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Environmental Statement
Noise and vibration assessment
for

Biomass Fuelled
Power Plant
Glenavy
near Crumlin

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1.Introduction

1.0 The proposed biomass fuelled electricity generating power plant will be near to the site of the Ulster Farm By Products facility/rendering plant at Glenavy. The power plant will consist of a reception building incorporating storage and mixing bins, a boiler house to the rear with a turbine hall, enclosed dust arrestment equipment, ash silos, condensers, a chimney and switch gear yard. An internal road will provide access around the 5 Hectare complex.

1.1 The power plant will operate seven days per week, fuelled by poultry bedding and meat and bone meal (a product of the rendering facility of Ulster Farm By Products). Imports of poultry bedding from farms and removal of ash would only take place five and a half days per week and within limited hours.

1.2 The site for the new power plant is located off the Ballyvannon Road near to the established Ulster Farm By Products factory. The 30 megawatt power plant is a separate development from this facility although meat and bone meal will go to the power plant. This is a mixed residential and industrial area within a rural locality with noise from the established factory, HGV movements, traffic on local roads and ground movements/aircraft flights from Belfast International Airport.

1.3 The nearest noise sensitive noise receptors are residential properties beyond the site boundaries on the Ballyvannon Road, Shore Road and Lurgan Road.

1.4 The new power plant will operate during the day and at night, but with deliveries within the hours of 0700 to 1900 daily and 0700 to 1300 on a Saturday. Vehicle movements of 142 two way trips will include lorries carrying chicken litter, MBM, ash and general deliveries. Any increase in the number of HGVs coming to this site will be small and given the existing numbers of vehicles entering the Ulster Farm By Products site, the impact will not be significant.

1.5 There will be external items of plant such as ash conveyors, dust arrestment and fans and the impact from these items will also be assessed.

1.6 The development, if permitted, will result in the introduction of additional road traffic to and around the site, and the potential of noise from plant and activities associated with the normal function of the power plant. However, it is noted that this is a primarily rural area with mixed residential and industrial

use in the vicinity of the site.

Evaluation Criteria

1.7 The noise impact potential from the proposed development can be usefully split into three sources, that are subject to separate noise impact criteria.

Construction Noise

1.8 The impact of the short-term works associated with the site preparation and subsequent construction.

This will be assessed using BS5228 (1984 and 1997), “Noise and Vibration Control on Construction and Open Sites”.

Facility Noise

1.9 The impact of the use and function of the proposed facility.

This will be assessed with regard to BS4142 (1997), “Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas”, PPG24 (1994), “Planning and Noise”, and World Health Organisation Environmental Health Criteria (as included in BS8233,1999).

Vehicle Noise

1.10 The impact of traffic movement on roads approaching and within the boundaries of the site, including the impact of customer/staff and service vehicles.

This will be assessed using the methodology detailed in the “Calculation of Road Traffic Noise” (1990) document and reference to individual vehicle noise impact such as that detailed for “Haul Road” calculations in BS5228 “Noise Control on Construction and Open Sites”.

The plant project documentation provides that target noise levels should not exceed 45 dBL_{Aeq} at the boundary fence of the site for night-time and not exceed 55dBL_{Aeq} at 1m from the plant buildings. The greatest potential noise source is the turbine hall which will be heavily insulated to prevent noise breakout.

2. Existing Conditions

2.0 Noise surveys were conducted across the site during daytime and night-time on the 30th, 31st May 2007 and 1st June 2007. Weather conditions during all measurement periods were favourable with dry conditions and low wind speeds.

All conditions were considered normal with no activity on the proposed site.

All measurements were obtained using Type 1 instrumentation, calibrated as required by the appropriate British Standards. The times and results of the measurements are summarised in Tables 2.1and 2.2.

Location	Time	L_{Aeq}	L_{A10}	L_{A90}	L_{AMax}
1 **28 Ballyvannon Road Front facade**	15:43 30/5/07	67.6	65.5	42.3	92.7
2 **25 Ballyvannon Road Rear facade**	16:05 30/5/07	54.6	53.6	41.7	81.7
3* **23 Ballyvannon Road Rear facade**	16:10 30/5/07	47.9	48.8	42.6	65.5
4 **21 Ballyvannon Road Gable facade**	14:40 31/5/07	56.8	56.3	42.5	89.3
5** **28 Shore Road Rear façade**	10:55 31/5/07	40.6	42.9	35.1	50.3
6 **99 Lurgan Road Front façade**	14:30 31/5/07	52.8	53.9	51.8	56.5
6 **101 Lurgan Road Front façade**	14:36 31/5/07	49.7	52.2	46.7	66.7

Table 2.1: Daytime Measurement Results (20 minute recordings)
*23 Ballyvannon Road will be demolished
** Subject to aircraft fly over- excluded from recording

Location	Time	L_{Aeq}	L_{A10}	L_{A90}	L_{AMax}
1 **28 Ballyvannon Road Front facade**	23:17 31/5/07	51.7	49.5	42.5	74.2
2 **25 Ballyvannon Road Rear facade**	23:53 31/5/07	43.5	45.3	39.3	63.4
3* **23 Ballyvannon Road Rear facade**	23:47 31/5/07	43.9	45.6	36.2	66.9
4 **21 Ballyvannon Road Gable facade**	00:27 1/6/07	40.5	43.6	34.2	60.5
5 **28 Shore Road Rear façade**	00:38 1/6/07	34.5	35.6	30.5	57.0
6 **99 Lurgan Road Front façade**	01:13 1/6/07	49.1	48.3	46.7	69.0
6 **101 Lurgan Road Front façade**	01:18 1/6/07	50.0	51.0	48.7	62.4

