sources without a specific character, previously termed “anonymous noise”. Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions”. However, it is noted that the design criteria of BS8233 accords well with the internal noise guidance proposed by the WHO to protect even the most vulnerable of society. Therefore, to base consideration on the internal design criteria values of BS8233/WHO is considered to be acceptable and provide a representative impact assessment of noise associated with the proposed AAD facility on internal noise environs.

The assessment has been undertaken to a receptor location positioned at the closest façade of the closest residential buildings at first floor window height (assumed to be approximately 4m above ground). The façade prediction locations used within the assessment are the same as those detailed within Image 6-1.

In order to calculate the potential ingress of noise it has first been necessary to make an assumption as to the level of attenuation afforded by the façade of each building, as no detail is available regarding the construction of the adjacent houses or of the glazing specifications present. As such attenuation for a window open for ventilation purposes has been assumed which would achieve in the order of 15dB attenuation regardless of façade/glazing specification (PPG24 and WHO). The assumption regarding façade attenuation of an open window is considered to be a worst case as closed windows, of any specification, would give significantly better acoustic performance.

Table 6-5: Overnight Internal Noise Assessment – facility noise alone

Location	Predicted Noise Level (dB)	Attenuation for an open window (dB)	Predicted resulting Internal Level (dB) from AAD Facility	Relevant BS8233 Internal Criteria achieved (ref Table 2.2)
AL1	31.1	-15	16.1	<30
AL2	28.0		13.0	<30
AL3	19.0		<10	<30
AL4	24.7		<10	<30

The assessments presented above indicate that during the overnight period even with an open window, the level of noise ingress from the operation of the AAD facility alone at the nearest residential receptors would be considered acceptable with regard to the internal design criterion of both BS8233 and the guidance of the WHO.

Further to the internal noise assessment undertaken purely for the AAD facility noise, presented within Table 6-5 above, it is also appropriate to consider the existing ambient noise climate of the area and ascertain any changes caused by the proposed AAD facility plant during the overnight period.

Noise levels predicted from the AAD facility have been logarithmically added to the prevailing ambient noise climate (L<sub>Aeq</sub>) as measured within this study. It is noted that the assessment takes no account of noise generated within the receiving room by human activity, TV’s, music systems or other sources and purely accounts for existing external and AAD generated noise “break in” into the receiving room.

Table 6-6: Overnight Internal Noise Assessment – Future Ambient Noise

Location	Measured Ambient External Noise level (L <sub>Aeq</sub> ) dB	Assumed existing internal noise climate with an open window	Predicted internal noise level from the AAD Facility	Cumulative internal noise climate	Increase in internal Ambient noise level, dB
AL1	35.1	20.1	16.1	21.6	+1.5
AL2	36.1	21.1	13.0	21.7	+0.6
AL3	40.0	25.0	<10	25.0	0.0
AL4	40.0*	25.0	<10	25.0	0.0

**Notes to Table 6-6**

\* The measured L<sub>Aeq</sub> at NML4 is considered to be unduly influenced by vehicle movements on the adjacent roadway and as such it is concluded to be more representative to use the lower L<sub>Aeq</sub> measured at AL3 to represent the ambient noise climate of this receptor.

The calculations presented above indicate that the AAD facility operating during the overnight period would result in at worst barely perceptible increases in internal noise of no greater than 1.5dB at the nearest residential receptors. However, it is reiterated that this takes no account of noise generated within the receiving room.

Furthermore, the combined future internal noise climate with the inclusion of contribution from the operation of the AAD facility would remain within the good internal guidance levels of BS8233 and be acceptable with regard to the WHO guidelines.

## 7 Conclusions

An assessment has been undertaken to consider the potential noise impacts associated with the installation of an AAD facility at the existing Cog Moors WwTW near Dinas Powys in the Vale of Glamorgan.

### 7.1 Inherent Mitigation

The specifics of the assumptions made within the scope of this noise assessment are presented within Section 5 of this report.

The main assumptions, with regard to acoustic mitigation inherent within the calculations informing this study are as follows:

- Maximum noise generation associated with any AAD related building: 55dB @ 1m from the building façade.
- Maximum noise generation from any external plant elements associated with the AAD: 75dB @ 1m; and,
- Maximum noise generation of the following plant items associated with the AAD: 70dB @ 1m.
  - Plant item 21: Disinfected Final Effluent Booster Pumps;
  - Plant item 06: Cake imports Facility;
  - Plant item 22: Liquors Balance Tank Pumps;
  - Plant items 25: Export Silos A and B Installations;
  - Plant items 07: Pre THP Silos A and B; and,
  - Plant item 17: Portable Water Booster Pump-set.

It has further been assumed that all AAD facility buildings will be well constructed with no gaps/acoustic weak points, and all façade elements (windows, doors, louvres etc.) have been assumed to provide a similar level of acoustic attenuation as the surrounding composite façade element (quoted by DCWW as Rw 25dB).

### 7.2 External Noise Assessment

#### 7.2.1 Weekday Daytime Assessment

The BS4142 assessments undertaken during the weekday daytime period, between 07:00 and 23:00 Monday to Friday, indicates that noise associated with the operation of the AAD facility would be concluded by the Standard to be “*an indication of the specific sound source having a low impact*” as a result of the relationship of the predicted noise relative to the existing baseline noise climate of the area.

As such it is concluded that no further acoustic mitigation would be necessary at the site above that already specified within Section 5.4 to be required within the design.

#### 7.2.2 Weekend Daytime Assessment

The BS4142 assessments undertaken during the weekend daytime period, between 07:00 and 23:00 Saturday and Sunday, indicates that noise associated with the operation of the AAD facility would be concluded by the

Standard to be “*an indication of the specific sound source having a low impact*” as a result of the relationship of the predicted noise relative to the existing baseline noise climate of the area.

As such it is concluded that no further acoustic mitigation would be necessary at the site above that already specified within Section 5.4 to be required within the design.

### **7.2.3 Overnight Assessment**

The BS4142 assessments undertaken during the overnight period, between 23:00 and 07:00, Monday to Sunday, indicates that noise associated with the operation of the AAD facility would be concluded by the Standard to be “*an indication of the specific sound source having a low impact*” as a result of the relationship of the predicted noise relative to the existing baseline noise climate of the area.

Additionally, it is concluded that as a result of various stated limitations to the BS4142 Standard (re low noise climates and internal noise) the conclusions of the BS4142 overnight assessment may not be robust or representative of the true impacts in this case. Additional consideration has been given to the predicted noise levels relative to the internal criteria of both BS8233 and the WHO and the conclusion is drawn that internal noise would be acceptable inclusive of the contribution from the AAD facility.

## **7.3 Conclusion**

Overall it is concluded, and demonstrated, that subject to the implementation of additional mitigation within the design of the facility noise generated by the proposed AAD facility at the Cog Moors WwTW site would not be considered detrimental to the amenity of the nearest noise sensitive receptor locations.

As such there are considered to be no significant issues relating to noise associated with the AAD Facility.

## References

Department for Communities and Local Government – National Planning Policy Framework, March 2012.

Department for Environment, Food and Rural Affairs – Noise Policy Statement for England, March 2010.

British Standards Institution. British Standard 4142: Method for Rating and Assessing Industrial and Commercial sound – 2014.

British Standards Institution. British Standard 8233: Guidance on Sound Insulation and Noise Reduction for Buildings', 2014.

British Standards Institution. British Standard 7445-2 (ISO 1996-2:1987): 'Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use', 1991.

World Health Organisation's (WHO) 'Guidelines for Community Noise' 1999.

World Health Organisation's (WHO) 'Night Noise Guidelines for Europe' 2009

## **Appendix A**

### **Baseline Noise Data**



**NM1**

Start Time	LAeq	LAmx	LA10	LA90
14/07/2017 12:58	51.5	85.2	39.7	35.1
14/07/2017 13:13	41.7	59.3	40.5	35.6
14/07/2017 13:28	37.6	56.7	39.4	34.8
14/07/2017 13:43	42	57.7	43.8	35.5
14/07/2017 13:58	58	75.5	58.8	37.9
14/07/2017 14:13	60.5	76.7	65.7	37.9
14/07/2017 14:28	58.9	73.4	64	36.5
14/07/2017 14:43	58	74.7	62.6	37.8
14/07/2017 14:58	62.5	78.7	67.9	36.2
14/07/2017 15:13	38.3	47.6	40.5	35.5
14/07/2017 15:28	53.8	76.1	41.5	35.5
14/07/2017 15:43	43.5	67.2	44.5	38
14/07/2017 15:58	42.5	66.4	44.4	39.1
14/07/2017 16:13	59.4	77	63.5	39.8
14/07/2017 16:28	61.8	74.6	67.6	41.5
14/07/2017 16:43	61.4	74.5	67.7	41
14/07/2017 16:58	64.3	86.3	69.4	42.2
14/07/2017 17:13	61.7	75.8	67.8	41.2
14/07/2017 17:28	65.9	93.3	70.5	42.9
14/07/2017 17:43	62.8	78.4	68.4	42.1
14/07/2017 17:58	57.7	74.5	60.4	41.1
14/07/2017 18:13	42.8	54.2	45.4	39.9
14/07/2017 18:28	44.1	66.7	46.6	39.8
14/07/2017 18:43	42.5	60.5	44.8	39.3
14/07/2017 18:58	43.3	64.2	45.8	39.5
14/07/2017 19:13	42	54	45.2	37.9
14/07/2017 19:28	41.8	51.4	44.4	38.4
14/07/2017 19:43	42.4	60.1	44.7	38.7
14/07/2017 19:58	40.9	54.8	43.5	37.6
14/07/2017 20:13	39	48.1	41.1	36.8
14/07/2017 20:28	37.9	49.6	40.1	35.5
14/07/2017 20:43	37.4	46	39.6	34.9
14/07/2017 20:58	51.1	76.6	41	34.5
14/07/2017 21:13	37.2	52.6	39.2	35
14/07/2017 21:28	37.5	48.7	40.3	34.3
14/07/2017 21:43	38.1	65.2	38.9	33.9
14/07/2017 21:58	34.4	41.7	35.8	32.9
14/07/2017 22:13	64.9	94	37.6	33.9

