KILKEE WWTP

NOISE IMPACT ASSESSMENT REALTING TO PUMPING STATION

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Technical Report Prepared For

EPS Group

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EXECUTIVE SUMMARY

Permission is sought for a new wastewater treatment plant (WWTP) and Pumping Station at Kilkee, Co Clare. AWN Consulting Limited has been commissioned to conduct an assessment relating to noise emissions associated with the operation of the pumping station to noise-sensitive locations in the vicinity of the site to address a Request for Further Information (RFI) from Clare County Council.

The existing noise climate has been surveyed and has been found to be a quiet environment, with low noise levels. The site is screened from any major road or other major noise sources. The main noise sources noted during noise surveys were bird call, leaf rustle and surrounding suburban residential activities and road traffic in the distance.

The design of the pumping station includes no external items of plant associated with normal operation. All operational pumps and motors serving the buildings or structures are located below ground in sealed concrete chambers or below concrete roof slab. A noise model was developed to establish the potential noise breakout of operational noise sources to the surrounding environment. The assessment has concluded that due to the enclosed nature of the operational sources, the site layout and perimeter screening, operational noise emissions from the pumping station can achieve the internal noise levels set out in the request for further information issued by Clare County Council.

In the event of a power failure at the site, an emergency generator will operate. This scenario does not form part of the normal day to day operation of the site. Noise levels calculated for this scenario indicate acceptable noise levels at the closest noise sensitive locations based on the infrequent scenario over which it will operate.

CONTENTS

			Page
	Executive Summary		3
1.0	Introduction		5
2.0	Relevant Criteria		6
3.0	Existing Environment		7
	3.1	Environmental Noise Survey	7
	3.2	Survey Periods	8
	3.3	Personnel and Instrumentation	9
	3.4	Measurement Parameters	9
	3.5	Survey Results	9
4.0	Assessment of Noise Impacts		11
	4.1	Identification of Sensitive Receptors	11
	4.2	Operational Phase Noise Impacts	11
	4.3	Operational Noise Impact Assessments	16
5.0	Mitigation		18
6.0	Conclusion		18
Appendix A – Glossary of Acoustic Terminology			19

1.0 INTRODUCTION

Permission is sought for a for a new wastewater treatment plant (WWTP) and Pumping Station at Kilkee, Co Clare. The development will consist of:

- Construction of a New Terminal Foul Pumping Station with Emergency Storage to convey sewage flows from the Kilkee agglomeration to the proposed WWTP via existing rising mains.
- Construction of a new WWTP providing primary treatment and including stormwater storage, with a new final effluent outfall PS and new final effluent rising main to existing outfall.

The proposed infrastructure will discharge treated effluent and storm overflows via the existing outfall. Flows from the proposed Kilkee Foul PS will be pumped to the WWTP utilising the existing rising mains.

A Request for Further Information (RFI) from Clare County Council (CCC) has listed the following information request relating to noise:

> 4. (a) With regard to the potential for adverse impacts on adjacent amenities by reason of noise, the Planning Authority notes the close proximity of a number of dwellings and mobile homes to the Victoria Pumping Station. On the basis of the available information, it is unclear to the Planning Authority what the operational noise levels, attributable to the proposed works would be within these adjacent dwellings and mobile homes. The internal noise levels, when measured at the windows of the adjacent dwellings and mobile homes, should not exceed 35 dB(A) L_{Aeq} during the period 0700 to 2300 hours, and 30 dB(A) L_{Aeq} at any other time.
>
> Therefore, you are requested to submit a report from an acoustic engineer (or other suitably qualified person) which outlines the predicted noise levels within the adjacent dwellings and mobile homes. Where mitigation measures are required to achieve these levels these should be clearly outlined in the report, and should outline the extent to which the measure(s) would reduce the noise levels in line with the above thresholds.

This report has been prepared to address the above information request from Item 4 of the RFI.

The assessment has been prepared by Jennifer Harmon, Associate with AWN Consulting. She is a full member of the Institute of Acoustics (IoA), holds a degree in Environmental Science, a Post Graduate Diploma in Acoustics and has over 20 years consulting experience in the field of acoustics. Jennifer therefore satisfies the requirement for a *suitably qualified person.*

Appendix A presents a glossary of acoustic terminology that is used throughout this report.