Table 2:2 Night-time Measurement Results (20 minute recordings)
*23 Ballyvannon Road will be demolished

Existing Conditions

2.1 During the daytime measurement periods the predominant noise source across the site was that of transportation noise mainly from the Ballyvannon Road. Fixed plant noise and vehicle movement in and around the Ulster Farm By-Products Industrial complex was also perceptible at some locations. Aircraft noise and some agricultural activity was also noticeable during the daytime. The night time measurement was conducted around midnight to 1am when traffic flows were lower. Low frequency noise was heard at some locations such as the Lurgan Road properties from the nearby industrial complex. This ensured a 'worst case' measurement was obtained, which will be used to set the relevant target levels.

2.2 It is submitted, therefore, that the complete data represents an accurate assessment of the existing ongoing noise climate at the proposed site.

2.3 With reference to BS4142, activity noise levels not greater than 5dB above the background level (L_{A90}) have less than marginal significance with regard to complaint. Therefore, an appropriate target is chosen which is not more than 5 dB above the background measurement recorded.

The individual assessments will also incorporate a tonal correction, where appropriate, in line with the methodology of BS4142.

Therefore, based on the surveyed data the following targets are presented:

Daytime Target Level L_{Aeq} = 40 dB

Night-time Target Level L_{Aeq} = 35dB

Construction noise is assessed with regard to absolute short term noise limits as detailed in the Construction Noise section following.

3. Assessment of Temporary Construction Noise Impact

3.1 **NB.** It should be noted that at this stage in the project only general information is available to assess possible noise impact and site machinery used will depend on contractors' available plant. The data following is for guidance purposes.

General details of construction works required are expected to be as follows:

Site Excavation and Preparation	D8 type Dozers + Komatsu PC400 and similar Large HGV tipper vehicles
Foundations	Cement Mixer Pile drivers (Piled foundations may be used depending on site investigations) Concrete vibrators
Steel Erection	Large cranes (wheeled typically 250 EB) Delivery (articulated vehicles)
General Construction	Masonry Construction/ possible rivetted fixing to roof Services, drainage and surfacing etc.
Internal Fit Out	

From the base data and with reference to BS 5228, the following noise levels for construction work can be ascertained

Activity	Plant	L_{Aeq} at 10m
Site clearance/excavation Removal of waste/rubble	Lorries (driveby) Cranes Dozers HGV and tippers	70 dB to 80 dB 87 dB 84 dB
Foundations	Compressor Water Pump Concrete Pour Poker Vibrator Place and vibrate concrete cycle (Table 9/29) Cement Mixers Pile Driving (driven precast as 'worst case') Sheet Piling (Kring/Ice Hammer) Sheet Piling (Giken Silent System)	81 dB to 80 dB to 86 dB to 96 dB 80 dB 74 dB 91 dB 90 dB 60 dB
Steel Erection	Large crane operations Articulated lorry	86 dB 70 dB
Concrete Frame	Large crane operations Place and vibrate	86 dB 80 dB
General Construction Works	Surfacing Steel panel fixing (possible riveting) Internal fit/ bricklaying	to 85 dB 90 dB 70 dB
Road works/landscaping (Compilation of data in BS5228 Table 12)	Surfacing/rolling	76 - 86 dB

Table 3.1: Noise Levels from Construction Works (ref: BS 5228)

3.2 For prediction purposes, it is assumed that at any one stage in construction several activities occur together. Therefore, at equal unscreened distances from a receiver, the 'worst case' construction activity level may become:

Combined maximum activity level (during foundation construction) = 98 dB L_{Aeq} at 10m

It would be expected that such activity would only occur close to a single property for 1 hour in any day. Other construction activity is typically 80-87 dB L_{Aeq}.

3.3 The impact of construction is assessed by considering the 'worst case' combined maximum activity level predicted above, and correcting for the minimum distance from source to receiver. The nearest residential properties to the site are 25 Ballyvannon Road and a cluster of residential property to the west of the site. They are at least 70m from the extents of the main building works, and at circa 90m from the centre of works. The attenuation provided by ground absorption or screening by topography calculated as typically 5dB, has been omitted to provide a margin of safety.

Typical construction activity level = 80-87 dB L_{Aeq}

'Worst case' combined activity level = 98 dB $L_{Aeq,1h}$ = 87 dB $L_{Aeq,12h}$

Attenuation by typical distance to properties = 20 log 90/10 = 19dB

Attenuation by minimum distance to properties = 20 log 70/10 = 17dB

Typical noise impact at properties = 87 – 19 = 68dB L_{Aeq}

'Worst case' noise impact at properties = 87 – 17 = 70 dB L_{Aeq}

Therefore, the impact of construction on these properties will typically be 68 dB L_{Aeq}, with levels up to 70 dB $L_{Aeq,12h\ unscreened}$ for extensive activity at the extent of works.

3.4 It is envisaged that if hard core is required from off site, the traffic could peak at 10-15 loads per hour for a number of weeks. The next busiest period would be during concrete pours, circa 10 trucks per hour for about 5 hours per day. The nearest property is 25 Ballyvannon at the entrance to the site. The private rear garden to this property may be screened by an L shaped 2m high earth bund near to the access road onto the site. In the worst case, the predicted impact from construction traffic is as follows:

Assessment of HGV Movement

3.5 It is typical to assess transportation noise with regard to absolute criteria as detailed in the “Calculation of Road Traffic Noise” (DOT, 1990) document and Planning Policy Guide (PPG) 24 “Planning and Noise”. However, due to the specific nature of this impact, HGV movement will be considered with regard to existing noise levels, influenced by transportation noise, at the site.

