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**Noise Impact Assessment
for the
Construction phase**

**Landscape proposals
for
Ward Park
Bangor
County Down**

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Introduction and Methodology

Ards and North Down Borough Council propose to carry out landscaping works to Ward Park in the centre of Bangor.

F.R.Mark and Associates, noise and acoustic consultants were instructed by Doran Consulting to carry out an assessment of the likely noise impact during the construction phase on any nearby noise sensitive receptors. This is a large established park with residential properties, community hospital, library, colleges/academy and churches near to the areas that will be landscaped. The works include temporary diversion of the ponds, removal of silt, demolition and replacement of upstream bridges and existing structures; building new reinforced concrete structures, widening and new paths or decking and felling of trees. Please see Appendix for outline details of works.

Explanations of noise terms used in this assessment are presented in *Appendix 1*.

Existing Noise Environment

The existing noise environment is urban in nature with traffic on Hamilton Road and Castle Street being the main source of noise in the area. However some of the dwellings in Moira Drive and Castle Street benefit from screening as their rear gardens over look Ward Park. The Community Hospital and library are both open during the daytime. The existing ambient noise levels are likely to be low during the daytime and at night. The author knows Ward Park well having lived in Bangor since 1981.

F.R.Mark and Associates recorded background, ambient, and maximum noise levels at noise sensitive receptors facing onto Ward Park during the daytime and night in November 2018.

The noise measurement locations are shown in Figure 1.



Figure 1: Noise Measurement Locations (Not to scale)

Background Noise Levels

The existing background levels recorded on Saturday 24th November 2018 and Sunday 25th November 2018 at noise sensitive receptors facing onto Ward Park in Bangor were as follows:

The measurements were taken under dry still weather conditions with little activity in the park on a quiet weekend with little road traffic.

Location Date/Time	L _{Aeq} dB	L _{A90} dB	L _{Af,max} dB	Comment
NML 1 To the side of Castle Cottages 23:10-23:25	52.4	46.2	65.5	Dry still cold, little traffic Some disturbance earlier in the evening
NML 3 Castle St terrace 23:35-23:50	50.9	47.5	62.4	No activity outside hospital Screened from substation and boiler house
NML 5 Moirra Drive 00:05-00:20	49.0	43.7	68.6	Near tree line but little wind/noise through vegetation
NML 6 Moirra Drive 00:23-00:48	43.3	39.0	64.2	Facing onto sports pitches/possible construction compound location

Table 1: Night time Noise Levels, Saturday 24/11/2018

Location Date/Time	L_{Aeq} dB	L_{A90} dB	L_{Af,max} dB	Comment
NML 1 To the side of Castle Cottages 13:30-13:47	54.6	49.8	61.8	Dry, still, cold, little traffic
NML 2 Bangor Community Hospital 14:00-14:15	48.3	44.7	71.3	No activity outside hospital Screened from substation and boiler house
NML 4 Library 14:25-14:40	53.4	48.4	66.6	Little activity in children's playground opposite
NML 5 Moir Drive 14:44-15:01	52.3	46.9	71.5	Near tree line but low wind
NML 6 Moir Drive 15:05-15:20	52.3	46.1	70.4	Near tree line but low wind

Table 2: Daytime Noise Levels, Sunday 25/11/2018

Construction Noise

The impact of the short-term works associated with the preparation of the site and the subsequent landscaping/construction will be assessed using BS5228 (2009), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

Assessment of Short-term Construction Noise Impact

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

Typical Construction Noise Levels

General details of expected construction works are identified in *Table 3*, with typical noise levels for each activity taken from BS5228.