Figure 1 presents the site location and the approximate outline of the proposed pumping station development site and the surrounding adjacent sentisitve buildings to the site boundary. The site is bound to the north and east by residential dwellings in Victoria Park, to the west by the Haugh Mobile home park and to the south by greenfield land and residnetial properties beyond.

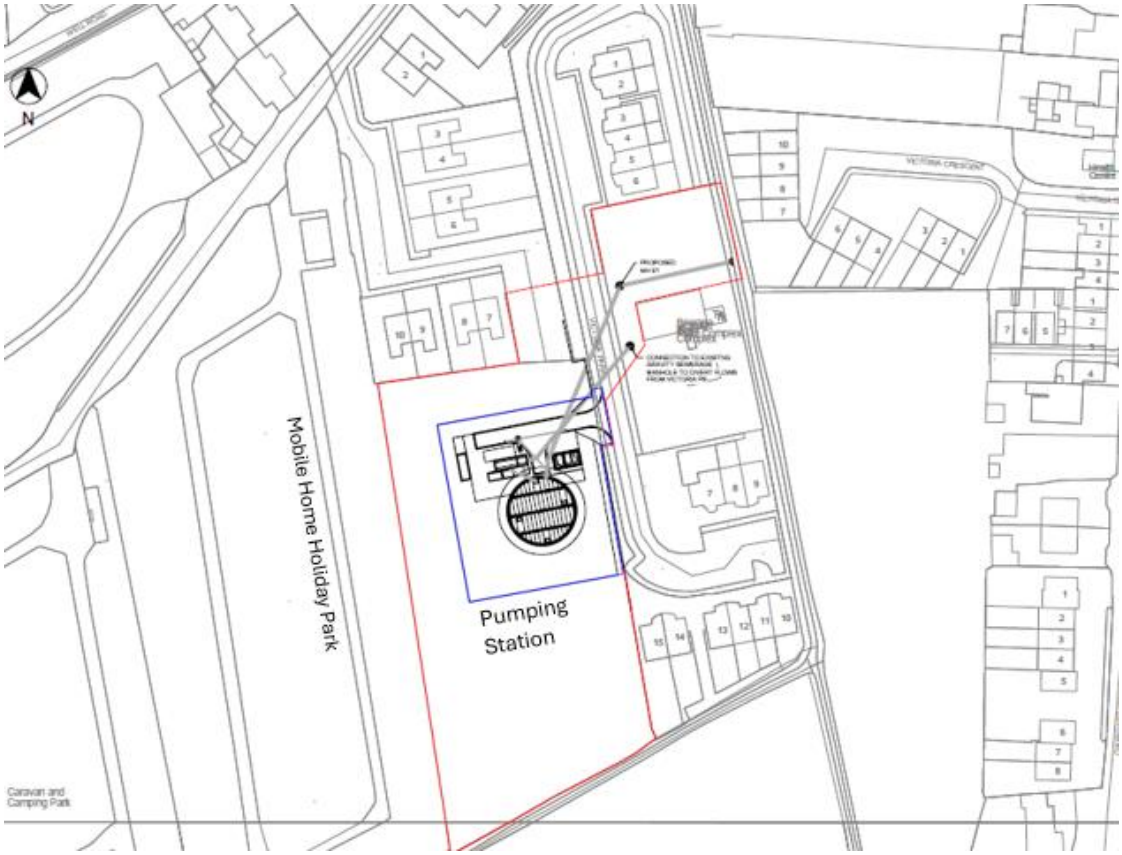

Figure 1 Location of Proposed Development and Approximate Red Line Boundary

2.0 RELEVANT CRITEIRA

Item 4a of the RFI document sets the following internal noise levels at the closest noise sensitive locations (NSLs)

> The internal noise levels, when measured at the windows of the adjacent dwellings and mobile homes, should not exceed 35 dB(A) L_{Aeq} during the period 0700 to 2300 hours, and 30 dB(A) L_{Aeq} at any other time.

The internal noise levels align with those set out in British Standard BS 8233: 2014: *Guidance on Sound Insulation and Noise Reduction for Buildings* which provide recommended acceptable internal noise levels within residential spaces. Table 1 below summarises the recommended internal ambient noise levels within dwellings.