3.6 The impact of delivery vehicles traversing the site is best predicted using the Haul Road Method of BS5228. HGVs on access roads to the construction site are at a minimum of 10-15m from and will be fully screened to the nearest residential properties at the entrance to the site.

Potential noise level =Average SWL - 33 + 10 log Q - 10 log V - 10 log d

Consultants for the scheme estimate that a peak hour HGV movement of approximately 15 vehicles is considered likely therefore (Q=30), travelling at a speed of 20 km/h (V):
Average sound power level of HGV = 98 dB
Calculation correction = – 33 dB
Correction for number of passes in any hour (Q) = + 10 log 30 = + 14 dB
Correction for minimum speed of vehicle (V) = – 10 log 20 = – 13 dB
Attenuation by minimum distance to property = – 10 log 15 = – 12 dB
Attenuation by full screening = -10 dB

Potential HGV impact at properties = 98 – 33 + 14 – 13 – 12 - 10 = 44 dB LAeq,1h

It is predicted that the potential noise impact from ‘worst case’ HGV movement on site roads meets the daytime and night-time target levels.

3.7 It would be expected that, in common with other construction sites and EHO practice, maximum allowable noise levels at the site during construction would be recommended as follows

Monday to Friday	Maximum at Measurement Points
07:00 - 19:00	75 dB $L_{Aeq,1h}$
19:00 - 22:00	65 dB $L_{Aeq,1h}$
22:00 - 07:00	No noise audible

Saturday	Maximum at Measurement Points
08:00 - 13:00	75 dB $L_{Aeq,1h}$
13:00 - 22:00	65 dB $L_{Aeq,1h}$
22:00 - 07:00	No noise audible

Sunday

No operations

3.8 Typical short-term construction noise can be controlled to within Environmental Health guidelines for both daytime and night-time exposure. Extra care will need to be taken when carrying out works close to the properties at the extents of the work. Works here may exceed the target levels. It is suggested that the affected residents be consulted to obtain a suitable time and duration for this activity.

3.9 Appropriate mitigation measures are to include providing instruction to contractors to control noise impact of extensive construction activity close to existing residential properties.

Mitigation Measures for Construction Noise

3.10 BS5228 includes a number of guidelines and recommendations which are considered appropriate and of good working practice for all construction contracts. These are summarised below.

General Measures

3.11 The contractor should take note of the control measures for relevant plant listed in BS5228 and apply the appropriate measures where practicable, including temporary screening or enclosure of noisy plant, control of "on times" for noisy plant, and positioning of plant as far as possible from noise sensitive locations and properties. Also:

- use of good well maintained plant and where possible new plant manufactured under recent EC guidelines for manufacturers.
- substitution of unsuitable plant.
- maintenance of silencers and moving components.

Screening

3.12 The contractor should endeavour to sequence operations such that spoil mounds or storage areas are located in positions to screen nearby residential properties from ongoing works. It is intended to soil strip and then excavate with the spoil being put in situ along the south western boundary to attenuate construction and later any operational noise. This work will be carried out at an early stage to provide screening and avoid moving spoil around or off site at a later stage. The earth bunds may also be landscaped at an early stage. The access road around the site will be put in at an early stage. There will be a 2m high earth bund that will screen the weighbridge in addition to earth bunding around the nearest residential property at the entrance to the site. Temporary screening using sandbags, 20mm plywood sheeting or similar dense boarding may be required to reduce impact of static machinery or extensive works close to noise sensitive locations. Such measures can be best assessed during the contract by monitoring.

Monitoring

3.13 Given the limited impact it would not be appropriate to require regular noise monitoring of the site. However occasional measurement of noise levels generated using a Type 2 or better sound level meter should be conducted to check on the continuing impact of the works.

Off-time

3.14 At locations where earthworks will result in an exceedance of EHO limits, daily operations in that area should be limited so as control impact (eg. continuous dozer activity for 3 hours at 20m from a property, and for up to 6 hours at 30m, would not exceed the daytime target of 75 dB L_{Aeq} at that property).

Responsible Person

3.15 It is often recommended that the appropriate party should appoint or delegate a responsible person who will be present on site and who will be willing to answer and act upon queries from the local public.

Night Works (construction only)

3.16 If there are items of plant (e.g. dewatering pumps and similar) in use during night-time hours they should be chosen, sited and enclosed such that levels at the nearest residential properties do not exceed background level. Sound reduction of up to 15 dB(A) is possible by screening and hence any plant could be controlled to within the guidelines indicated.

4. Operational Impact

Assessment of Internal activity noise within the power plant

4.1 Noise impact from such facilities will depend on the activity with which each unit is involved.

4.2 Given current EEC requirements, as stated in the Control of Noise at Work Regulations 2005, it is reasonable to assume that the maximum noise levels within a light industrial unit would not be greater than 85 dB L_{Aeq}, the current "safe" limit. Even a unit where workers are exposed at workstations to noisier activities would, in all probability, not exceed a reverberant internal noise level of 85 dB L_{Aeq} within the unit. However, in an industrial unit such as the turbine hall, reverberant levels may reach or exceed 90 dB L_{Aeq}.