Activity	L _{Aeq} at 10m
HGV movement, for removing spoil and bringing necessary fill and other sundry materials to the site	70 dB
Tracked or wheel excavators to remove existing topsoil, rubble and subsoil in preparation for foundations of bridges and other structures	to 87 dB
Piling operations (typical non-displacement system – if necessary)	80-88 dB
General construction, including delivery of building materials and plant	70-84 dB
Dewatering pumps (if required)	to 80 dB
JCBs for services, drainage and landscaping	to 84 dB
Vibrating rollers and other road surfacing plant	76-86 dB

Table 3: Typical Noise Levels from Construction Works (ref: BS5228)

Given that construction will be at least 20m from the nearest noise sensitive property, construction impact is as follows: (Based on typical distance from path around the Middle Pond to the rear facade of properties in Moira Drive)

Moira Drive

Typical construction noise level 80-84 dB L_{Aeq}

Combined maximum construction level 90 dB L_{Aeq}

Attenuation by minimum distance $20 \log 20/10 = 6 \text{ dB}$

Attenuation by ground absorption $5 \log d/d_0 - 2 = \text{dB}$

Applicable only for distances > 25m

Working duration for 1/3 of the day = $10 \log 1/3 = -5 \text{ dB}$

Typical noise level at property façade 69-73 dB L_{Aeq}

'Worst case' noise level 79 dB L_{Aeq}

The impact of construction at the nearest properties will typically be 69-73 dB L_{Aeq} for works to the path around the middle pond with levels up to 79 dB L_{Aeq} for site preparation activity at the extent of works.

Moira Drive

Demolition and replacement of the two bridges is likely to be the noisiest operation. This is at least 54m from the rear facade of properties in Moira Drive.

Typical construction noise level	80-84 dB L_{Aeq}
Combined maximum construction level	90 dB L_{Aeq}

Attenuation by minimum distance	$20 \log 54/10 = 15 \text{ dB}$
Attenuation by ground absorption	$5 \log d/d_0 - 2 = 2 \text{ dB}$
Applicable only for distances > 25m	
Working duration for 1/3 of the day	$= 10 \log 1/3 = -5 \text{ dB}$

Typical noise level at property façade	57-61 dB L_{Aeq}
‘Worst case’ noise level	67 dB L_{Aeq}

Using the same methodology for Bangor Community Hospital and for the Library is as follows:

Bangor Community Hospital

Demolition and replacement of the two bridges is likely to be the noisiest operation. This is at least 75m from the rear facade of Bangor Community Hospital.

Typical construction noise level	80-84 dB L_{Aeq}
Combined maximum construction level	90 dB L_{Aeq}

Attenuation by minimum distance	$20 \log 75/10 = 18 \text{ dB}$
Attenuation by ground absorption	$5 \log d/d_0 - 2 = 2 \text{ dB}$
Applicable only for distances > 25m	
Working duration for 1/3 of the day	$= 10 \log 1/3 = -5 \text{ dB}$

Typical noise level at property façade	55-59 dB L_{Aeq}
‘Worst case’ noise level	65 dB L_{Aeq}

Bangor Library

Replacement of paths is likely to be the noisiest operation. This is at least 22m from the rear facade of Bangor Library.

Typical construction noise level	80-84 dB L _{Aeq}
Combined maximum construction level	90 dB L _{Aeq}
Attenuation by minimum distance	$20 \log 22/10 = 7 \text{ dB}$
Attenuation by ground absorption <small>hard ground</small>	$5 \log d/d_0 - 2 = 0 \text{ dB}$
Applicable only for distances > 25m	
Working duration for 1/3 of the day	$= 10 \log 1/3 = -5 \text{ dB}$
Typical noise level at property façade	68-72 dB L _{Aeq}
‘Worst case’ noise level	78 dB L _{Aeq}

The assessment has considered the noise impact from works at fixed locations but the cumulative noise impact will also include the contribution from mobile plant. Dump trucks and HGVs will be moving along set haul roads to these locations. At present until a contractor is appointed, there is no detail as to the location of a secure compound, haul roads and the number of vehicles needed to move many cubic metres of silt and debris across the park and off site. When that is determined the assessment may include the contribution from vehicles using the haul routes.

It can be shown at present that the contribution of fixed works/plant during the construction phase is at or may exceed the daytime maximum permissible construction noise levels at these receptors.