The derived external levels are based on the approximate attenuation provided by a partially open window of 15 dB, as advised in BS 8233, and represent the appropriate noise level at the external façade of the building that would achieve the relevant internal noise levels.

Activity	Location	Daytime (07:00 to 23:00hrs)	Night (23:00 to 07:00hrs)	Derived External Levels
Resting	Living room	35 dB $L_{Aeq, 16hr}$	-	50 dB $L_{Aeq, 16hr}$
Dining	Dining room	40 dB $L_{Aeq, 16hr}$	-	55 dB $L_{Aeq, 16hr}$
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16hr}$	30 dB $L_{Aeq, 8hr}$	50 dB $L_{Aeq, 16hr}$ (45 dB $L_{Aeq, 8hr}$ at night)

Table 1 Guidance on Indoor Ambient Noise Levels for Dwellings (BS 8233 2014)

3.0 EXISTING ENVIRONMENT

3.1 Environmental Noise Survey

Environmental noise surveys have been conducted to quantify noise levels across the existing site. The survey was conducted in general accordance with ISO1996-2:2017 *Acoustics - Description, Measurement and Assessment of Environmental Noise - Determination of Sound Pressure Levels*. The following section reviews the existing noise environment.

Figure 2 indicates the noise monitoring locations surveyed. The survey locations are described below.

Figure 2 Noise Monitoring Locations (Source Google Earth)

Location	Description	
N1	Attended daytime survey along western site boundary adjacent to mobile home park boundary	
N2	Attended daytime survey along northern site boundary adjacent to rear garden of properties within Victoria Park	
N3	Attended daytime survey along eastern site boundary adjacent to residential properties within Victoria Park	
N4	Attended night-time survey within mid portion of site to capture night-time noise levels representative of the closest properties	

3.2 Survey Periods

The attended surveys were carried out during daytime, evening and night-time periods between Thursday 18th May and Friday 19th May. At locations N1, N2 and N3, 15-minute measurements were recorded at each location in a cyclical basis during the daytime and evening time periods. At Location N4, continuous measurements were recorded at 5-minute intervals between the hours of 23:00, and 01:00 to capture data during the night.

The weather during the period was mostly calm and dry, with some light wind reaching 5 m/s during the latter period of the daytime measurements.

3.3 Personnel and Instrumentation

The baseline noise survey was undertaken AWN staff fully certified in environmental noise measurements. The following instrumentation was used for the survey.

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	RION NL-52	575782	September 2023
Sound Calibrator	Brüel & Kjær Tupe 4231	2263026	January 2023

Table 2 Instrumentation Details

3.4 Measurement Parameters

The noise survey results are presented in terms of the following three parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFmax} is the instantaneous fast time weighted maximum sound level measured during the sample period.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

3.5 Survey Results

The site is located in a quiet area set back from busy roads or surrounding commercial or industrial sources. The site is adjacent to residential estates and a mobile home park. Noise sources throughout the survey included seagulls flying overhead, distant intermittent construction noise, wind related foliage noise and distant road traffic, which was barely audible and intermittent throughout.

3.5.1 Daytime and Evening

Table 3 presents the measured noise levels over the day and evening periods at Locations N1 to N3.

Location	Period	Time	Sound Pressure Level (dB re $2x10^{-5}$ Pa)		
			$L_{Aeq,15min}$	L_{Amax}	$L_{A90,15min}$
N1	Day	13:42-13:57	45	64	35
		14:33-14:48	42	56	37
		15:28-15:43	42	64	36
	Eve	22:07-22:22	38	55	36
N2	Day	13:59-14:14	42	63	36
		14:51-15:06	41	62	37
		15:45-16:00	41	55	36

Location	Period	Time	Sound Pressure Level (dB re $2x10^{-5}$ Pa)		
			$L_{Aeq,15min}$	L_{Amax}	$L_{A90,15min}$
	Eve	22:24-22:39	36	48	34
N3	Day	14:16-14:31	41	58	37
		15:09-15:24	44	63	39
		16:02-16:17	41	54	39
	Eve	22:40-22:55	39	49	37

Table 3 Measured Noise Levels at Locations N1 to N3

The results measured over the day and evening periods are similar across the three measurement locations.

During daytime periods, ambient noise levels were measured in the range of 41 to 45 dB $L_{Aeq,15mins}$ at the three locations. Seagulls and distant traffic with very occasional local traffic movements were the main sources noted. The background noise levels ranged between 35 and 39 dB $L_{A90,15mins}$.