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14/07/2017 22:28	41.1	67.9	36.6	33.6
14/07/2017 22:43	35.4	44.4	36.9	33.6
14/07/2017 22:58	34.6	42.8	35.9	33.2
14/07/2017 23:13	36.2	47.3	38.7	33.5
14/07/2017 23:28	35.6	47.7	37.6	33.1
14/07/2017 23:43	34.2	42.1	35.3	32.9
14/07/2017 23:58	36.2	49.4	38.1	33.2
15/07/2017 00:13	35.7	48.8	37.4	33.1
15/07/2017 00:28	34.3	46.4	35.1	32.7
15/07/2017 00:43	34.4	48.5	35.6	32.5
15/07/2017 00:58	33.8	42.1	34.9	32.3
15/07/2017 01:13	33.8	46.1	34.8	32.4
15/07/2017 01:28	34.7	45.2	35.9	33.3
15/07/2017 01:43	35.3	47.3	36.6	33.4
15/07/2017 01:58	34.7	44.1	36	33.2
15/07/2017 02:13	34.1	37.5	35.2	33.1
15/07/2017 02:28	35.3	47.4	36.5	33.7
15/07/2017 02:43	34.9	43.1	36.3	33.3
15/07/2017 02:58	34.4	42.2	35.7	33.1
15/07/2017 03:13	33.9	41.5	35	32.8
15/07/2017 03:28	34.4	42.1	35.7	33.1
15/07/2017 03:43	34.5	47	35.2	33
15/07/2017 03:58	34.8	38.4	35.8	33.6
15/07/2017 04:13	34.9	39.2	36.1	33.8
15/07/2017 04:28	35.9	44.1	37.4	34.3
15/07/2017 04:43	36.1	47.5	37.5	34.7
15/07/2017 04:58	36.8	52.8	38	34.5
15/07/2017 05:13	35.5	47	36.8	33.7
15/07/2017 05:28	35.9	46.5	37.4	34.4
15/07/2017 05:43	36.5	47.2	38.6	34.3
15/07/2017 05:58	36.1	49.3	37.2	34.2
15/07/2017 06:13	35.7	45	36.9	34.3
15/07/2017 06:28	36.8	52.6	38.6	34.3
15/07/2017 06:43	36.6	57.2	37.6	34.2
15/07/2017 06:58	36.8	50.8	38.3	34.9
15/07/2017 07:13	37.4	47.6	39.2	35.6
15/07/2017 07:28	38	57.8	39.1	35.5
15/07/2017 07:43	40.6	63.9	39	35.4
15/07/2017 07:58	39.5	49.7	41.8	36.8
15/07/2017 08:13	39.3	56.6	41.4	37.2

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15/07/2017 08:28	54.9	85.4	43	38.3
15/07/2017 08:43	40.5	48.4	42.7	38
15/07/2017 08:58	39.1	52.4	40.8	37
15/07/2017 09:13	40.5	59.7	42.1	37.6
15/07/2017 09:28	40.7	58.6	42.7	38.5
15/07/2017 09:43	40.8	49.5	42.9	38.2
15/07/2017 09:58	40.1	50.7	42.4	37.2
15/07/2017 10:13	40.1	49.7	42.1	37.9
15/07/2017 10:28	39.8	51.5	42	36.9
15/07/2017 10:43	40.4	59	42.3	37.2
15/07/2017 10:58	41.6	58.4	43.6	38.8
15/07/2017 11:13	42.5	62.1	43.9	39.8
15/07/2017 11:28	42.1	57.3	44.3	39.4
15/07/2017 11:43	41.7	54.7	43.5	39.6
15/07/2017 11:58	40.7	54	42.8	38.3
15/07/2017 12:13	41.2	62	43.2	38.6
15/07/2017 12:28	41.5	57.5	43.3	38.7
15/07/2017 12:43	41.8	56.5	44	38.6
15/07/2017 12:58	44.3	71.1	44.6	39.5
15/07/2017 13:13	42.3	58.1	44.4	39.7
15/07/2017 13:28	42.7	56.7	44.9	40
15/07/2017 13:43	44.3	56.4	46.7	40.9
15/07/2017 13:58	45.3	53.8	47.6	41.8
15/07/2017 14:13	45.1	56.9	47.5	42.2
15/07/2017 14:28	44.8	70.8	46.2	40.9
15/07/2017 14:43	44.7	67.8	45.9	39.8
15/07/2017 14:58	42.2	58	44.2	39.7
15/07/2017 15:13	42.3	53	44.7	39.1
15/07/2017 15:28	44.4	68.5	46.9	40.6
15/07/2017 15:43	46.5	67.7	43.5	38.6
15/07/2017 15:58	40.9	50.1	42.6	38.8
15/07/2017 16:13	40.8	49.7	42.7	38.8
15/07/2017 16:28	63.2	93	43.3	38.1
15/07/2017 16:43	40.9	47.6	43.2	38.5
15/07/2017 16:58	41.9	55.1	44	38.6
15/07/2017 17:13	41.3	48.8	43.5	39.1
15/07/2017 17:28	43.9	61	46	40.7
15/07/2017 17:43	43	58.2	45.1	40
15/07/2017 17:58	43.6	50.9	46.1	40.2
15/07/2017 18:13	41.8	50.7	44.2	39

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15/07/2017 18:28	41.1	55.4	43.3	38.3
15/07/2017 18:43	42.1	58.6	45.2	37.6
15/07/2017 18:58	38.4	57.6	40.3	36.2
15/07/2017 19:13	39	47.8	40.7	36.8
15/07/2017 19:28	41.4	54.8	43.9	37.3
15/07/2017 19:43	39.1	56	41.1	36.5
15/07/2017 19:58	38.5	47.1	40.5	36.3
15/07/2017 20:13	38.3	61.1	39.8	35.9
15/07/2017 20:28	38.2	52.8	40	35.4
15/07/2017 20:43	42.8	73.1	39.9	35.9
15/07/2017 20:58	40	67	40.6	35.4
15/07/2017 21:13	45.8	75.5	41.2	36.4
15/07/2017 21:28	38.9	45.5	41.3	36.3
15/07/2017 21:43	39	59.4	41	36.4
15/07/2017 21:58	41	51.2	43.2	37.5
15/07/2017 22:13	42.8	51.1	45.4	38
15/07/2017 22:28	39.9	51.8	41.9	37.4
15/07/2017 22:43	39.4	46.9	41.8	36.6
15/07/2017 22:58	40.5	49.8	42.7	37.4
15/07/2017 23:13	40.7	53.5	43.2	37.1
15/07/2017 23:28	41.3	60.6	43.9	37.5
15/07/2017 23:43	41.6	50.5	43.8	39
15/07/2017 23:58	42.7	52	45.5	38.4
16/07/2017 00:13	39.9	47.4	42.6	37.1
16/07/2017 00:28	40.5	53.2	42.5	37.3
16/07/2017 00:43	36.7	46.9	38	34.9
16/07/2017 00:58	36.9	45.1	39	34.8
16/07/2017 01:13	36.5	48.8	38.2	34.6
16/07/2017 01:28	36.2	43.5	37.8	34.6
16/07/2017 01:43	36.2	46	37.9	34.2
16/07/2017 01:58	37.8	45.5	40.1	35.2
16/07/2017 02:13	39.9	49.6	42	36
16/07/2017 02:28	39.5	47.4	41.9	36.5
16/07/2017 02:43	38.5	51.3	40.8	35.3
16/07/2017 02:58	37.5	48.4	39.6	35
16/07/2017 03:13	36.7	44.1	38.4	34.5
16/07/2017 03:28	38.7	46.8	40.9	36.2
16/07/2017 03:43	37.2	44.9	39.1	35.3
16/07/2017 03:58	36	41.2	37.6	34.2
16/07/2017 04:13	36.6	47.8	38.2	34.7