Fixed Plant

4.3 This plant would generally operate at night-time. Some items of external plant, (or plant near to external facades), may be required and all such units (standby generators, cooling units, fans, compressors, dust arrestment and others) can be silenced to an appropriate target level by manufacturers and installers. Alternatively, they can be installed internally in plant rooms and the air intakes and outlets silenced.

4.4 As stated previously, the nearest noise sensitive properties are those properties on the Ballyvannon Road. The minimum distance between the building façades of the material holding building and the nearest residential property at 25 Ballyvannon Road is 70m. The nearest property is 23 Ballyvannon Road but it and surrounding land have been purchased by the holding company for this project. Due to the topography of the site, some property on the Ballyvannon Road may not be screened from high level plant on the façade of the unit. Hence the following maximum noise level from any item (or items) of plant **must be achieved**.

4.5 Based on the standard attenuation by distance formula the following are established as the maximum permissible noise levels from any single or combined item(s) of plant at 10m.

Plant operating during daytime only
Permissible levels for fixed plant at the materials holding area
Attenuation by distance = 20 log 70/10 = 17dB
Tonal correction = - 5
Permissible Daytime Target Level= 40 + 17 – 5 = 52dB L_{Aeq}

That is, 52 dB L_{Aeq} limit at 10m from any plant or (items of plant) operating at 70m (on the façade of material holding building) from any receptor for any plant operating during the daytime hours. Plant may be located at a greater distance from any receptor and can also be screened.

Plant operating over 24 hours
Permissible levels for fixed plant at the materials holding area
Attenuation by distance = 20 log 70/10 = 17dB
Tonal correction = - 5
Permissible Night-time Target Level= 35 + 17– 5 = 47dB L_{Aeq}

That is, 47dB L_{Aeq} limit at 10m from any plant (items of plant) operating at 70m (on the façade of material holding building) from any receptor for any plant operating over 24 hours. Plant may be located at a greater distance from any receptor and can also be screened.

4.6 Typical noise levels from properly maintained and (where necessary) housed or screened units are as follows:

Chiller/AHU units	Unsilenced	67 dB(A) at 10m
	Silenced	50 dB(A) at 10m
	(Source ABK Ltd.)	
Fans (Roof Mounted)	Unsilenced, Light Duty	35 dB(A) at 10m
	Unsilenced, Heavy Duty	62 dB(A) at 10m
	(Source Matthew & Yates Ltd.)	
Standby Generators	Outside enclosure	57 dB(A) at 10m
	(Measured at existing sites)	
Final Effluent Pumps	Unscreened	62 dB(A) at 10m
	(Measured at existing sites)	
Vent Air System	Unscreened	62 dB(A) at 10m
	(Measured at existing sites)	

4.7 It follows from the above data that all plant will need to be carefully designed and chosen to meet adequate design targets. It may be necessary to specify low noise units, (fans, chill units, stand-by generators), or at least locate same in appropriate areas. Nevertheless, with appropriate design input, it is entirely possible to provide required mechanical plant for the facilities without exceeding the noise criteria given.

4.8 The Boiler House, Turbine Hall, Switchgear service building, condensers and dust arrestment plant are located to the north western portion of the site. Consequently, potential noise from these buildings would be at least partially screened from receptors by the bulk of the materials reception hall.

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Internal Levels from the Material Holding Building

4.9 Given that operating times will extend into the evening and at night a check on the design requirements for the building envelope to contain internal noise levels should be completed.

4.10 Typical construction methods for wide spanning storage structures involve steel framed metal clad units in single or double skin insulated material. The minimum attenuation provided by such a unit is of the order of 25 dB R_W (source: "Kingspan") for insulated panels, and circa 22 dB R_W (source "Metal Cladding Roofing Manufacturers Association Technical Paper No.8) for single skin panels. Higher specification constructions can be used if necessary. Solid core fire escape or other access doors which may separate the activities from the external environment provide around 28 dB of attenuation and can be upgraded as required. The wall and roof panels to be used for the main buildings will provide at least 40dBRw Weighted Sound Reduction Index.

4.11 Other noise measurements have previously been recorded by this consultancy for similar facilities. These measurements were recorded in a warehouse/distribution centre, large incinerator complex, recycling facility and power station. The internal noise environment consisted of tannoy noise, cages and forklift truck movements. The materials handling facility is nearest to housing and will provide partial screening of activity noise from the boiler house and turbine room area where noise levels may be up to 90dB L_{Aeq} from boilers and turbines

4.12 Internal "material handling noise" noise $\leq$85 dB L_{Aeq}
(to comply with Health and Safety regulations – noise levels should not exceed this limit)

Attenuation of enclosure $\geq$ 25 dB

Potential Impact from Activity in material intake/handling facility

Distance to nearest property façade = 70 m
Attenuation by distance =10 log r
(due to potentially large surface area)
=18 dB
Reverberant to Free Field Correction = -6dB
Partial screening as building at lower ground level = -5dB

Total available attenuation = $\geq$54 dB

Impact from materials handling activity= 85- 54dB
= 31 dB L_{Aeq}

4.13 It follows that the potential noise impact due to "materials handling" noise within the complex is not more than 31 dB L_{Aeq} at any residential property. This is within the target criteria, including the possibility of late night working. The assessment has reduced the attenuation by distance from the facade to the nearest house to include a margin for safety. The wall and roof panels will provide at least 40dBRw weighted sound reduction index. Smoke and heat and ventilation systems will typically provide at least 25dBRw but they act as point sources rather than large area sources. When this is taken into account any noise breakout is within external daytime and night time noise targets at the nearest noise sensitive receptors

4.14 The plant project documentation provides that target noise levels should not exceed 45 dBL_{Aeq} at the boundary fence of the site for night-time and not exceed 55dBL_{Aeq} at 1m from the plant buildings.

