Hunterston Construction Yard
Noise Impact Assessment

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CONTROL SHEET

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EXECUTIVE SUMMARY

A construction Noise Impact Assessment (NIA) has been carried out for the proposed upgrade to Hunterston Construction Yard (HCY) into a harbour facility with a large working platform suitable for renewable industries.

Changes to noise levels have been predicted for a number of noise sensitive receptors (NSRs) under the worst case combined construction activity scenarios using Computer Aided Noise Abatement (CadnaA) modelling software.

The NIA predicted neutral impacts for all construction activity scenarios at all NSRs during the daytime and evening. In accordance with TAN 1/2011, neutral impacts are not significant, and noise need not be considered as a determining factor in the decision-making process.

The NIA also predicted a moderate adverse impact for dredging activity using a backhoe dredger at one NSR during the night-time. In accordance with TAN 1/2011, moderate effects, if adverse, while important, are not likely to be key decision-making issues.

This impact may be mitigated by means of an adjusted dredging schedule whereby backhoe dredging is prioritised during day-time, and only carried out during night-time in close proximity to the HCY site Use of alterative dredging plant (i.e., a trailing suction hopper dredger) is predicted to result in a neutral impact at this NSR during all assessed periods.

A Construction Noise Management Plan (CNMP) has also been prepared to minimise any potential construction noise impacts. Following implementation of the CNMP and with appropriate planning and scheduling of night-time dredging activities, there should be no significant adverse effects on any NSRs.

Contents

Appendices

Tables

1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Ltd has been appointed by Arch Henderson on behalf of Clydeport Operations Ltd to undertake a Construction Noise Impact Assessment (CNIA) of the proposed upgrade to Hunterston Construction Yard (HCY) into a harbour facility with a large working platform suitable for renewable industries.

This report presents the results of the construction noise assessment for the proposed development. The assessment considers the impact associated with airborne construction noise at existing sensitive receptors surrounding the site. The impacts on marine life are considered as part of the Underwater Noise Assessment presented in Technical Appendix 5.3, and Chapter5, Marine Ecology of the EIAR. The impacts on nesting birds are considered as part of the Biodiversity Assessment presented in Chapter 5 of the EIAR.

1.2 Site Description

HCY extends out into the Firth of Clyde with Hunterston Power Stations ~1km to the south, Fairlie village ~1.9km to the northeast, the island of Great Cumbrae ~1.4 km to the northwest and the redundant Hunterston Coal Terminal ~500m to the east. The Southannan and Hunterston Sands Sites of Special Scientific Interest (SSSI) bound the site to the northeast, east and southeast. The site is centred at Grid Reference NS 185 530.

1.3 Proposed Development

The proposed development incorporates construction works to facilitate the upgrading of the HCY into a harbour facility with a large working platform. The following specific construction elements will be undertaken:

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- Demolition works of existing structures including removal of the base of the former dry dock.
- Infilling of the former dry dock basin to provide additional land for general industrial purposes;
- The construction of a new quay and associated quayside infrastructure on the western edge of the site to berth vessels;
- Ground improvement works including general ground works, site platforming and levelling and piling.
- Capital dredging to -12m chart datum to enable marine vessel access to quay areas;
- Works to include removal of the existing dock entrance bund, and/or removal of existing land to facilitate the construction of appropriate berths;
- Installation of navigational aids;
- Provision of site utilities including lighting, substations, drainage, security fencing, access gates and CCTV;
- Erection of temporary site offices and staff welfare buildings to accommodate site workforce.

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1.4 Previous Noise Monitoring

HCY has been subject to alternate proposals for development in recent years. It was previously proposed that the drydock would be restored to functionality for use in decommissioning/reverse engineering operations on structures brought in by sea.