During the evening period the measured ambient noise levels ranged between 36 and 39 dB $L_{Aeq,15mins}$. Ambient levels range from 35 to 36 dB $L_{A90,15min}$ with background noise levels measured in the range of 34 to 37 dB $L_{A90,15mins}$

3.5.2 Night-time

Table 4 presents the measured noise levels logged over 5 minute intervals at Location N4 in the mid portion of the site.

Location	Period	Time	Sound Pressure Level (dB re $2x10^{-5}$ Pa)		
			$L_{Aeq,5mins}$	L_{Amax}	$L_{A90,5min}$
N1	Night-time	23:01	38	47	36
		23:06	39	53	37
		23:11	38	47	36
		23:16	37	44	35
		23:21	37	42	36
		23:26	39	52	37
		23:31	38	43	36
		23:36	37	41	36
		23:41	36	42	35
		23:46	36	42	35
		23:51	36	41	35
		23:56	37	47	35
		00:01	36	48	34
		00:06	35	42	34
		00:11	36	39	35
		00:16	36	40	34
		00:21	36	40	35
		00:26	36	40	35
		00:31	36	44	35
		00:36	37	43	35
		00:41	38	48	36
		00:46	38	49	36
		00:51	37	43	35
		00:56	36	45	35

Location	Period	Time	Sound Pressure Level (dB re $2x10^{-5}$ Pa)		
			$L_{Aeq,5mins}$	L_{Amax}	$L_{A90,5min}$
		01:01	38	49	36
Average			37	40 - 53	35

Table 4 Measured Noise Levels at Location N4

At Location N4, the ambient noise levels were measured in the range of 35 to 39 dB $L_{Aeq,5\text{-}mins}$. Background noise levels were measured in the range of 34 to 37 dB $L_{A90,5mins}$.

4.0 ASSESSMENT OF NOISE IMPACT

4.1 Identification of Adjoining Sensitive Receptors

The nearest residential dwellings are located to the east and north of the site at Victoria Park at a distance of 10 to 20m from the pumping station boundary. The closest mobile home units are at a distance of approximately 15m from the site western site boundary. (Refer to Figure 1)

4.2 Operational Phase Noise Impacts

The proposed development includes the development of new buildings and structures. Table 5 presents a summary of the proposed development elements included in the planning application and notes the areas where there is potential for operational noise emissions, as advised by the design team.

Planning application Reference	Description	Operational Plant Noise Sources
A Pumping Station	Emergency Storage Tank	Venturi pump – located at base of tank and below concrete slab to roof. Used on rare occasion the overflow / emergency tank is required Storm blaster washer nozzle system: 3 No nozzles located below manhole covers within tank. Used on rare occasion the overflow / emergency tank is required
	Surge Kiosk	n/a
	Washwater Kiosk	n/a
	Odour control building	non mechanical active odour control. No operational noise sources
	Control panel Kiosk	n/a
	Standby generator	Emergency use in absence of power to site
	Foul pumping station	4 No pumps in sealed underground chamber, 2 duty, 2 standby L series Discreen: sealed in underground chamber
	Petrol interceptor	n/a
	ESB Building & Panel Room	Concrete building – no notable noise emissions from structure

Table 5 Proposed site elements and operational plant items.

The proposed site layout and identified buildings and plant locations are identified Figure 3.