4.15 As a worked example, if the attenuation provided by the structure of the building provides attenuation such that the noise level does not exceed 55dBL_{Aeq} at 1m from the plant buildings. Then in the worst case at the western boundary which is closest to the materials handling building the predicted impact will be as follows.

Potential Impact from Activity in material intake/handling facility

Distance to nearest boundary = 10 m
Attenuation by distance =10 log r
(due to potentially large surface area)
=10 dB
Reverberant to Free Field Correction = -6dB included in original noise target
Partial screening as building at lower ground level = -5dB

Total available attenuation = $\geq$15dB

Impact from materials handling activity= 55-15dB
= 40 dB L_{Aeq}

Predicted noise impact at boundary is likely to be less than night time noise target of 35 $dBL_{Aeq.}$

4.16 Noise emission data was used to predict the likely cumulative impact from the Materials Handling Building, Boiler House, Turbine House, flue gas cleaning and fixed plant such as flue gas ducts, ash conveyors, wet cooling tower and the stack. CADNA Environmental noise modelling software was used to predict the likely impact at the boundary and at nearby residential properties from numerous noise sources associated with the development. Typical sound insulation values for wall and roof construction of industrial buildings along with doors and opening was used in the model. Sound power levels and sound pressure levels from other similar plant such as the cooling tower inlet and outlet, fabric filters and ID fan silencer was provided by a large energy company.

4.17 The predicted noise levels when all plant is running simultaneously in the materials handling facility, the boiler house and turbine hall along with fixed plant at high and low level is circa 44-49dBL_{Aeq} at the north western boundary. This is in excess of the target level of 45 dBL_{Aeq} at the boundary fence of the site for night-time. However there has been no allowance made for additional screening by earth bunds along that section of the boundary and there are no properties close to the boundary. The highest predicted noise levels beyond the north western boundary (where most of the fixed external plant is located) for those properties on the Ballyvannon Road was 41 dB$L_{Aeq.}$ In practice the cumulative noise impact is likely to be less as the model has allowed for openings, several HGVs at the Materials Handling Building and noise breakout through the weaker parts of the structure such as smoke ventilators. Doors to the Materials Handling Building, Turbine Hall and Boiler House would normally be kept closed when not in use. The highest predicted noise levels along the northern boundary are due to an HGV in the turning circle close to this boundary. At night there will be fewer vehicle movements, and no HGV movements after 7pm, which are a significant source of noise and roller shutter doors will be kept closed. The model has assumed worst case condition with highest internal reverberant noise levels, minimum distance and minimum screening to the nearest properties. See Appendix for CADNA noise model.

4.18 Maximum or L_{AMax} noise levels are also considered. Peak noise levels are possible at the top of the boiler house (blow off start up valve 100dB(A) and 120dB(A) for safety valves. Peak noise levels are much higher than maximum noise levels but assuming that these figures relate to maximum noise levels the impact at the nearest property is as follows.

Maximum noise level	$\leq$	100 dB L_{Amax} at 1m
Attenuation by distance		=20 log 80
		=38dB
Attenuation by partially open bedroom window	=	15 dB
Total available attenuation	$\geq$	53dB
Impact from blow off valve	=	100 – 38–15 = 47 dB L_{AMax}

It is therefore predicted that short term maximum noise levels from a start up valve or safety valve, may be audible occasionally in the nearest dwelling when the windows to a habitable room are open. However this is using the 'worst case' with highest noise levels and minimum distances to the nearest properties. Maximum or L_{Amax} noise levels associated with road traffic in this area are generally much higher.

5. Traffic

Assessment of HGV Delivery Noise Impact

5.1 It is typical to assess transportation noise with regard to absolute criteria as detailed in the "Calculation of Road Traffic Noise" (DOT, 1990) document and Planning Policy Guide (PPG) 24 "Planning and Noise". However, due to the specific nature of this impact, HGV movement and marshalling will be considered with regard to BS4142 and in relation to the background noise level at the site. The target of 35dB L_{Aeq} at any residential property is more strict that the targets presented in CRTN and will be used for this assessment.

Delivery Vehicles on Access Roads

5.2 The impact of delivery vehicles traversing the site is best predicted using the *Haul Road Method* of BS5228. HGVs on access roads to Service Areas are at a minimum of 65 m from properties on Ballyvannon Road.

5.3 Based on data provided by the traffic consultants, it is estimated that approximately 100 (two way) HGV's carrying poultry bedding, ash or general deliveries may access the site in a 24 hour period. As a 'worst-case', it will be assumed that 5 HGVs may access the site in any hour (Q=10), travelling at a speed of 20-30km/h (V). The traffic impact assessment predicts 9 (two way) HGV movements in a peak hour period. Therefore:

Potential Impact of HGV Activity at the properties on the Ballyvannon Road

Average sound power level of HGV = 98 dB

Calculation correction = – 33 dB

Correction for number of passes in any hour (Q) = + 10 log 5 = + 7dB

Correction for minimum speed of vehicle (V) = – 10 log 30 = – 15 dB

Attenuation by minimum distance to property = – 10 log 15 = – 12dB

Potential HGV impact at properties = 98 – 33 + 7– 15– 12 = 45dB $L_{Aeq,1h}$

The assessment has provided a margin of safety as the access route and exit route are separate. HGVs use the new access route off the Ballyvannon Road at the location of the existing access to No.23 Ballyvannon Road.