To support this application EnviroCentre Ltd carried out an operational noise assessment which included a baseline noise monitoring campaign undertaken in June 2018 (EnviroCentre Report Ref 8029, February 2019). There are a number of existing noise sensitive receptors in the surrounding area with full or partial line of sight to the development site. Through previous consultation with North Ayrshire Council (NAC) the following locations were agreed to best represent the most exposed noise sensitive receptors in the surrounding area:

- Holiday accommodation by Hunterston Castle;
- Residence at Glenside Cottage to the west;
- 25A Main Road, Fairlie; and
- Elevated residential properties around Castlepark Drive in Fairlie; and
- Residential properties on Marine Parade on Great Cumbrae (near Millport)

An additional monitoring campaign was carried out at these locations in June 2019 to address concerns that the measured background noise levels from 2018 contained interference from anthropogenic sources and did not capture any levels during the night.

The baseline data captured at these locations in 2019 is considered suitable for this assessment owing to the reductions in measured level at multiple locations and the low levels captured. The measured results and monitoring locations are discussed in further detail in Section 4.

1.5 Potential Impacts

Significant noise generating construction activities associated with the construction of the quayside and laydown area, including piling and dredging have the potential to impact existing residents in the surrounding area.

Noise generating activities during the construction phase are understood to include;

- Construction of new access road/refurbishment of existing access;
- Construction of new quay wall;
- Site earthworks and demolition;
- Dredging of area west of proposed quay;
- Infilling of the dry dock; and
- Ground improvement and compaction.

1.6 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

2 NOISE POLICY AND GUIDANCE

This section outlines policy and guidance relevant to this NIA.

2.1 National Planning Framework 4

The purpose of National Planning Framework 4[1] is to set out national planning policies which reflect Scottish Ministers priorities for the operation of the planning system and the development and use of land.

Noise is highlighted as a key aspect of a development which should be considered. Methods of attenuating noise levels are encouraged.

2.2 PAN 1/2011 Planning and Noise

Advice on the role of the planning system in helping to prevent and limit the adverse effects of noise is provided in Planning Advice Note (PAN) 1/2011 – Planning and Noise[2]. PAN 1/2011 promotes the principles of good acoustic design and a sensitive approach to the location of both noise sensitive and noise generating developments. PAN 1/2011 promotes the avoidance of significant adverse noise impacts from new development while supporting sustainable economic growth. The input of environmental health officers and professional acousticians from an early stage is recommended to avoid unreasonable effects on quality of life. PAN 1/2011 promotes the application of reasonable criteria to assess noise impact but does not suggest specific target levels, allowing for consideration of contextual and non-acoustic factors.

The associated *Technical Advice Note (TAN) 'Assessment of Noise'*[3] provides guidance on NIA methods. The recommended assessment method includes an initial identification of noise sensitive receptors and their sensitivity, a quantitative assessment, a qualitative assessment, a determination on the level of significance and recommendations for the decision process.

2.3 Assessment of Noise: Technical Advice Note

Assessment of Noise: Technical Advice Note (TAN) is supplementary guidance to PAN 1/2011 published by the Scottish Government. TAN recommends a five stage process to the assessment of noise, as detailed below

Stage 1: Initial Process

The development is categorised according to whether it has the potential to generate noise *i.e.* a Noise Generating Development (NGD) or be affected by the existing noise *i.e.* a Noise Sensitive Development (NSD). All Noise Sensitive Receptors (NSRs) that have the potential to be impacted by the proposed development are identified and prioritised according to their level of sensitivity. Residential NSRs are noted to be of high sensitivity.

[1] The Scottish Government (February 2023), *National Planning Framework 4.*
[2] The Scottish Government (2011), *PAN 1/2011 Planning and Noise*.
[3] The Scottish Government (2011), *TAN 1/2011 Technical Advice Note*.

Stage 2: Quantitative Assessment

The quantitative assessment method depends on the type of development proposed *i.e.* Noise Sensitive Development (NSD) or Noise Generating Development (NGD). Typically, the assessment will compare absolute levels (predicted or measured) with an agreed target. The magnitude of the impact is then defined by assessing the amount the predicted noise level exceeds the agreed assessment target criteria for either day or night time periods. The agreed target and magnitude of impact scales used in this assessment are presented in Section 3.

Stage 3: Qualitative Assessment

The qualitative assessment allows the magnitude of the impact established in Stage 2 to be adjusted accordingly to account for additional factors not addressed in the quantitative assessment.