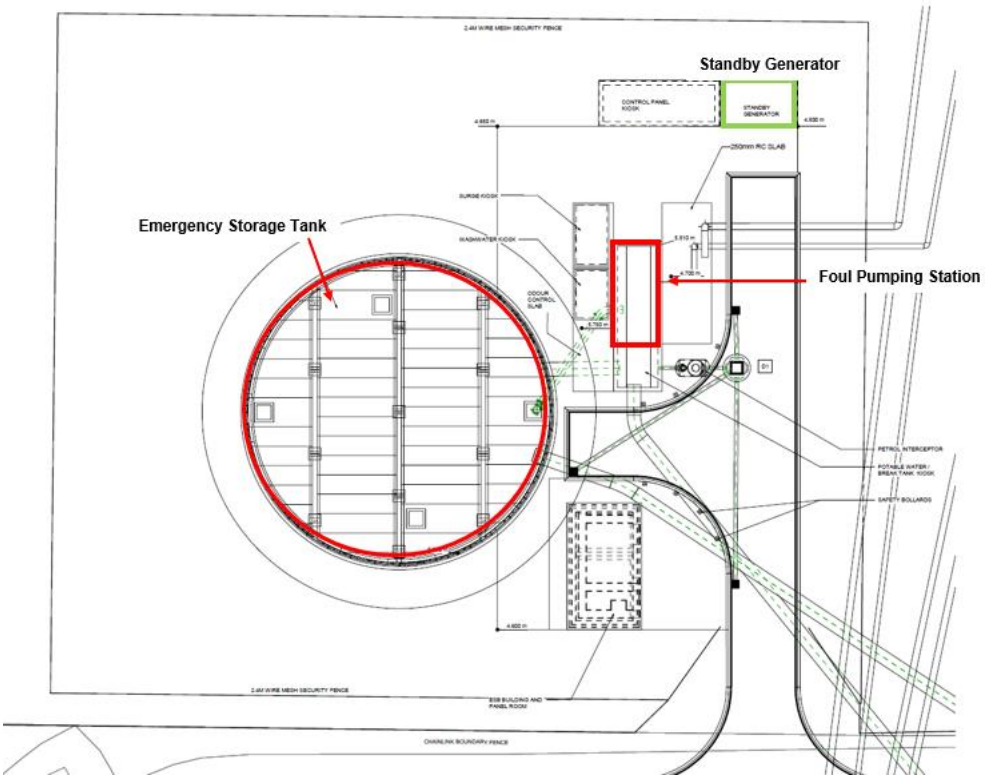

Figure 3 Site Layout Plan

The identified areas are discussed in turn below.

4.2.1 Foul PS Pump Sump and Overflow Screen Chamber

The pumping station comprises two below ground chambers, one inlet screening chamber and one inlet pump sump chamber.

Within the inlet sump chamber there are 4 No pumps. Two of the pumps will operate in duty mode and 2 on standby. The operational noise from the pumps is quoted as 65 dB(A) at 1m from the pump suppliers. The pumps will operate intermittently 24/7 depending on the plant demand.

The pumps are fully underground in a concrete chamber with access provided for maintenance.

A discreen unit will operate within the below ground concrete inlet screening chamber. The screen is operated by a 1kw motor which has a quoted operational noise level of 70 dB(A) at 1m. This unit is fully underground in a concrete chamber with access provided for maintenance.

To assess the potential noise impact, noise breakout via the chamber roof structure with access hatches has been modelled. The model assumes continual operation of 2 sump pumps and discreen within the chambers and a composite SRI of 40dB R_w for the chamber concrete roof with an access manhole.

4.2.2 Emergency Storage Tank

The storage tank will be a 19m x 6.5m deep circular precast concrete which sits below ground level. The tank will be covered with a concrete slab with a thickness of approximately 150mm. There will be access openings via manhole covers for a venturi mixer, cleaning and overflow maintenance.

Within the tank, 2 no. venturi pumps will operate within a sump at base of the tank to keep solids in suspension.

A cleaning system will operate on a demand basis using 3 No. Storm Blaster nozzles consisting of rotating nozzle heads. These nozzle heads rotate through 360 degrees whilst spraying and are located within the tank below the manhole covers. These will only operate only when the emergency storm overflow tank is used. This is expected to only be on rare occasions during specific weather events.

To assess the potential noise impact, the model assumes continual operation of 2 No. venturi pumps with an operational noise level of 80 dB at 1m. The same operational noise level associated with the cleaning spray nozzles has also been assumed as a worst case scenario. A screening correction of 30 dB R_w for the tank lid has been included.

4.2.3 Emergency Generator

An emergency generator is included at the pumping station along the western boundary. This unit will not operate under normal circumstances and will only operate in the event of power failure. The generator will be tested intermittently during daytime hours only.

Operational sound data provided by the generator suppliers quote a sound power level of 97 dB(A) from the generator set and a quoted value of 60 dB(A) at 15m.

4.2.4 Noise Model of Plant Items

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, SoftNoise Predictor, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*.

Predictor is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout The general site layout has been obtained from the drawings provided by the design team. The site boundary will be formed with a 2.4m high blockwork wall around the site perimeter.