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16/07/2017 04:28	36.9	49.9	38.3	34.8
16/07/2017 04:43	36.4	55.5	38.1	33.7
16/07/2017 04:58	34.8	44.3	36	33.3
16/07/2017 05:13	34.6	47.3	35.6	33.1
16/07/2017 05:28	35	49.9	35.8	33.2
16/07/2017 05:43	36.8	62.2	36.5	33.2
16/07/2017 05:58	37.2	58.5	37.8	33.9
16/07/2017 06:13	36.3	59.8	37.2	34.3
16/07/2017 06:28	37.6	54.2	39.3	34.8
16/07/2017 06:43	37	49.8	38.5	34.8
16/07/2017 06:58	36.7	57.2	37.3	34.4
16/07/2017 07:13	37.6	62.6	38.6	35.3
16/07/2017 07:28	38.5	57.6	39.9	35.2
16/07/2017 07:43	38	58.2	39.7	35.3
16/07/2017 07:58	38.7	64.2	40.9	35.4
16/07/2017 08:13	36.6	52.9	38.6	34.4
16/07/2017 08:28	38.4	59.1	40.3	35.9
16/07/2017 08:43	38.5	55.3	40.4	36
16/07/2017 08:58	39	61.4	39.8	35.3
16/07/2017 09:13	37.2	50.7	38.3	35.3
16/07/2017 09:28	38.6	50.3	40.7	35.9
16/07/2017 09:43	39.4	54	41.6	36.6
16/07/2017 09:58	39.5	54	41.6	37.2
16/07/2017 10:13	38.6	50.8	40.4	36.5
16/07/2017 10:28	38.1	55.6	40.2	35.6
16/07/2017 10:43	39.1	54.4	41.2	36.3
16/07/2017 10:58	39.9	52.6	41.9	37.2
16/07/2017 11:13	40.6	50.5	42.8	38.2
16/07/2017 11:28	40.6	53.8	42.7	38.1
16/07/2017 11:43	40.5	50.5	42.7	37.9
16/07/2017 11:58	42.4	63.2	44.4	38.5
16/07/2017 12:13	60.4	91.9	46.8	38.8
16/07/2017 12:28	59.1	85.3	61	39.3
16/07/2017 12:43	46.8	76.8	47.1	39
16/07/2017 12:58	63.6	92.5	54.5	38.6
16/07/2017 13:13	61.1	88	60.5	38.4
16/07/2017 13:28	46.1	67	48.2	38.9
16/07/2017 13:43	48.8	73.6	49	36.5
16/07/2017 13:58	50.6	75.5	48.2	37.4
16/07/2017 14:13	40.7	58.9	43	37

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16/07/2017 14:28	39.9	54.7	42.1	36.3
16/07/2017 14:43	40.5	54	43.1	36.5
16/07/2017 14:58	44.4	60.5	48.1	36.5
16/07/2017 15:13	38.1	53.3	40.3	34.7
16/07/2017 15:28	41.9	72	41.4	35.9
16/07/2017 15:43	42.1	61.1	44.1	36.8
16/07/2017 15:58	51.8	76.3	54.6	37.5
16/07/2017 16:13	48.5	78.3	50.2	36.8
16/07/2017 16:28	52.4	80.6	53.4	37
16/07/2017 16:43	44.6	71	46.8	36
16/07/2017 16:58	37.8	53.7	39.5	35.2
16/07/2017 17:13	50.4	72.7	41.4	36
16/07/2017 17:28	38.9	53	40.9	36
16/07/2017 17:43	39.7	63.3	40.9	35.2
16/07/2017 17:58	39.9	60.5	42.2	34.9
16/07/2017 18:13	39.8	54.5	43.2	34.5
16/07/2017 18:28	38.7	52	40.7	35.1
16/07/2017 18:43	56.8	89.7	43.1	35.5
16/07/2017 18:58	40.2	66	41.5	35.4
16/07/2017 19:13	37.2	52.7	39.1	34.6
16/07/2017 19:28	36.1	53.8	37.6	34
16/07/2017 19:43	36.8	58.6	38.2	33.8
16/07/2017 19:58	35.2	48.8	37.1	32.9
16/07/2017 20:13	35.4	45.4	37.3	33.3
16/07/2017 20:28	54.6	74.4	37.7	32.9
16/07/2017 20:43	37.6	63.4	39	33.9
16/07/2017 20:58	35.8	50	37.4	33.8
16/07/2017 21:13	36.3	52.4	37.6	34.1
16/07/2017 21:28	35.7	59.9	37.7	32.8
16/07/2017 21:43	34.8	59	35.2	30.7
16/07/2017 21:58	31.5	45.9	33	30
16/07/2017 22:13	32.6	45	35.1	29.4
16/07/2017 22:28	31	39.5	33.1	29
16/07/2017 22:43	66	93.5	35.8	28.3
16/07/2017 22:58	31.8	59.5	32.9	28.3
16/07/2017 23:13	31.9	61.7	32.2	29
16/07/2017 23:28	30.2	40.5	31.4	28.6
16/07/2017 23:43	29.4	38.9	30.4	28.5
16/07/2017 23:58	30.1	42.3	31	29
17/07/2017 00:13	29.3	42.1	29.9	28.5

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17/07/2017 00:28	30.2	54.3	30.3	28.5
17/07/2017 00:43	29.2	42.1	30.1	28.1
17/07/2017 00:58	30.5	38.2	32.1	28.5
17/07/2017 01:13	34.4	55.2	30.8	28.2
17/07/2017 01:28	31.2	43.1	32.4	29.3
17/07/2017 01:43	31.4	33.9	32.5	30
17/07/2017 01:58	31.9	38.8	32.7	30.8
17/07/2017 02:13	30.5	35.9	31.2	29.9
17/07/2017 02:28	31.2	42.3	32.3	29.8
17/07/2017 02:43	31	44.8	32	30
17/07/2017 02:58	33.2	44.3	33.7	31.5
17/07/2017 03:13	31.8	38.8	32.7	30.6
17/07/2017 03:28	32	35.6	32.7	31.4
17/07/2017 03:43	31.3	39.4	31.9	30.3
17/07/2017 03:58	32.7	45.5	32.8	31.2
17/07/2017 04:13	34.1	52.4	35.2	30.4
17/07/2017 04:28	33.4	48.6	34.5	29.3
17/07/2017 04:43	33.8	56.5	33.4	30.4
17/07/2017 04:58	33.9	49.9	35.6	30.9
17/07/2017 05:13	34.3	48.4	36.9	29.6
17/07/2017 05:28	36.2	58.9	37.1	29.1
17/07/2017 05:43	42.4	70	43.2	30
17/07/2017 05:58	35.5	61.2	35.4	30.7
17/07/2017 06:13	33.9	44.8	36.6	30.7
17/07/2017 06:28	36.6	61.5	39.4	30.1
17/07/2017 06:43	56.9	89	41.9	31
17/07/2017 06:58	42.9	61.4	43.7	30.3
17/07/2017 07:13	39.5	60.8	42.8	31.5
17/07/2017 07:28	42.3	64.6	44.2	32.2
17/07/2017 07:43	46.3	66.6	48.1	35.1
17/07/2017 07:58	42.1	55.7	46.1	35.5
17/07/2017 08:13	42.3	57.6	46	36
17/07/2017 08:28	44.3	63.1	46.7	35.7
17/07/2017 08:43	49	71.8	45	36.6
17/07/2017 08:58	40.3	60.5	43	33.7
17/07/2017 09:13	47.1	71.2	47	31.9
17/07/2017 09:28	44.3	62.2	43.3	31.4
17/07/2017 09:43	39.6	62.8	40.4	31.6
17/07/2017 09:58	37.7	52.8	41.1	31.7
17/07/2017 10:13	37.6	49.1	41.3	32.1

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17/07/2017 10:28	38.5	63.5	38.9	29.4
17/07/2017 10:43	44.1	72	42.3	32.7
17/07/2017 10:58	38.3	65.6	40.1	30.6
17/07/2017 11:13	40.7	63.9	39.6	31.2
17/07/2017 11:28	42.1	64.9	42.9	31.2
17/07/2017 11:43	34.4	60.8	36.7	29.4
17/07/2017 11:58	38.5	67.4	39.4	30.8
17/07/2017 12:13	60.1	77.8	64.1	32
17/07/2017 12:28	59.9	79	65.2	32.7
17/07/2017 12:43	60.5	75.4	65.5	31.3
17/07/2017 12:58	64	76.5	70.3	33.6
17/07/2017 13:13	61.6	76	66.7	31
17/07/2017 13:28	61.8	76.4	67.4	30.6
17/07/2017 13:43	62.3	76.2	68.1	32.6
17/07/2017 13:58	62.2	76.2	68	33.1
17/07/2017 14:13	52.1	73.6	45.8	30.2
17/07/2017 14:28	58.9	74.6	64.2	31
17/07/2017 14:43	58.6	74.1	63.7	31.4
17/07/2017 14:58	38.4	60.9	41.1	30.7
17/07/2017 15:13	37.2	61.7	39.1	32.6
17/07/2017 15:28	35.2	55.6	37.5	30.6
17/07/2017 15:43	40.1	58.2	42.6	32.2
17/07/2017 15:58	42.4	63.2	44.2	32.9
17/07/2017 16:13	42.9	61.2	44.5	31.7
17/07/2017 16:28	49.7	73.5	44.2	31.8
17/07/2017 16:43	34	58.5	36.1	29.4
17/07/2017 16:58	40	62.7	41.6	29.7
17/07/2017 17:13	37.8	59.3	40.4	30
17/07/2017 17:28	42.9	68.8	43.3	32.7
17/07/2017 17:43	48.2	69.4	50.7	32.6
17/07/2017 17:58	55.5	82	56.6	36.4
17/07/2017 18:13	50.6	75.7	52.9	33.2
17/07/2017 18:28	46.5	74.3	44.9	32.8
17/07/2017 18:43	42.5	66.4	45.2	32.8
17/07/2017 18:58	42.6	73.7	43	29
17/07/2017 19:13	40.3	63.1	41.8	30.5
17/07/2017 19:28	36	57.4	38.8	29
17/07/2017 19:43	32.8	45.5	35.7	27.6
17/07/2017 19:58	32.6	52.2	35.3	27.6
17/07/2017 20:13	34.5	55.9	35.9	27.7



Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

17/07/2017 20:28	32	55	34.7	28
17/07/2017 20:43	32.6	52.5	35.7	28
17/07/2017 20:58	33.2	48.8	37	28
17/07/2017 21:13	41.6	75.7	37.9	28
17/07/2017 21:28	31.7	46.4	35.4	27.3
17/07/2017 21:43	42	71.6	33.5	26.4
17/07/2017 21:58	33.5	48.7	35.9	27.4
17/07/2017 22:13	32.2	43.8	35.8	27.6
17/07/2017 22:28	35.3	61.6	37.9	28.7
17/07/2017 22:43	31.9	45.3	34.5	27.7
17/07/2017 22:58	30.6	53.7	31.9	26.8
17/07/2017 23:13	29.8	48.6	30.9	27.1
17/07/2017 23:28	30.4	42.8	32.5	27.3
17/07/2017 23:43	29.4	36	30.9	27.5
17/07/2017 23:58	30.2	40.3	32.1	27.8
18/07/2017 00:13	29	38	30.1	27.4
18/07/2017 00:28	27.8	43.2	28.9	26.8
18/07/2017 00:43	27.6	45.2	28.4	26.8
18/07/2017 00:58	29.2	44.1	31.2	27.2
18/07/2017 01:13	27	34.9	28.1	25.9
18/07/2017 01:28	26.2	38.3	27	25.4
18/07/2017 01:43	27.5	47.5	28.6	26
18/07/2017 01:58	28.9	43.1	30.8	26.5
18/07/2017 02:13	28.5	40.1	29.7	27.1
18/07/2017 02:28	28.7	43.2	29.8	27.6
18/07/2017 02:43	28.1	43.5	28.8	27.4
18/07/2017 02:58	28.7	41.8	29.5	27.9
18/07/2017 03:13	30.1	44.7	30.4	28.3
18/07/2017 03:28	29.5	34.3	30.3	28.8
18/07/2017 03:43	29.9	34.7	30.8	29
18/07/2017 03:58	30.2	35.1	31.2	29.1
18/07/2017 04:13	30.4	39.8	31.8	29.1
18/07/2017 04:28	30.8	43.1	32.1	29.7
18/07/2017 04:43	30.9	49.9	31.5	29.6
18/07/2017 04:58	31.8	49.9	32.8	30.3
18/07/2017 05:13	32.6	45.6	34.3	30.7
18/07/2017 05:28	34	47.5	36.1	30.9
18/07/2017 05:43	33.7	61.1	35.4	30.7
18/07/2017 05:58	40.9	63.2	41.9	32.6
18/07/2017 06:13	39.3	56.2	42.6	32.9

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

18/07/2017 06:28	34.8	47.5	37	31.9
18/07/2017 06:43	34	43.7	35.9	31.5
18/07/2017 06:58	35.4	55.9	36.7	32.2
18/07/2017 07:13	42.7	61.4	42	34.4
18/07/2017 07:28	42.6	62.4	43.5	35.1
18/07/2017 07:43	39.3	56	40.6	35.4
18/07/2017 07:58	39.5	54.3	41.9	36.4
18/07/2017 08:13	40.8	61.3	42.7	37.5
18/07/2017 08:28	41.8	63.6	44	36.8
18/07/2017 08:43	46.5	79.2	40.8	36.2
18/07/2017 08:58	43.9	66.3	45	37.1
18/07/2017 09:13	49.4	74	52.6	37.8
18/07/2017 09:28	57.1	76.8	57.1	36.3
18/07/2017 09:43	57.7	76.2	56.1	35.2
18/07/2017 09:58	55.9	77.3	53.6	34.4
18/07/2017 10:13	43.4	73.7	43.3	34.3
18/07/2017 10:28	45.9	70.5	46.3	34.6
18/07/2017 10:43	44.6	70	46.2	35.4
18/07/2017 10:58	49.1	79.7	45.5	37.7
18/07/2017 11:13	43.2	68.3	44.4	38.1
18/07/2017 11:28	44.1	65.1	47.3	38.3
18/07/2017 11:43	45.1	64.8	48.6	39
18/07/2017 11:58	46	72.4	46.7	37.7
18/07/2017 12:13	42.5	63.5	46.4	36.2
18/07/2017 12:28	40.3	63.4	41.3	35.4
18/07/2017 12:43	40.7	70.9	41.2	35.3
18/07/2017 12:58	41.9	74.3	41.9	34.4
18/07/2017 13:13	50.8	78.5	50	34.2
18/07/2017 13:28	41.4	68.8	42.6	34.2
18/07/2017 13:43	42.2	62	44.5	33.9
18/07/2017 13:58	43.6	59.4	45.9	33.8
18/07/2017 14:13	37.6	63.8	38.9	33.6
18/07/2017 14:28	46.9	70.7	45.2	34.9
18/07/2017 14:43	48.1	73.4	47.2	34.8
18/07/2017 14:58	46.6	73.8	47.3	36.2
18/07/2017 15:13	44	70.6	42.5	35.2
18/07/2017 15:28	47.8	70.7	43.4	34.7
18/07/2017 15:43	38.6	58.8	40.4	35.5
18/07/2017 15:58	42	55.7	44.6	37.4
18/07/2017 16:13	46.9	72.3	48.2	37

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

18/07/2017 16:28	41	54.5	43.7	37.1
18/07/2017 16:43	42.9	64.3	44.2	37.2
18/07/2017 16:58	39.8	51.7	41.3	37.9
18/07/2017 17:13	44.3	67.3	42.3	37.1
18/07/2017 17:28	38.9	50.5	40.8	36.3
18/07/2017 17:43	38.9	62	40	35
18/07/2017 17:58	47.7	71.2	45.9	33.8
18/07/2017 18:13	44.9	78	43.4	35.3
18/07/2017 18:28	45.4	70.1	45.2	36.1
18/07/2017 18:43	39.8	52.8	42.3	36.4
18/07/2017 18:58	39.2	55.9	41.8	34.4
18/07/2017 19:13	46.3	72.9	47.2	34.1
18/07/2017 19:28	40	54.2	42.8	34.8
18/07/2017 19:43	42.9	62.7	45	37.6
18/07/2017 19:58	38.3	50.2	40.7	34.7
18/07/2017 20:13	37.9	55.9	40.4	33.9
18/07/2017 20:28	36.3	51.7	38.2	33.4
18/07/2017 20:43	43.9	75.4	42.5	37.7
18/07/2017 20:58	39.9	47.8	42.2	37.2
18/07/2017 21:13	38.7	48.5	41.3	34.9
18/07/2017 21:28	36.8	51.5	39.1	32.3
18/07/2017 21:43	38.1	55.7	40.4	34.1
18/07/2017 21:58	37.7	60.2	38	30.2
18/07/2017 22:13	33.9	46.1	35.5	30.8
18/07/2017 22:28	36.8	63.9	35.6	30.5
18/07/2017 22:43	37.1	53.9	38	32
18/07/2017 22:58	34.8	45.6	37.5	31.3
18/07/2017 23:13	37.1	46.4	39.3	34.6
18/07/2017 23:28	35.8	43.4	37.9	33.6
18/07/2017 23:43	35.2	42.2	37.3	32.9
18/07/2017 23:58	48	70.3	38.9	33.4
19/07/2017 00:13	46.4	60.1	48.4	37.6
19/07/2017 00:28	41.5	48.1	44.7	36.2
19/07/2017 00:43	37.9	61.3	39.7	34.6
19/07/2017 00:58	36.9	44.6	39.1	34.3
19/07/2017 01:13	36.3	45.5	38.8	32.9
19/07/2017 01:28	35	47.4	37.3	31.6
19/07/2017 01:43	32.7	43.5	34.7	30.5
19/07/2017 01:58	33.4	43	35.3	31.1
19/07/2017 02:13	33	43.9	34.8	30.8

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

19/07/2017 02:28	30.3	46.8	31.2	27.7
19/07/2017 02:43	31.6	57.9	32.1	27.2
19/07/2017 02:58	36.1	46.5	38.4	32.7
19/07/2017 03:13	41	49.7	43.7	35.4
19/07/2017 03:28	40.8	55.6	43.2	36
19/07/2017 03:43	41.6	49.3	43.9	38.5
19/07/2017 03:58	38.7	48.5	41.7	32.9
19/07/2017 04:13	38.5	50.4	40.7	34.7
19/07/2017 04:28	37.4	53.4	40	32.6
19/07/2017 04:43	36.8	55.3	39.3	32.8
19/07/2017 04:58	36.8	65.2	37	31.1
19/07/2017 05:13	35.7	48.3	37.6	33.4
19/07/2017 05:28	36.1	44.9	38.3	33.1
19/07/2017 05:43	36.4	53.1	39.9	31.3
19/07/2017 05:58	34.6	52.4	36.1	31.4
19/07/2017 06:13	44.5	64.1	43.7	31.9
19/07/2017 06:28	36.9	64.7	38.5	31.2
19/07/2017 06:43	34.3	51.3	36.3	30.7
19/07/2017 06:58	39.2	59.5	40.5	31.7
19/07/2017 07:13	38.9	54.5	40.9	34.1
19/07/2017 07:28	39.9	60.6	42.3	35.9
19/07/2017 07:43	41.1	58.6	42.7	34.7
19/07/2017 07:58	38.6	52.6	40.3	36.3
19/07/2017 08:13	46.1	76.7	43.7	37.1
19/07/2017 08:28	43.5	67.1	43.9	36.2
19/07/2017 08:43	46.6	71.4	40.4	35.2
19/07/2017 08:58	54.8	88.6	50.6	35.4
19/07/2017 09:13	37.9	52.6	39.8	35.2
19/07/2017 09:28	41.4	62.8	38.4	33.4
19/07/2017 09:43	52.5	81.8	39.7	32.1
19/07/2017 09:58	37	62.7	37.7	31.6
19/07/2017 10:13	40.4	63.4	37.5	31.3
19/07/2017 10:28	34.8	52.6	37.3	31
19/07/2017 10:43	45.8	73	38.2	30.2
19/07/2017 10:58	42.7	70.2	41.5	32.6
19/07/2017 11:13	48.9	76.6	44.8	34.7
19/07/2017 11:28	39.1	53.8	40.6	37.1
19/07/2017 11:43	38.9	57.4	40.3	36.7
19/07/2017 11:58	39.6	47.9	41.8	37.1
19/07/2017 12:13	40.5	58.3	41.4	36

## Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

19/07/2017 12:28	40.1	54.9	42.2	37.2
19/07/2017 12:43	39.9	47.9	42.4	36.8
19/07/2017 12:58	39.9	50.1	42	37.1
19/07/2017 13:13	40.3	53.5	42.3	37.3
19/07/2017 13:28	39.4	54.6	41.5	36.3
19/07/2017 13:43	38.2	50.5	40.2	35.5
19/07/2017 13:58	38.3	49.6	40.4	35.2
19/07/2017 14:13	40.6	49.1	42.5	38.3
19/07/2017 14:28	40.5	61	42.2	38.2
19/07/2017 14:43	41.2	49.7	43.1	38.9
19/07/2017 14:58	40.9	48.8	42.9	38.3
19/07/2017 15:13	39.2	64.2	40.4	34.5
19/07/2017 15:28	39.3	50.8	41.8	36.4
19/07/2017 15:43	43.7	69.9	42.6	36.1
19/07/2017 15:58	40.8	58.5	42.8	37.2
19/07/2017 16:13	42.3	65.5	42.7	38.1
19/07/2017 16:28	42.4	55.6	44.7	39
19/07/2017 16:43	41.9	59.5	44.1	38
19/07/2017 16:58	42.1	54.1	44.2	39.3
19/07/2017 17:13	43.8	60.3	45.8	40.5
19/07/2017 17:28	51	76.1	49.6	40.9
19/07/2017 17:43	54.6	81.8	52.6	40.5
19/07/2017 17:58	42.4	60.8	44.5	38.8
19/07/2017 18:13	72.8	100.3	72.4	40.2
19/07/2017 18:28	59	85.1	60.7	38.6
19/07/2017 18:43	42.2	63.6	42.2	36.6
19/07/2017 18:58	40.9	51.3	45.4	35.9
19/07/2017 19:13	40.9	57.4	44	36.5
19/07/2017 19:28	54.8	85.4	46.4	36.2
19/07/2017 19:43	38.6	55.5	40.7	35.9
19/07/2017 19:58	37.3	50.3	38.9	35.2
19/07/2017 20:13	36.3	45.7	38.2	34.5
19/07/2017 20:28	37.7	56.7	39.9	34.1
19/07/2017 20:43	36.6	48.2	38.5	34.4
19/07/2017 20:58	36.7	50.4	38.3	34.3
19/07/2017 21:13	37.7	61.4	39.8	34.2
19/07/2017 21:28	34.9	46.2	36.8	32.5
19/07/2017 21:43	35.7	43.5	37.4	33.5
19/07/2017 21:58	38.2	49.9	40.2	35.2
19/07/2017 22:13	36.5	49.9	38.2	34.4

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

19/07/2017 22:28	35.8	51.8	37.2	34.3
19/07/2017 22:43	36.3	44.4	39.2	33.4
19/07/2017 22:58	35.8	49.2	38.6	33.3
19/07/2017 23:13	35.4	62.3	37.7	32.1
19/07/2017 23:28	33.5	45	34.5	31.8
19/07/2017 23:43	33.2	44.5	35	31.1
19/07/2017 23:58	33	45.2	34.9	30.7
20/07/2017 00:13	33.9	43.2	35.4	32.2
20/07/2017 00:28	32.9	41.7	33.9	31.8
20/07/2017 00:43	33.8	41.3	36.4	31.4
20/07/2017 00:58	37.9	55.9	40.3	34.6
20/07/2017 01:13	33.5	51.3	34.4	31.7
20/07/2017 01:28	32.9	45.9	34.3	31.2
20/07/2017 01:43	34.6	49	35.6	32.3
20/07/2017 01:58	33.9	41	35.1	32.6
20/07/2017 02:13	35.6	53.6	36.6	34.3
20/07/2017 02:28	36	48.8	37.5	34.6
20/07/2017 02:43	37.3	60.1	38.8	34.3
20/07/2017 02:58	36	48.4	38.8	33.7
20/07/2017 03:13	34.4	45.2	35.7	33.1
20/07/2017 03:28	34.6	42.2	35.9	33.1
20/07/2017 03:43	35.4	44.4	36.9	33.5
20/07/2017 03:58	35.2	41.7	36.6	33.7
20/07/2017 04:13	36.5	45	38.5	34.4
20/07/2017 04:28	35.7	44.9	37.3	33.7
20/07/2017 04:43	34.5	47.9	35.5	33.1
20/07/2017 04:58	34.2	41.6	35.3	32.8
20/07/2017 05:13	39.1	60.2	36.4	33.5
20/07/2017 05:28	35.6	51.7	37	33.5
20/07/2017 05:43	37.1	51.7	39.2	34.1
20/07/2017 05:58	36.3	50.3	37.6	33.9
20/07/2017 06:13	37.8	56.2	39.3	35.2
20/07/2017 06:28	38.3	51.3	40.8	35
20/07/2017 06:43	37.1	50.1	39.3	34.6
20/07/2017 06:58	40.8	65.9	41.5	35
20/07/2017 07:13	41	65.7	42.2	35.3
20/07/2017 07:28	39.5	56.7	42.2	35.1
20/07/2017 07:43	44.4	64.6	43.4	36.5
20/07/2017 07:58	44.9	68.7	43.4	36.5
20/07/2017 08:13	39.8	51.3	42.6	36.3

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20/07/2017 08:28	59.6	97	42.5	36
20/07/2017 08:43	41.3	59.3	42.7	36.4
20/07/2017 08:58	39.7	57.1	42.3	35.4
20/07/2017 09:13	39.2	49.8	41.4	36.1
20/07/2017 09:28	40.7	57.3	42.8	36.3
20/07/2017 09:43	40.1	56.3	42.8	36.5
20/07/2017 09:58	36.9	56.3	38.5	34.5
20/07/2017 10:13	39.4	47.6	41.8	36.6
20/07/2017 10:28	40.5	51.8	43	36.4
20/07/2017 10:43	41.5	52.9	43.9	38.4
20/07/2017 10:58	42.7	50.8	45.2	38.9
20/07/2017 11:13	42.6	62.9	45.9	37.5
20/07/2017 11:28	42.3	57.4	43.9	38.3
20/07/2017 11:43	42	54.5	44.9	37.8
20/07/2017 11:58	39.8	54	42.1	36.7
20/07/2017 12:13	40.3	53	42.8	36.8
20/07/2017 12:28	40.8	49.1	43.7	37.6
20/07/2017 12:43	39.2	49.9	41.4	36.2
20/07/2017 12:58	43.5	72.4	44.2	36.9

**NM2**

Start Time	LAeq	LAmix	LA10	LA90
07/07/2017 11:10	50.3	84.8	46.3	36.2
07/07/2017 11:25	41.9	67.2	43.6	34.7
07/07/2017 11:40	51.8	79.5	48.4	35.2
07/07/2017 11:55	64.1	84.9	53.4	36.7
07/07/2017 12:10	63.4	93.6	47.2	34.5
07/07/2017 12:25	42	58.4	45.3	36.5
07/07/2017 12:40	45.5	61.6	46	37.4
07/07/2017 12:55	42.3	60.2	44.8	36.3
07/07/2017 13:10	43.6	61.4	47	37.7
07/07/2017 13:25	39.1	54.6	40.7	36.2
07/07/2017 13:40	62.8	89.9	56.7	37.5
07/07/2017 13:55	50.6	79.3	47.3	37.1
07/07/2017 14:10	43.1	68.1	44.9	37.9
07/07/2017 14:25	40.2	61.7	40.1	34.8
07/07/2017 14:40	42.5	62.6	43.6	37.9
07/07/2017 14:55	44.2	58.7	46.4	41
07/07/2017 15:10	46.3	71.6	47.3	41
07/07/2017 15:25	43.4	60.3	45.6	39.7
07/07/2017 15:40	42.5	55.8	44.9	38.2
07/07/2017 15:55	55.1	86.2	45.3	39.3
07/07/2017 16:10	42.8	53.6	45.2	39.7
07/07/2017 16:25	43.9	58.8	43.6	38.3
07/07/2017 16:40	40.1	55.6	41.6	37.8
07/07/2017 16:55	41.1	54.1	43.4	38
07/07/2017 17:10	42.2	56.9	44.2	38.7
07/07/2017 17:25	40.5	50.4	42.5	38.1
07/07/2017 17:40	42.5	63	42.4	37.3
07/07/2017 17:55	38.7	51.8	41.1	35.3
07/07/2017 18:10	40.3	58.1	42.4	36.3
07/07/2017 18:25	41.8	61.2	43.1	37.1
07/07/2017 18:40	42.7	65.5	42	35.9
07/07/2017 18:55	43	66.9	44.1	36.5
07/07/2017 19:10	40.3	56.7	41.8	37
07/07/2017 19:25	41.7	59.6	43.9	35.5
07/07/2017 19:40	37.2	49.3	38.8	35.1
07/07/2017 19:55	39.3	53.3	41.1	36.2
07/07/2017 20:10	38	48.4	40.5	34.9
07/07/2017 20:25	37.3	57.3	39.3	34.2