Traffic leaving the site will do so via the existing Ulster Farm By Products access route. There will be 8 less HGV movements over a 24 hour period as UlsterFarm By Products is no longer having to move material to other sites. Th assessment has also assumed that all delivery vehicle are HGVs and this is not the case

5.4 It is calculated that the potential noise impact from 'worst case' HGV movement at the site is above the daytime /night-time target level. It is submitted that the existing background noise levels at location 2 (nearest house) are 42dB L_{A90} during the day and 39dB L_{A90} at night and therefore the potential noise impact will be lower than predicted. Minimum distances have been used and in practice HGVs will be fully screened by an embankment, acoustic fence and retaining wall. In order to meet the set noise targets it will be necessary to regrade the topography along the western boundary and at the entrance to the site. A wide 2m high earth bund/retaining wall on the western boundary and at the entrance to the site would provide full screening of the HGVs on the site access road to the nearest houses at the entrance and beyond the western boundary. Full screening by an earth bund/retaining wall at these locations provides a further 10dB attenuation. An L shaped 2m high earth bound or similar should be used to screen the nearest property at 25 Ballyvannon Road. The screening at these locations should be provided in the early stages of the project to minimise the impact from construction traffic and plant across the site In the worst case the potential noise impact at the nearest property from HGVs using site access roads would now be = 48dB – 10dB

Potential HGV impact at properties = 38dB $L_{Aeq,1h}$ (Fully screened)

5.5 It is further submitted that, given the existing noise environment is predominantly transportation noise from road traffic, the potential impact from HGV movement is typical of the existing noise environment. HGV movement will not occur at night.

Noise Impact Due to External Marshalling Activity at the Materials Handling Area

5.6 Noise levels of large HGVs marshalling have been measured in a recycling and incinerator complex throughout Northern Ireland. The measured noise level was 70 dB L_{Aeq} at 10m for non refrigerated vehicles, and included vehicle movement, forklift truck movement and personnel activity associated with loading and unloading.

5.7 Non refrigerated vehicles, not running, with forklift trucks accessing are more likely to have levels of the order of 60 dB(A)Leq to 65 dB(A)Leq at 10m. However normal practice will be for HGVs to reverse up to the bins/hoppers within the materials handling building and the doors closed before off-loading of material. Consequently, potential noise from these buildings would be at least partially screened from receptors by the bulk of the materials reception hall.

Forklift trucks will not be used. The system will use an overhead travelling crane and loading shovels to move the chicken litter and meat/bone meal. It should also be remembered that that the material being handled will not give rise to impact noise which is often the case with other recycled materials such as metals and glass.

5.8 The topography of the site is such that the proposed marshalling area will be fully screened to the most proximate residential property on Ballyvannon Road as the site will be at a lower level than surrounding area and there is an embankment on the western boundary. There will be noise from vehicles moving down to the external marshalling area and then moving up the incline to the weigh bridge. However their movements will be screened by the earth bund/acoustic barrier on this section of the route.

HGV marshalling noise level, at 10m (non refrigerated vehicles) = 60 dB L_{Aeq}

Attenuation by distance, to nearest properties = 20 log 170/10 = 24 dB

Taken to be from centre of turning circle

Screening = -10dB

Potential noise impact due to marshalling activity = 60 – 34= 26dB L_{Aeq}

5.9 It is noted that the potential ‘worst case’ impact of marshalling activity in the proposed service yard meets the daytime and night-time target levels. However all marshalling and unloading activity is to take place inside the

distribution area with vehicles reversed and parked within the loading bay. This will provide at least 10-15dB attenuation as the loading activity is fully screened from the nearest housing. It is therefore predicted that the potential 'worst case' noise impact of continuous marshalling activity will be below both the daytime/night-time target levels.

Assessment of Delivery Entrances (Roller Doors)

5.10 Due to the orientation of the proposed distribution/storage centre, the main openings used for delivery/marshalling have a reduced angle of view for properties on Ballyvannon Road at a distance of 100 m to the nearest roller shutter door.

Internal Noise Level	= < 85 dB L_{Aeq}
Attenuation by Distance (Taken as a point source due to distance)	= 20 log 100 = 40dB
Reverberant to free field correction	= 6dB
Screening by topography/retaining wall	= -10
Potential Noise Impact (With Doors Open)	= 29dB L_{Aeq}

511 Attenuation by soft ground and reduced angle of view has been omitted to provide a margin of safety. It can be seen that the potential noise impact from internal works, through the open roller shutter door, will meet the daytime and night-time target level.

5.12 However it would be normal practice in this type of facility to close any entrance doors not in use and to use loading bays furthest from noise sensitive receptors

5.13 Where possible HGVs can also be parked so as to provide a further 5 dB screening to nearby housing.

Assessment of Traffic Noise Impact

Existing Approach Roads Ballyvannon Road

5.14 It is generally accepted in most current reference documents that an increase of 3 dB(A) on existing traffic noise is required before it may be noticed by the public (example ref: UK DOETR "Guidance on the Methodology for Multi-Modal Studies", Paragraph 4.3.5). With reference to the "Calculation of Road Traffic Noise" document (CRTN), and if all other factors remain equal, this would represent an increase in traffic flow of 100%.