Local Area The location of noise sensitive locations has been obtained from a OS mapping provided by the design team and google earth review.

Heights The heights of proposed on-site buildings have been obtained from section drawings forwarded by the design team. Building heights of existing buildings in the surrounding environment are taken from on-site observations and google earth review.

Source Noise The operational pumps and motors included within the development are those described in Section 4.2.2 which as discussed are all enclosed. All sources were modelled at 500Hz in terms of A-weighted sound power.

4.2.5 Noise Results

Normal Operation

Noise levels were calculated at the façade of the closest NSLs surrounding the site and noise contour grid was calculated around the site at a height of 4m above ground. The model assumes the day to day plant items are in operation continually and simultaneously which is a highly conservative assessment.

The calculated noise contour is presented in Figure 4.

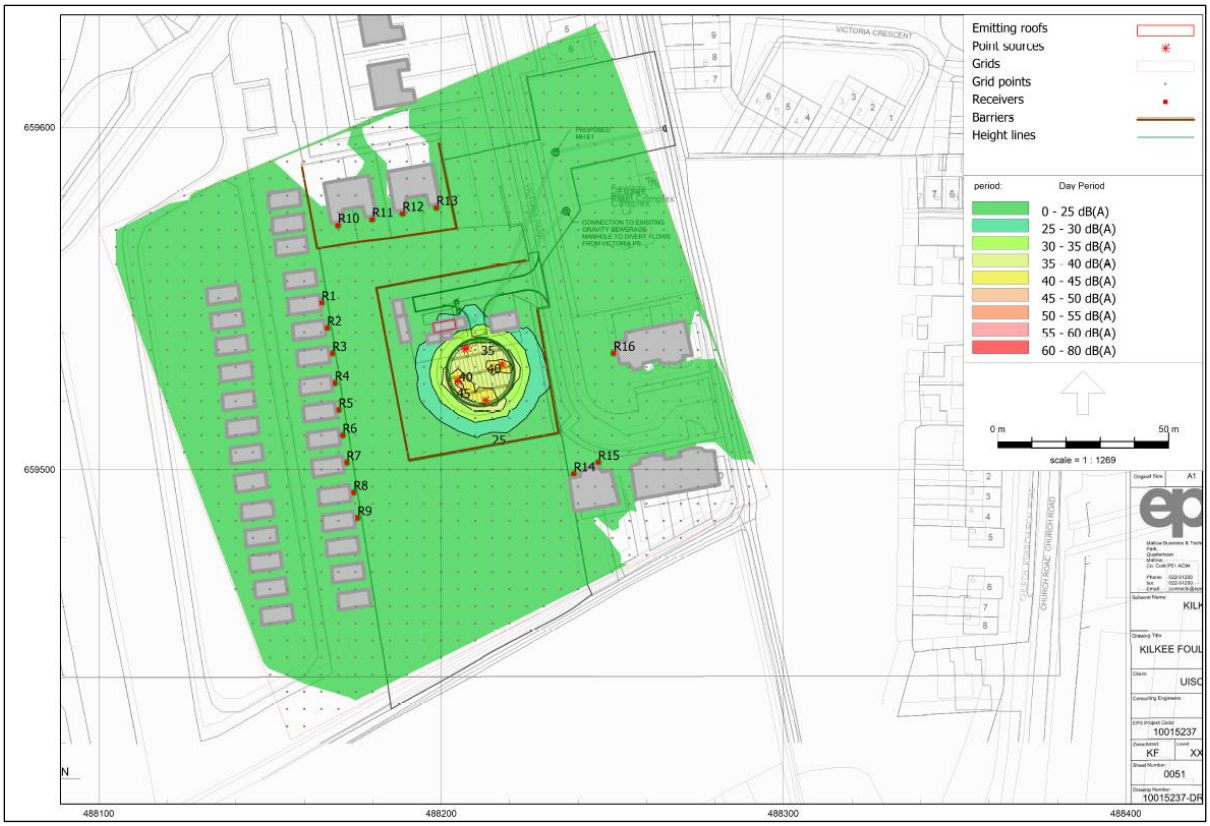

Figure 4 Operational Noise Levels from All operational plant items

At all NSLs surrounding the site, the calculated external noise level is below 25 dB $L_{Aeq,T}$. This is due to the enclosed nature of the operational sources and the solid 2.4m boundary wall to the site perimeter.