The contribution from mobile plant is likely to be similar as the compound and haul routes will be within the park.

Maximum Permissible Construction Noise Levels

BS5228:2009 + A1 2014 Noise and Vibration Control on Construction and Open Sites provides recommendations for temporary construction noise limits, based on an assessment of the existing ambient noise levels within the vicinity of the works. The ‘ABC’ method, as found in BS 5228 Section E.3.2, provides an appropriate assessment method for determining temporary construction noise level targets. The level is determined by rounding the ambient noise level within the vicinity of the construction works to the nearest 5 dB. This resultant level is then compared with Category A, B and C values. When this resultant level is 5 dB less than Category A values, then noise limits should be set in line with Category A values. When the resultant level is similar to Category A values then noise limits should be set in line with Category B values. When the resultant level is similar to Category B values or higher then noise limits should be set in line with Category C values. **Table 4** below outlines Values for Categories A, B and C.

Assessment Category and Threshold Value Period L_{Aeq}	Threshold Value, in Decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00-07:00)	45	50	55
Evenings and weekends	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

Table 4: Example Threshold of significant effect at dwelling

Therefore, as it is expected that ambient levels at the most proximate residential properties to the proposed landscaping will be relatively low due to the rural setting, it would be deemed appropriate to set noise target levels similar **Category A**.

Mitigation Measures for Construction Noise

Whilst it is unlikely that the EHO target limits could be met for works involving the middle pond, a number of mitigation measures are presented to provide additional instruction to contractors. These measures are detailed in BS5228 (2009), “Noise and Vibration Control on Construction and Open Sites”, and are considered appropriate and of good working practice for all construction contracts.

Choice of Plant

The contractor should take note of the control measures for relevant plant listed in BS5228 and apply the appropriate measures where practicable. These measures include:

- positioning of static plant as far as possible from residential properties, and utilising available screening by temporary structures, stock piles, etc.
- use of well maintained plant, and where possible new plant manufactured under more strict EC guidelines for manufacturers.
- substitution of unsuitable plant.
- maintenance of silencers and moving components.
- any dewatering pumps that may run overnight should be located and screened so as to minimise any noise impact on noise sensitive receptors
- audible reversing warning systems on dump trucks should be of a type which, whilst ensuring that they give proper warning, have minimum impact on premises within and overlooking Ward Park

Monitoring

Given the likely impact it would be appropriate to require noise monitoring of the site.

Appointment of a Responsible Person

It is 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.

Conclusions

The intention throughout any construction programme should be to minimise levels of site noise whilst having due regard to the practicality and economic implications of any proposal or control measure.

The proposal is at an outline stage and noise from construction plant at fixed locations such as the bridges or middle pond is likely to be at or exceed the Category 'A' maximum permissible construction noise limits at Moira Drive, Bangor Community Hospital or Bangor Library during the daytime. It has not been possible to quantify the contribution from mobile plant on haul roads within Ward Park. However there is a significant quantity of silt and debris that needs to be removed from the ponds and this needs to be taken into account once the number of vehicles coming/leaving the site and across the site; the location of the haul routes and any construction compound has been established.

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_{Amax}** 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:

Calibration details

Item	Serial no.	Last Calibration	Cert No.	Calibration Due
Norsonic Nor 140 Sound Level Meter	1403218	16/2/2018	TCRT18/1158	16/2/2020
Norsonic Nor 140 Sound level meter Microphone Nor- 1225	96035	16/2/2018	TCRT18/1158	16/2/2020
Norsonic Nor 140 Sound level meter Pre- amplifier Nor- 1209	12616 Used during traceable calibration of Nor-1403218	16/2/2018	TCRT18/1158	16/2/2020
Cirrus CR:515Acoustic Calibrator	70607	15/9/2017	TCRT17/1605	16/9/2019

Table 5:

The acoustic calibrator is compared to a reference instrument chain at least annually.