5.15 The "Design Manual for Roads and Bridges" document (DMRB) suggests that a 1dB increase in traffic might be perceptible, although it acknowledges that other factors in visual perception and magnitude of traffic levels before increase are relevant. Again with reference to CRTN, a 1dB increase in noise level is approximately equivalent to a traffic number increase of 25%.

5.16 There are 81 HGVs (2 way deliveries) to the existing Ulster Farm By products rendering plant in a typical weekday. The number of deliveries to the power plant when it is operational will be 100 (2 way deliveries, HGV and LGV combined) per day.

5.17 Therefore, guidance documents would indicate that the increases in traffic noise on approach roads would be greater than 10% but would not be perceptible at existing properties close to roads, even during peak hour use. The percentage increase is greater than 10% simply because of the low volume of traffic on existing roads.

5.18 Using CRTN methodology the predicted change in noise levels at the nearest dwelling on the Ballyvannon Road over an 18hour day from increased road traffic associated with the development would not be significant.

Employee/visitor Activity in Car Park

5.19 The majority of the car parking spaces are at a distance of at least 80m from the nearest residential properties. The number of employees required by the facility is relatively low.

5.20 Measurements have been taken by this consultancy in a retail/leisure car park location in Glengormley, (Co. Antrim), when large numbers of vehicles and members of the public were leaving. The measurements were at circa 2m from the closest vehicles, and included: people moving to their cars, talking, shouting and laughing; engines starting and revving; and cars leaving the site. Levels immediate to the meter rarely exceeded 70 dB(A), with the complete event resulting in a noise level of 63 dB L_{Aeq}.

'Worst Case' Car park Activity Impact

Car park activity noise level, at 2m = 63 dB L_{Aeq}
Attenuation by distance, to residential properties = 20 log 95/2 = 33 dB

Potential noise impact at residential properties = 63 – 33 = 30 dB L_{Aeq}

The car parking areas are screened by the intervening topography and will provide at least 10dB attenuation by full screening.

5.21 Therefore, the potential noise impact of car park activity is less than the measured background noise level at the site, and submitted to be within the daytime /night-time target levels.

Noise Impact

5.22 There may be an occasion when all the activities from power plant/ external plant and vehicle movement will occur simultaneously. The following summary predicts the likely noise impact of the proposed power plant/ external plant and vehicle movement.

Dwelling nearest to the site

Activity	*'Worst Case' Impact Level at NSR*
Noise from external fixed plant	= 30 dB L_{Aeq}
Internal noise levels from power plant	= 31 dB L_{Aeq}
HGV Movement on Site Roads	= 38dB $L_{Aeq\ (screened)}$
Marshalling Activity	= 26 dB $L_{Aeq\ (screened)}$
Roller Shutter Doors	= 28 dB $L_{Aeq\ (screened)}$
Car park activity	= 20 dB $L_{Aeq\ (screened)}$

5.23 Highest recorded noise levels from similar operations, minimum distances and minimum screening to nearby properties has been used in the assessment to provide a margin of safety. The proposed power plant will provide screening to properties from other noise and from vehicle movements around the site. Items of external plant may be located and screened using the new building.

6.Vibration

6.1 Vibration associated with heavy plant such as boilers and turbines may be controlled by anti-vibration mountings on heavy bases, flexible connections to reciprocating plant and commissioning and maintenance of items such as fans.

6.2 The assessment of vibration impact and disturbance is detailed in Chapter 6 of the Design Manual for Roads and Bridges, DMRB, It is likely that the reference source of this chapter is research work by the Transport Research Laboratory (TRL) and particularly Report 246 “Traffic Induced Vibrations in Buildings”. The DMRB chapter makes a number of points:

6.3 Vibration levels from traffic are low, even in properties close to heavily trafficked roads, and normal use of the building often generates much higher vibration levels. Extensive research has shown that traffic induced vibrations do not cause significant damage to buildings.

6.4 The highest levels of traffic induced vibration are generated by irregularities in the road, and this is unlikely to be an important consideration for new roads. However, as road conditions may be improved during maintenance work, it should not be presented as a benefit of a new scheme. (The TRL Report 246 presents a prediction method for traffic vibration in which the depth/height of an irregular surface is a main component in the assessment of peak particle velocity effects. As this value approaches 0, the induced vibration also approaches 0. Thus a new surface has limited potential for vibration impact).
Notwithstanding the TRL report, DMRB concludes that ground-borne vibration level depend on many factors and is difficult to accurately predict.

6.5 Airborne vibration is more likely to cause disturbance than ground-borne vibration, but both sources of vibration will cause less disturbance than noise, and are applicable within a shorter distance from the road.

6.6 Other empirical matters, relating to traffic induced vibrations, have been monitored and noted. Some general guidance on the effect of vibrations is contained in BS6472 (1992), “Guide to Evaluation of Human Exposure to Vibration in Buildings” and BS7385 (1990 and 1993), “Evaluation and Measurement for Vibration in Buildings”.

6.7 Vibration associated with heavy impact activities on other construction sites have been measured as less than 0.5 mm/s at 20m. Vibration from HGV road traffic has also been measured at less than 0.5mm/s at 15m in other locations with good road conditions.