Stage 4: Level of Significance

The level of significance of the noise impact at the NSR is obtained through the relationship of the receptor's sensitivity to noise and the magnitude of the noise impact. The prescribed level of significance is used to determine whether or not noise is a key decision making issue for the NSR in question.

Stage 5: The Decision Process.

Stages 2 to 4 are repeated for all identified NSRs and a Summary Table of Significance is completed which provides an overview of the level of significance of the noise impact on all NSRs. The recommendation from the environmental health officer to the planning officer should be informed by the distribution of levels of significance.

2.4 World Health Organization Guidelines for Community Noise

In *Guidelines for Community Noise*[4], 55 dB $L_{Aeq,16h}$ is indicated as a criterion threshold below which few people are seriously annoyed for an outdoor living area, during daytime and evening hours. A lower guideline value of 50 dB $L_{Aeq,16h}$ is provided as a criterion below which few people are annoyed. In addition, the guidance identifies that negative sleep impacts are avoided at 30 dB $L_{Aeq,8h}$ for continuous noise sources. It is stated that "for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10 – 15 times per night".

It should be noted that these limits are typically understood to relate to the onset of adverse impact. This is clarified in TAN: *"The WHO guideline levels have been set at the threshold of detectable effects in the population. There is no evidence that anything other than a small minority of the population exposed at the WHO guideline noise levels finds them to be particularly onerous in the context of their daily lives."*

2.5 BS5228-1:2009+A1:2014; Code of Practice for Noise and Vibration Control on Construction and Open Sites.

Methods for calculating noise and vibration produced by construction and open sites are provided in BS5228-1:2009+A1:2014[5]. Annexes C and D of Part 1 provide generic source data for different types

[4] World Health Organization (1999), *Guidelines for Community Noise*.
[5] British Standards Institution (2014), *BS 5228-1:2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise.*

of noise source, as well as methods for calculating noise from stationary and mobile plant. Specific advice on noise from sources such as piling is provided.

2.6 ISO 9613-2:1996 – Acoustics – Attenuation of Sound during Outdoor Propagation – Part 2: General Method of Calculation

ISO 9613-2:1996[6] presents a standardised methodology to calculate the propagation of outdoor sound levels based on source characteristics, environmental conditions and intervening features.

[6] International Organization for Standardization (1996), *ISO 9613-2:1996 – Acoustics – Attenuation of Sound during Outdoor Propagation – Part 2: General Method of Calculation*.

3 CONSULTATION, METHODOLOGY AND TARGET CRITERIA

3.1 Consultation

A summary of the relevant responses to the Scoping Report submitted by EnviroCentre is shown in Table 3-1.

Table 3-1: Summary of Consultation Responses

Organisation	Consultation Response	Outcome
Marine Scotland	The Scottish Ministers agree with the approach to the assessment of terrestrial noise as detailed in the Scoping Report and with the proposed inclusion of a construction noise impact assessment and the mitigation proposed. The North Ayrshire Council representation agreed that there will be a likely impact from construction noise and notes the Applicant's commitment to consult with North Ayrshire Council Environmental Health Department to agree a methodology for a noise impact assessment.	Assessment of construction noise has been included in the EIA report assuming worst case construction scenarios, source data contained within BS 5228 and baseline monitoring data captured in 2019. A CNMP has been prepared and is presented in Appendix A
North Ayrshire Council (NAC)	The construction noise impact assessment methodology was presented by EnviroCentre Ltd to NAC and approved on 12/04/2024. The assessment methodology includes use of previously monitored baseline levels for determination of receptor sensitivities and magnitudes of impact. It was requested by NAC that a Construction Noise Management Plan (CNMP) should be prepared to ensure that the best practicable means are adopted to minimise disruption to occupiers of nearby noise sensitive properties.	