Appendix 3: Outline Construction Programme

			Week no	Duration
Site Establishment			1	1
Phase 1	Inlet Structure & Upper Pond			
Phase 1a	Inlet Structure	Site Fencing & Signage	2	1
		Site Clearance	2	1
		Establishment of Haul Routes	2	1
		Temporary Diversion of Watercourse	3&4	2
		Temporary Diversion of Services	5	1
		Demolition & Disposal of Existing Structure	6	1
		Excavation & Disposal for new RC Structure	7	1
		New RC Structure	8,9,10	3
		Sealing with existing walls	10	1
		Excavation & Disposal for Filter Bed	10	1
		Granular Filter Material	11	1
		Gabions	9	1
		Decorative Filter stone	12	1
		Scum/Debris Baffle	12	1
		Over flow Chamber/Screen	12,13	2
		Oil Interceptor	12,13	2
		Removal of temporary works	14	1
		Paths/Pavements	14	1
		Reinstatement	14	1
Phase 1b	Upper Pond	Site Fencing & Signage	9,10	2
		Site Clearance	9,10	2
		Establishment of Haul Routes	9,10	2
		Temporary Diversions of Watercourse (2No - 1 on either side of island)	11,12,13	3
		Dewatering (2No - 1 on either side of island)	12,13	2
		Removal of silt (315m ³)	13,14	2
		Removal of Debris	15	1
		Excavation of Existing Island	16	1
		Excavation for Increased Pond	17	1
		Creation of New Islands	18,19	2
		Underwater berms/shallows	18,19	2
		Removal of existing bank walls	19,20	2
		Creation of new pond edges	20,21	2
		New Upstream Bridge	16,17	2
		New Paths	20,21,22	3
		Repairs to stone channel walls incl copes	20,21,22	3
		Downstream bridge and weir (flow control)	22,23	2
		Planting	24,25,26	3
		Lighting	24,25,26	3
		Seating & Features	24,25,26	3

Phase 2		Middle Pond & Bird Enclosures		
Phase 2a	Middle Pond	Site Fencing & Signage	54	1
		Site Clearance	54	1
		Establishment of Haul Routes	54	1
		Temporary Diversions of Watercourse (2No - 1 on either side of islands)	55&56	2
		Dewatering (2No - 1 on either side of islands)	55&56	2
		Removal of silt	57,58,59,60	4
		Removal of Debris	59,60	2
		Excavation of Existing Islands	61,62,63	3
		Creation of New Islands	64,65	2
		Underwater berms/shallows	65,66	2
		Removal of existing bank walls	66,67	2
		Creation of new pond edges	67,68,69	3
		Boardwalks	68,69,70,71	4
		New Paths	70,71,72,73	4
		Downstream bridge and weir (flow control)	70,71	2
		Planting	71,72,73,74	4
		Lighting	71,72,73,74	4
Seating & Features	71,72,73,74	4		
Phase 2b	Bird Enclosures	Demolition of existing structures	54	1
		Bird Enclosures	55-71	17
		Paving/seating & features	66-71	6
		Security Fencing	66-73	8
		Planting	69-74	6
Phase 3		Lower Pond & Playground		
Phase 3a	Lower Pond	Site Fencing & Signage	61	1
		Site Clearance	61	1
		Establishment of Haul Routes	61	1
		Removal of silt	62-63	2
		Removal of Debris	63	1
		Repairs to stone channel walls incl copes	64,65	2
		Repairs to stone bridge	65,66	2
		Repairs to pond bank walls	66,67	2
		New copings	68,69,70	3
		Pavements	71,72	2
		Bank softening	71,72	2
		Pond Feature	73,74	2
		Planting	71,72,73,74	4
		Seating and Features	71,72,73,74	4
Lighting	71,72,73,74	4		
Phase 3b	Playground	Removal of existing Playground Equipment	54,55	2
		New Playground Equipment	56,57,58,59	4
		Surfacing and Fencing	60,61,62	2