6.8 Empirical data, as detailed above, suggests that vibration levels will be less than 0.5mm/s circa 10-20 Hz at the majority of properties. With reference to BS6472, it is considered that this represents a “low probability of adverse comment” by residents. With reference to BS7385 and allowing for normal circumstances, this vibration level is not of a severity that might cause any structural damage to the property. (See Appendix 2 for further details)

7. Mitigation Measures

7.1 A noise survey has been conducted at the site during daytime and night-time to establish the existing noise environment.

7.2 The potential noise impact from the proposed development on the most proximate noise sensitive properties has been assessed and appropriate target noise levels have been ascertained.

7.3 No excessive impact from normal production and distribution activity is likely, and, where plant associated with these facilities is utilised, it can also be selected and designed to ensure any noise impact is below background noise level + 5dB. External plant such as dust extraction, fans and condensers may be sited or enclosed to meet daytime and night time noise targets. Internal reverberant noise levels are likely to be highest in the Turbine Room and Boiler House but any potential noise breakout may be controlled using an enclosure with sufficient mass. The techniques of sound attenuation and absorption are well established and used at similar larger facilities such as Kilroot Power Station.

7.4 The initial noise survey around the site was used in the analysis of the likely impact from multiple noise sources and large area sources on the site. Changes were made to the site layout and additional screening to plant, buildings and access roads was adopted to minimise the impact on the nearest properties. With the inclusion of the proposed mitigation measures, noise from delivery and power plant operations can be controlled to within target levels. The mitigation measures include internal loading of HGVs, closing loading bay doors when not in use and screening by buildings.

7.5 Sound attenuation on this site is mainly by distance from the nearest housing with re-grading of topography on the western boundary to provide additional screening by retaining walls and earth bunds at the boundary of the site in order to meet daytime and night time noise targets. No. 25 Ballyvannon Road at the entrance to the site should be screened using an L shaped 2m high earth bund or similar. This would provide additional screening to general traffic on the access road and from construction traffic and plant

7.6 Changes to traffic noise on roads around the site will be generally imperceptible based on the available traffic data and the percentage increases in traffic that are predicted.

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7.7 Typical short-term construction noise can be controlled to within Environmental Health guidelines for both daytime and night-time exposure. Extra care will need to be taken when carrying out works close to the properties at the extents of the works.

Rey Gaston B.Sc..M.I.O.A.
For and on behalf of F.R.Mark & Associates

Appendix 1 – Explanation of Noise Terms

Definitions of environmental noise terms are detailed in ISO1996 (BS7445), *Description and Measurement of Environmental Noise*.

The following explanations of the terms used in this assessment are meant to clarify the nature and use of each term and are made with reference to the glossary of terms in PPG24.

L_A A-weighted sound pressure level (in decibels, dB)
The measured sound level incorporating a logarithmic base and weighting system to approximate the manner in which humans perceive sound. An increase in 10 dB is approximately equivalent to a perceived doubling of loudness.

$L_{Aeq, T}$ Equivalent continuous A-weighted sound pressure level (in decibels, dB), over a given time interval
An average of the energy associated with the noise at a location over a given time interval. Where a time interval is not given it is typically considered as a continuous level.
Indicates the activity noise level of a source. Typical source descriptions include “ambient noise”, “specific noise” and “residual noise” as defined in BS4142.

$L_{A10,T}$ A-weighted sound pressure level (in decibels, dB) obtained using “Fast” time-weighting that is exceeded for 10% of the given time interval.
Indicates the upper limit of a fluctuating noise source such as that from road traffic. For road traffic, it is typically expressed for peak hour, or as the arithmetic average of hourly L_{A10} values over an 18 hour day (06:00-24:00).

$L_{A90,T}$ A-weighted sound pressure level (in decibels, dB) obtained using “Fast” time-weighting that is exceeded for 90% of the given time interval.
Defined as the background noise level at a location in BS4142.

$L_{A\ max}$ The highest A-weighted sound pressure level (in decibels, dB) recorded during a measurement event.
May be obtained using either “Slow” time-weighting (as incorporated in PPG24) or “Fast” time-weighting (as incorporated in WHO *Guidelines for Community Noise* and BS8233)

Appendix 2-Vibration

Evaluation Criteria

BS7385, “Evaluation and Measurement for Vibration in Buildings”, was intended to represent the current opinions on the probabilities of damage to structures when exposed to vibration levels with given peak particle velocities. However, the standard is non-specific in many areas due to the limited amount of core data available in the compilation of the document, particularly with regard to vibration damage records.

The guidelines in Table 1 have been based on BS7385, previous literature and the experience of this consultancy. “Cosmetic damage” refers to hairline cracking, with possible loosening of some poorly fixed components.

Peak Particle Velocity (ppv)	Likelihood of Damage
< 1.0 mm/s	Damage unlikely but continuous vibrations should be avoided
1.0 - 2.5 mm/s	Damage unlikely but continuous vibrations should be avoided as cosmetic damage may be possible to historic low rise structures.
2.5 - 5.0 mm/s	Poor quality or historic structures susceptible to cosmetic damage. Structural damage unlikely.
5.0 - 10.0 mm/s	Slight probability of cosmetic damage to low rise buildings or poorly fixed/secured panelling due to dynamic amplification. Poor quality structures susceptible to minor structural damage.
10.0 - 20.0 mm/s	High probability of cosmetic damage and slight probability of minor structural damage to low rise buildings.
> 20.0 mm/s	Buildings susceptible to structural damage.

Table 3: Guidelines for Likelihood of Damage from Vibration

Appendix 3- CADNA Noise model

Predicted noise levels at the boundary of the site