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07/07/2017 20:40	42.2	69.9	38.4	32.8
07/07/2017 20:55	35.3	47.3	36.8	32.4
07/07/2017 21:10	38.3	56.6	36.9	32.4
07/07/2017 21:25	35.1	48.1	37	32.7
07/07/2017 21:40	40.2	63.5	40.4	31.2
07/07/2017 21:55	34.4	57.2	36.5	30.8
07/07/2017 22:10	39.7	64.2	41	30.9
07/07/2017 22:25	40.4	67.1	41.2	31.7
07/07/2017 22:40	36.6	60	37.8	29.9
07/07/2017 22:55	33.5	51	35	29.8
07/07/2017 23:10	31.3	50.7	32.5	29.4
07/07/2017 23:25	31.1	45.8	32.3	29.6
07/07/2017 23:40	30.5	54.9	31.6	27.9
07/07/2017 23:55	31.1	45.3	33.1	27.9
08/07/2017 00:10	29.6	46	31	27.6
08/07/2017 00:25	31.7	56.8	31.5	28
08/07/2017 00:40	29.9	41.4	31.5	28
08/07/2017 00:55	35.2	60.8	32.8	27.9
08/07/2017 01:10	31.4	57.4	32.1	26.6
08/07/2017 01:25	28.1	40	29.3	26.7
08/07/2017 14:10	37.3	56.1	39.2	31.7
08/07/2017 14:25	44.1	63.4	44.6	31.1
08/07/2017 14:40	37.5	56.4	40.3	30.9
08/07/2017 14:55	40.3	60.6	38.1	30.3
08/07/2017 15:25	35.4	53.5	38.2	30.5
08/07/2017 15:40	33.4	45.2	35.1	30.6
08/07/2017 15:55	35.2	56.4	36.8	30.9
08/07/2017 16:10	33.3	50.5	34.8	29.1
08/07/2017 16:25	35.6	54.2	36.7	30.4
08/07/2017 16:40	35.3	50.3	37.9	31
08/07/2017 16:55	36	54	38.9	30.8
08/07/2017 17:10	43.5	63.5	45.9	31
08/07/2017 17:25	44.9	66.2	46.4	29.9
08/07/2017 17:40	48.8	70	47.2	30.5
08/07/2017 17:55	37.2	53.7	39.8	30.6
08/07/2017 18:10	37.2	58.5	39.5	30
08/07/2017 18:25	42.2	67.2	45.7	30.4
08/07/2017 18:40	41.1	64	44.2	30.3
08/07/2017 18:55	38.3	65.6	37.3	30.3
08/07/2017 19:10	41.8	68.2	42.9	30.6

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

08/07/2017 19:25	40.8	59.8	39.9	29.6
08/07/2017 19:40	32.2	55.2	33	27.8
08/07/2017 19:55	38.4	60.3	34.8	27.2
08/07/2017 20:10	43.8	68.5	38.5	26.7
08/07/2017 20:25	45.3	62.7	48.8	26.8
08/07/2017 20:40	31.3	45.9	33.9	27.7
08/07/2017 20:55	31.9	51.3	34.7	27
08/07/2017 21:10	30.5	52.5	31.7	27.1
08/07/2017 21:25	31.2	57.7	31.4	27.6
08/07/2017 21:40	31.4	59.6	32.8	27.9
08/07/2017 21:55	49.1	72.8	48.3	28.7
08/07/2017 22:10	52.5	80.6	46.8	29
08/07/2017 22:25	48	81	42.2	28.3
08/07/2017 22:40	58.2	89.7	41	27.9
08/07/2017 22:55	46.4	77.6	44.5	29.4
08/07/2017 23:10	31.6	54.7	32.5	29.4
08/07/2017 23:25	28.4	43.4	29.6	27.1
08/07/2017 23:40	29.6	42.6	31.1	27.2
08/07/2017 23:55	27.9	45.4	29.2	26.1
09/07/2017 00:10	27.8	40.3	29.3	25.6
09/07/2017 00:25	27.7	33.8	28.6	26.7
09/07/2017 00:40	27.8	42.3	28.7	26.7
09/07/2017 00:55	28.2	46.1	29.3	26.5
09/07/2017 01:10	27.9	50.8	29.3	23.9
09/07/2017 01:25	25.8	49.7	26.8	23.7
09/07/2017 01:40	25.3	35.1	26.4	24.2
09/07/2017 01:55	26	41.4	27.4	24.1
09/07/2017 02:10	27.1	42.7	28.4	24.1
09/07/2017 02:25	26.5	34.4	28	24.8
09/07/2017 02:40	25.6	34.5	26.6	24.5
09/07/2017 02:55	25.5	36.8	26.7	24.3
09/07/2017 03:10	25.7	34.7	26.7	24.4
09/07/2017 03:25	26.6	45.2	27.4	24.7
09/07/2017 03:40	28	37.6	29	26.8
09/07/2017 03:55	31.2	51.2	31.5	28.5
09/07/2017 04:10	42.5	68.4	32.6	30.3
09/07/2017 04:25	43.9	75.9	41.3	28.1
09/07/2017 04:40	41.1	61.9	39.6	25.5
09/07/2017 04:55	33.1	52.8	35.9	26.1
09/07/2017 05:10	37.8	57.6	39.6	27

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

09/07/2017 05:25	31.5	46.7	34.8	26.1
09/07/2017 05:40	33.2	54.6	35.9	25.9
09/07/2017 05:55	34.1	58.5	37	25.8
09/07/2017 06:10	32.5	53.7	34.6	26.6
09/07/2017 06:25	33.4	49.7	36.5	26.3
09/07/2017 06:40	31.2	51.1	34.2	25.6
09/07/2017 06:55	45.6	69.1	47.4	27.1
09/07/2017 07:10	41.2	64.9	39.5	25.5
09/07/2017 07:40	38.8	56.7	38.6	25.7
09/07/2017 07:55	38.4	60.9	40.1	26.2
09/07/2017 08:10	40.4	58.3	43.3	26.9
09/07/2017 08:25	36.5	61.8	35.8	25.9
09/07/2017 08:40	37.3	56.8	38.5	26.1
09/07/2017 08:55	32.7	52.9	33.1	26.2
09/07/2017 09:10	37.1	67	37.9	26.7
09/07/2017 09:25	33.3	50.9	36.4	26.5
09/07/2017 09:40	38	69.2	37.1	27.3
09/07/2017 09:55	37.3	64.1	35.9	28.2
09/07/2017 10:10	33.8	48.7	36.8	28.9
09/07/2017 10:25	39.3	64.7	38.9	28.8
09/07/2017 10:55	37.6	63.8	39.3	33.3
09/07/2017 11:10	43	64.3	41.3	33.6
09/07/2017 11:25	37.3	55.7	39.1	32.6
09/07/2017 11:40	37.9	52.6	40.7	34.2
09/07/2017 11:55	38.6	58.5	40.9	33.4
09/07/2017 12:10	35.7	54.7	37.3	33.7
09/07/2017 12:25	37.4	60	38.6	33.8
09/07/2017 12:40	37.8	61.9	37.2	33.4
09/07/2017 12:55	38.9	59.2	42	33.5
09/07/2017 13:10	36.1	51.7	38.1	32.6
09/07/2017 13:25	38.8	55.9	38.6	31
09/07/2017 13:40	36.3	54.4	38.5	33.4
09/07/2017 13:55	40.4	59	40.4	33.8
09/07/2017 14:10	45.5	65.8	45.8	33.7
09/07/2017 14:25	38.7	57.4	40.7	33.1
09/07/2017 14:40	36.7	50.4	38.7	33.7
09/07/2017 14:55	38.4	55.8	40.4	32.8
09/07/2017 15:10	36.2	55.3	37.6	32.2
09/07/2017 15:25	40.4	69.3	38.7	32.5
09/07/2017 15:40	55.4	84	51.1	31.8

## Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

09/07/2017 15:55	45.6	71.3	45.7	32.4
09/07/2017 16:10	37.4	55.8	38.6	33.3
09/07/2017 16:25	44	63.8	45.5	32.9
09/07/2017 16:40	39.6	54.4	42.6	34.7
09/07/2017 16:55	46.7	76.8	43.9	34.7
09/07/2017 17:10	40.4	60.2	42.9	34.1
09/07/2017 17:25	44.7	61	47.5	34.4
09/07/2017 17:40	43.6	63.9	40.5	33.9
09/07/2017 17:55	38.8	56.4	39.6	32.9
09/07/2017 18:10	37.5	53.7	40	33.9
09/07/2017 18:25	37.8	54.7	39.1	33.8
09/07/2017 18:40	35.4	56.7	36.6	32.1
09/07/2017 18:55	41.3	59	44.5	32.6
09/07/2017 19:10	45.7	67.4	44.6	34.6
09/07/2017 19:25	36.7	55.2	37.5	32.9
09/07/2017 19:40	37.3	61	38.1	33.3
09/07/2017 19:55	37.7	59.4	39.2	34.2
09/07/2017 20:10	41.7	73	42.2	35
09/07/2017 20:25	40.6	61.6	42.5	35.1
09/07/2017 20:40	37.9	53.8	40.1	34.2
09/07/2017 20:55	35.4	48.7	37.5	32.7
09/07/2017 21:10	34.9	55.7	36.4	32.2
09/07/2017 21:25	42.9	74.8	39.7	33.3
09/07/2017 21:40	47.4	79.9	45.3	34.8
09/07/2017 21:55	42.6	79.2	38.7	30.7
09/07/2017 22:10	32.3	50.4	33.9	30.4
09/07/2017 22:25	31.5	53	33.3	29.1
09/07/2017 22:40	45.6	66.9	35.1	29.1
09/07/2017 22:55	31	47.2	33.6	27.8
09/07/2017 23:10	30.2	38.7	32	28.3
09/07/2017 23:25	31	56.8	32.5	28.3
09/07/2017 23:40	29.6	35.2	30.8	28.3
09/07/2017 23:55	29.3	47.7	30.4	28.1
10/07/2017 00:10	30.1	43.5	31.6	28.3
10/07/2017 00:25	33.4	65.9	32.8	28.6
10/07/2017 00:40	31.4	58.6	31.7	28
10/07/2017 00:55	39.2	75	31.2	28.3
10/07/2017 01:10	30	44.6	31.3	28.3
10/07/2017 01:25	31.7	47.3	33	29.5
10/07/2017 01:40	31.4	44.3	32.7	29.7

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

10/07/2017 01:55	31.3	38.4	32.7	29.5
10/07/2017 02:10	30.4	34.1	32	28.2
10/07/2017 02:25	28.4	39.2	29.6	27.2
10/07/2017 02:40	27.7	35.1	29.4	25.8
10/07/2017 02:55	25.6	33.7	26.5	24.5
10/07/2017 03:10	25.9	43	27.3	24.2
10/07/2017 03:25	28	57	27.2	24.3
10/07/2017 03:40	33.4	61.6	28.6	24
10/07/2017 13:45	52.8	83.7	47.8	38.7
10/07/2017 14:00	41.7	51.5	44.5	37.7
10/07/2017 14:15	42.7	52.3	45.6	39
10/07/2017 14:30	43.5	58.6	46.5	39.9
10/07/2017 14:45	44.6	58.9	47.2	39.4
10/07/2017 15:00	44.7	56.4	47.5	40.8
10/07/2017 15:15	46	70.3	47.5	40.6
10/07/2017 15:30	43.9	62	46.1	39.5
10/07/2017 15:45	43.5	59.2	45.9	38.9
10/07/2017 16:00	42.6	52.1	45.4	38.4
10/07/2017 16:15	42.2	51.7	44	39.9
10/07/2017 16:30	42.3	58.5	44.4	39.6
10/07/2017 16:45	41.8	63.8	43.6	38.6
10/07/2017 17:00	41.6	54.7	43.2	39.2
10/07/2017 17:15	42.8	59.2	44.7	39.9
10/07/2017 17:30	44.6	69.4	47	38.7
10/07/2017 17:45	42	58.5	45.5	37.8
10/07/2017 18:00	42.1	59.7	44.5	37.9
10/07/2017 18:15	40.2	55	41.8	37.6
10/07/2017 18:30	42.2	54.3	44.4	38.3
10/07/2017 18:45	40	60.3	42.1	36.5
10/07/2017 19:00	38.8	58.5	40.4	35.6
10/07/2017 19:15	41.9	57	44.2	37.4
10/07/2017 19:30	46.3	65.5	46.3	39.2
10/07/2017 19:45	42.1	62.8	43.7	35.5
10/07/2017 20:00	37	57.3	38.1	34.1
10/07/2017 20:15	40.8	61.8	42.9	33.8
10/07/2017 20:30	38.7	62.9	38.7	34.1
10/07/2017 20:45	35.7	52.5	38	33.1
10/07/2017 21:00	35.9	50.4	37.7	32.8
10/07/2017 21:15	34.8	60.3	35.9	32.2
10/07/2017 21:30	34.2	49.4	35.1	32

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

10/07/2017 21:45	34	45.2	35	32.7
10/07/2017 22:00	36.2	54	36	32.5
10/07/2017 22:15	33.9	45.3	35	32.7
10/07/2017 22:30	34	40.8	35.1	32.8
10/07/2017 22:45	33.7	45.8	34.9	32.3
10/07/2017 23:00	34.3	47.2	35.4	32.9
10/07/2017 23:15	33.1	51.5	33.8	32
10/07/2017 23:30	33.3	53.2	34.1	31.8
10/07/2017 23:45	32.2	48.1	34.7	29.1
11/07/2017 00:00	33.2	58.9	33.6	29.8
11/07/2017 00:15	30.9	38	32.8	28.8
11/07/2017 00:30	31	43.2	32.8	29
11/07/2017 00:45	30.5	44.9	32.6	28
11/07/2017 01:00	31.7	40.4	32.9	29.6
11/07/2017 01:15	34.8	53.8	35.7	32.2
11/07/2017 01:30	33.5	40.2	34.4	32.5
11/07/2017 01:45	37.5	41.3	39	35.7
11/07/2017 02:00	38	45	39.9	35.9
11/07/2017 02:15	45.7	54.4	49.5	38.8
11/07/2017 02:45	38.2	50.8	40.8	35.3
11/07/2017 03:00	38.5	54.1	40.2	36.4
11/07/2017 03:15	40.8	54.9	43.3	37.1
11/07/2017 03:30	39.2	55.3	41	36.7
11/07/2017 03:45	39.5	52	41.5	36.7
11/07/2017 05:45	42.3	62.6	43.6	35.2
11/07/2017 06:00	37.9	64	39	34.3
11/07/2017 06:15	43	58.4	47.3	34.8
11/07/2017 06:30	40.5	55	43.6	35.5
11/07/2017 06:45	43.5	67.5	47.6	36.5
11/07/2017 07:00	39.8	54.2	41.3	37.5
11/07/2017 07:15	38.7	52.6	40.1	37
11/07/2017 07:30	39	58.4	40	37
11/07/2017 07:45	45.2	62.4	48.8	37.4
11/07/2017 08:00	44	69.5	44.6	37.8
11/07/2017 08:15	39.8	58.9	40.8	37.4
11/07/2017 08:30	39.1	55.9	40.5	37.3
11/07/2017 08:45	39.7	58.7	41.2	37.4
11/07/2017 09:00	40.9	60.5	41.5	36.7
11/07/2017 09:15	42.3	68.7	42.1	36.8
11/07/2017 09:30	40.3	56.8	42.7	36.4

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

11/07/2017 09:45	42.1	56.8	45	36.8
11/07/2017 10:00	40.3	62.1	41.8	36.5
11/07/2017 10:15	39.7	53.6	41.3	37.1
11/07/2017 10:30	40.1	59.1	41.5	38.1
11/07/2017 10:45	39.3	59.8	40.7	36.8
11/07/2017 11:00	42.9	71.7	41	36.5

**NM3**

Weekday Daytime

Start Time	LAeq	LAmx	LA10	LA90
07/07/2017 11:28	40.4	59.9	42.3	37.2
07/07/2017 11:43	43.3	60.5	45.1	37.3
07/07/2017 11:58	39.6	54.9	40.7	37.4
07/07/2017 12:13	40.4	56.9	42.1	38
07/07/2017 12:28	41.9	57.6	44.1	38
07/07/2017 12:43	41.4	60.2	43.1	38.2
07/07/2017 12:58	41.8	58.5	43.6	38.4
07/07/2017 13:13	41.9	58.3	43.2	38.9
07/07/2017 13:28	44.2	63.9	46.3	39.5
10/07/2017 11:20	45.6	65.3	47.2	40.1
10/07/2017 11:35	43.3	57.5	45.8	40
10/07/2017 11:50	45.2	59.9	48.4	39.5

Weekday Evening

Start Time	LAeq	LAmx	LA10	LA90
07/07/2017 20:21	38.4	59.7	43.9	36.1
07/07/2017 20:26	42.1	58.1	52.6	36.5
07/07/2017 20:31	40.7	59.4	50.1	36
07/07/2017 20:36	38.8	52.4	48	35.8
07/07/2017 20:41	37.6	51	44.2	35.3
07/07/2017 20:46	38.6	50.2	46.4	35.9
10/07/2017 20:17	39.3	54.1	46.7	36
10/07/2017 20:22	43.6	59	53.1	37.2
11/07/2017 20:22	40.5	52.8	47.8	37.1
12/07/2017 20:22	39.6	52.7	46.9	37.6
13/07/2017 20:22	38.5	46.8	41.7	37.1
14/07/2017 20:22	39	52.3	47.4	35.8



Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

Sunday Daytime

Start Time	LAeq	LAmix	LA10	LA90
09/07/2017 11:08	44.4	68.9	46.6	34.8
09/07/2017 11:23	41.2	60.5	44.1	34.1
09/07/2017 11:38	41.3	56.5	44.5	34.7
09/07/2017 11:53	41.6	57.2	45.4	34.4
09/07/2017 12:08	41.3	56	44.7	35.3
09/07/2017 12:23	41.7	62	44.4	35.2
09/07/2017 12:38	39.4	55.8	41.2	35
09/07/2017 12:53	39.6	53.9	42.3	35.9
09/07/2017 13:08	38.9	55.3	41	35.7