Emergency Power Operation

Noise levels were calculated with the standby generator in operation alongside the normal operational plant items. During this scenario, highest noise levels are calculated at NSLs to the north and east of the site. All calculated noise levels are below 51 dB L_{Aeq} outside the closest NSLs.

The calculated noise contour for this scenario is presented in Figure 5.

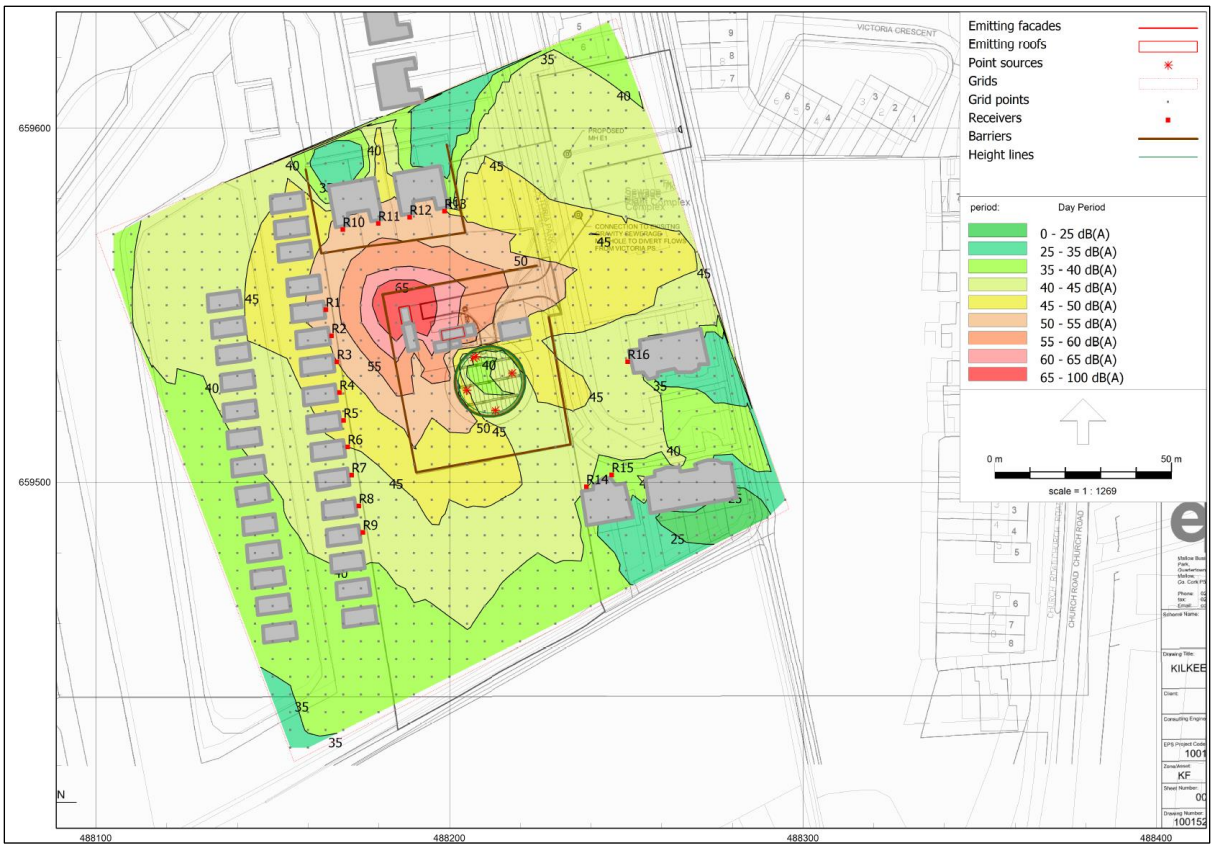

Figure 5 Operational Noise Levels during emergency generator scenario

4.3 Operational Noise Impact Assessment

4.3.1 Normal Operation

Table 6 summarises results of the assessment at the calculated NSLs against the RFI condition 4a with 'normal mode' operation which excludes emergency generator. This scenario include all pumps and motor in underground pumping station and emergency overflow tank which is a highly conservative scenario.