Sunday Evening

Start Time	LAeq	LAmix	LA10	LA90
09/07/2017 20:26	41.1	62.2	42.4	38.2
09/07/2017 20:31	40.6	55.8	42.2	37.5
09/07/2017 20:36	39.5	50.2	41.5	36.9
09/07/2017 20:41	40.4	51.7	42.2	37.2
09/07/2017 20:46	40.4	51.8	42.1	38.4
09/07/2017 20:51	40	49	41.6	37.8
09/07/2017 20:56	41.8	53.7	44.1	38.5

Overnight

Start Time	LAeq	LAmix	LA10	LA90
06/07/2017 23:59	41	69.5	41.6	38
07/07/2017 00:04	44.6	57.8	46	38.8
07/07/2017 00:09	40	47.3	41.8	37.8
07/07/2017 00:14	40.6	50.4	42.9	37.2
07/07/2017 00:19	42.1	50.8	42.5	36.7
07/07/2017 00:24	41	56	41.8	36
09/07/2017 00:01	38.8	68.9	36.7	34.2
09/07/2017 00:06	36.6	43.8	38.2	34.1
09/07/2017 00:11	36.1	43.2	38.2	33.7
09/07/2017 00:16	35.7	44.1	37.7	33.7
09/07/2017 00:21	36.9	50.5	39.6	32.9
09/07/2017 00:26	35.4	45.7	37.8	32.4

**NM4**

Weekday Daytime

Start Time	LAeq	LA10	LA90
07/07/2017 13:36	61.6	60.1	37.3
07/07/2017 13:51	59.7	57	36.6
07/07/2017 14:06	62.7	59.1	37.7
07/07/2017 14:21	63	64.4	37.1
07/07/2017 14:36	61.2	61.4	37.3
07/07/2017 14:51	62.7	64.8	39.4
07/07/2017 15:06	65.4	68.7	46.4
07/07/2017 15:21	62.9	65.8	40.9
07/07/2017 15:36	62.6	58.9	39.6
10/07/2017 12:27	61.6	52.1	37.8
10/07/2017 12:42	62.6	57.3	40.1
10/07/2017 12:57	62.9	56.4	39.1

Weekday Evening

Start Time	LAeq	LAmx	LA10	LA90
07/07/2017 20:56	62	81.8	57.4	33.6
07/07/2017 21:01	56.1	74.5	52.9	33.2
07/07/2017 21:06	63.1	82.7	58.4	35.7
07/07/2017 21:31	52.3	74.7	43.9	37
07/07/2017 21:36	51.3	71.1	47.9	34.7
07/07/2017 21:41	56.3	77.2	54	33.5
07/07/2017 21:46	58.6	82.2	43	32.6
10/07/2017 20:51	48.7	72.8	40.6	33.6
10/07/2017 20:56	61.6	83.5	48.6	33
10/07/2017 21:01	56.5	81.2	43.3	32.8
10/07/2017 21:06	56.3	82.4	40.2	32.9
10/07/2017 21:11	51.4	75	41.5	33.3

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant

Sunday Day

Start Time	LAeq	LAmaz	LA10	LA90
09/07/2017 13:39	63.2	83.5	59.4	36.9
09/07/2017 13:54	63.2	85.6	58.6	36.1
09/07/2017 14:09	63.6	86.1	59.2	36.8
09/07/2017 14:24	62.5	86.2	57.3	37.7
09/07/2017 14:39	63.6	84.4	63	38.6
09/07/2017 14:54	59.7	85.2	57.2	37.4
09/07/2017 15:09	62.6	84	55.3	35.7
09/07/2017 15:24	62	85.8	54.8	34.2
09/07/2017 15:39	54.6	74.4	43.4	34.8

Sunday Evening

Start Time	LAeq	LAmaz	LA10	LA90
09/07/2017 21:06	40.3	52.9	43.6	36
09/07/2017 21:11	56.3	80.9	46	36.3
09/07/2017 21:16	41.2	51.4	45.1	35.2
09/07/2017 21:21	56.9	78.1	44.8	35
09/07/2017 21:26	57.7	83.3	44.4	35.7
09/07/2017 21:31	57.8	78.5	47.2	35.5
09/07/2017 21:36	41.7	43.1	42.9	39.7

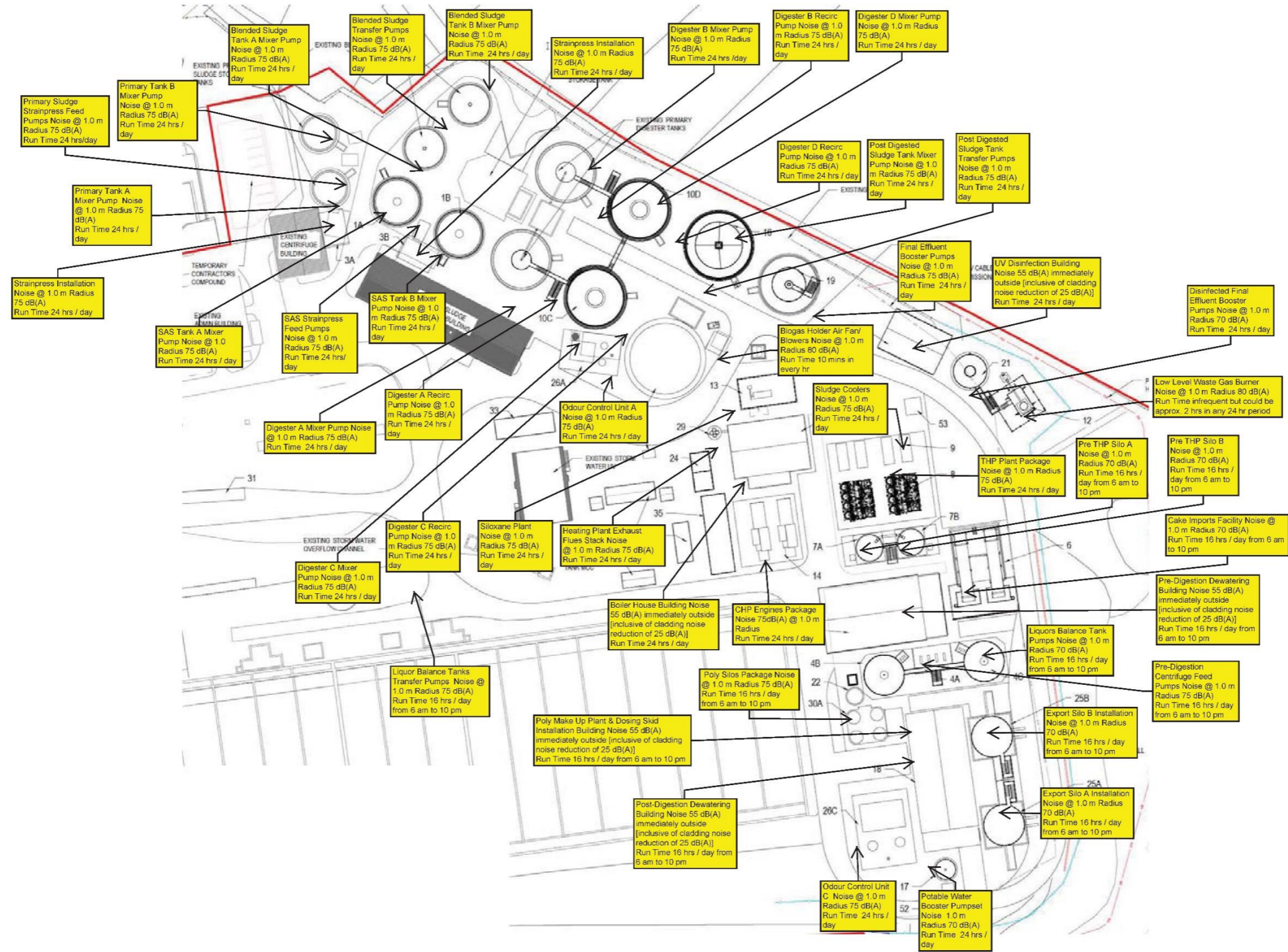
Overnight

Start Time	LAeq	LAmaz	LA10	LA90
07/07/2017 00:38	33.7	58.3	34.5	31.5
07/07/2017 00:43	32.6	40.8	34.3	30.8
07/07/2017 00:48	51.1	75.5	35.5	31.5
07/07/2017 00:53	35.5	46.9	38	32.3
07/07/2017 00:58	33.5	59	34.8	30.9
07/07/2017 01:03	35.2	59.8	35	31.1
07/07/2017 01:08	57.3	78.9	43.4	25.2
09/07/2017 00:38	56.9	77.2	49.1	25.3
09/07/2017 00:43	52.1	71.4	46.8	25.1
09/07/2017 00:48	26.6	41.6	27.3	25
09/07/2017 00:53	54.2	79.2	37.1	25.7
09/07/2017 00:58	55.8	78.8	42.2	25.5

## **Appendix B**

### **Noise Sources Identification Drawing**

Cog Moors WwTW – Proposed Advanced Anaerobic Digestion (AAD) Plant



NOISE SOURCES - MITIGATED APPROACH

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