Location	Description	Normal Mode Scenario - Calculated Results	
		External Noise Level, dB $L_{Aeq,T}$	Internal Noise level, dB $L_{Aeq,T}$
R1 – R9	Haugh Mobile home park	<25	<10
R10 – R13	Victoria Park - North	<25	<10

R14 – R16	Victoria Park – West / South west	<25	<10

Table 6 Calculated Noise Levels at Closet NSLs – Normal Operation

The calculated noise levels at all locations are below 25 dB $L_{Aeq,T}$ outside the closest NSLs. The related internal noise levels will be of the order of 15dB below this value with an open window and hence the contribution from the pumping station achieves the internal design criteria of 35 dB $L_{Aeq,T}$ during daytime periods and 30 dB $L_{Aeq,T}$ during night-time periods.

The calculated noise levels are at least 10 dB below the measured background noise level during day and night-time periods at the survey locations, hence the contribution of the operational sources are not predicted to add to the prevailing noise environment.

4.3.2 Emergency Power Scenario

Table 7 summarises results of the assessment at the calculated NSLs against the RFI noise condition 4a with 'emergency power mode' operation which includes the emergency generator.

Location	Description	Emergency Power Scenario - Calculated Results	
		External Noise Level, dB $L_{Aeq,T}$	Internal Noise level, dB $L_{Aeq,T}$ –
R1 – R9	Haugh Mobile home park	40 - 50	25 - 35
R10 – R13	Victoria Park – North (ground floor height)	46 - 47	31 - 32
	Victoria Park – North (first floor height)	51 - 52	36 - 37
R14 – R16	Victoria Park – West / South west (first floor height)	39 - 40	24 – 25

Table 7 Calculated Noise Levels at Closet NSLs – Normal Operation

The calculated noise levels at all locations are below 55 dB $L_{Aeq,T}$ outside the closest NSLs. The related internal noise levels range between 24 and 37 dB $L_{Aeq,T}$ assuming an open window scenario. Highest noise levels are calculated at first floor of residential properties to the north of the site at Victoria Park. With a window closed scenario, all internal noise levels will be below 30 dB $L_{Aeq,T}$.

Given this scenario is associated with emergency power only and does not form part of the facilities normal operation, the calculated noise levels associated with this scenario are deemed acceptable. The calculated noise levels are all below 40dB $L_{Aeq,T}$ which is set within BS 8233 as a good daytime internal noise level for concentration and dining. (Refer to Table 1)

Testing of the generator will be limited to daytime hours only.

5.0 MITIGATION

There is no specific noise mitigation measures required to control noise emissions from the facility with the current site layout and boundary treatments in place.

In the event any plant items are required to be installed at the development in the future, it is recommended they are limited to cumulative design criteria of **45dB $L_{Aeq,15min}$** during daytime periods and **35dB $L_{Aeq,15min}$** at night at the external facades of the nearest noise sensitive receptors. These values have been set to ensure no adverse noise impact will occur.

6.0 CONCLUSION

AWN Consulting Limited has been commissioned to conduct an assessment into the likely noise impacts associated with the operation of the pumping station to noise-sensitive locations in the vicinity of the site to address a Request for Further Information (RFI) from Clare County Council.

The design of the pumping station includes no external items of plant associated with normal operation. All operational pumps and motors serving the buildings or structures are located below ground in sealed concrete chambers or below concrete roof slab. A noise model was developed to establish the potential noise breakout of operational noise sources to the surrounding environment. The assessment has concluded that due to the enclosed nature of the operational sources, the site layout and permitter screening, operational noise emissions from the pumping station can achieve the internal noise levels set out in the request for further information issued by Clare County Council.

In the event of a power failure at the site, an emergency generator will operate. This scenario does not form part of the normal day to day operation of the site. Noise levels calculated for this scenario indicate acceptable noise levels at the closest noise sensitive locations based on the infrequent scenario over which it will operate

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

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

Background noise — The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

dB — Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).

dB(A) — An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

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

$L_{Aeq,T}$ — This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFmax} — is the instantaneous fast time weighted maximum sound level measured during the sample period.

Octave band — A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

SEL — Sound Exposure Level is numerically equivalent to the total sound energy. For example a noise level of 90 dBA lasting 1 second would have a SEL of 90 dBA but if the event lasted 2 seconds the SEL would be 93 dBA.