3.2 Methodology

The noise assessment was undertaken to establish the impact of construction and operational activities on noise sensitive receptors surrounding the Site. The assessment involved the following stages;

- Consultation with NAC Environmental Health Department to confirm assessment methodology, noise criteria and use of previously captured baseline data;
- Review of previous survey data captured by EnviroCentre Ltd. of baseline noise environment at areas representative of the most exposed noise sensitive receptors surrounding the proposed development; the monitoring locations are discussed in Section 4 and shown in Drawing No. 176482-GIS003A Appendix A;
- Review of construction activities, locations and noise data;
- Calculation and assessment of construction noise at the most exposed sensitive receptors, following guidance provided in BS5228-1:2009+A1:2-014; Code of Practice for Noise and Vibration on Construction and Open Sites. 3D computer noise modelling using CadnaA software has been used in the calculation of construction noise at sensitive receptors; and

- Preparation of a CNMP employing best practicable means across the site.

3.3 BS5228-1:2009+A1: 2014 Construction Noise Assessment Methodology and Target Criteria – ABC Method

The assessment of construction noise is carried out in accordance with guidance provided in BS 5228-1:2009+A1:2014[5] 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise'. The standard describes methods for evaluating the potential significant effects of construction noise, one of which is the 'ABC' method which is based on exceedance of fixed noise limits. The ABC method, as detailed within Annex E.3.2 has been used within this noise assessment, as it considers the pre-existing industrial noise climate at the receptors.

The ABC method considers that a potential significant effect occurs when the total noise level at a dwelling, including construction activity, exceeds the appropriate category values shown in Table 3-2. The table is used as follows;

- The ambient noise is determined and rounded to the nearest 5dB;
- The rounded ambient noise level is then compared with the total noise level, including construction. A significant effect at a noise sensitive receptor is considered to occur when the total noise, including construction activity exceeds the appropriate category values, shown in Table 3-2.
- The ABC method of BS5228-1:2009+A1:2014 does not provide specific guidance on determining the magnitude and significance of noise impacts above the threshold values shown in Table 3-2. In order to determine the level of significance, guidance provided in the Technical Advice Note (TAN) 1/2011 has been used. The significance criteria adopted within this noise assessment are shown in Table 3-3.

Table 3-2: Threshold of Significant Effect at Dwellings

Period	Threshold Value, in decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00 to 07:00)	45	50	55
Evenings weekday (19:00-23:00), Saturdays (13:00-23:00) and Sundays (07:00-23:00)	55	60	65
Daytime weekday (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
Note 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total L_{Aeq}, T noise level for the period increases by more than 3 dB due to site noise. Note 3: Applied to residential receptors only.			
Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.			

Table 3-3: Significance Criteria for the Assessment of Construction Noise

Significance	Level Above Threshold Value dB(A)	Definition
Neutral	< 0	No effect, not significant, noise need not be considered as a determining factor in the decision making process.
Slight adverse	≤ 0 to < 3	These effects may be raised but are unlikely to be of importance in the decision making process.
Moderate adverse	≤ 3 to < 5	These effects, if adverse, while important, are not likely to be key decision making issues.
Large adverse	≤ 5 to < 10	The effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a moderate or slight significance.
Very large adverse	≥ 10	These effects represent key factors in the decision-making process. They are generally, but not exclusively, associated with impacts where mitigation is not practical or would be ineffective.

4 BASELINE MONITORING

4.1 Introduction

A daytime baseline noise survey of the area surrounding the proposed development site was carried out on June 22nd 2018, following correspondence with NAC relating to the then-contemporary HCY application wherein the noise monitoring locations and durations were agreed. A second baseline noise survey of daytime and night-time periods was carried out from June 11th – 12th 2019. The second baseline noise survey is considered to have captured more conservative results inclusive of night-time measurements and addresses potential issues of disruptive anthropogenic sources present in the 2018 data which are not representative of the typical background noise continuum. Results from the 2019 survey are presented in detail below. This data was presented to NAC during the consultation process following the outcomes of the scoping determination and approved for use in this assessment.

The 2019 survey used two meters, a Norsonic Nor140 (serial number 1403301) and a Norsonic Nor 118 (serial number 11831675) both calibrated using a Nor-1251 calibrator (serial number 30796) before and after measurements, with a maximum drift of 0.2 dB noted.

Calibration certificates for EnviroCentre's equipment are available on request. Measurements were conducted between 1.3 and 1.5m above ground using a fast time weighting.

4.2 Noise Monitoring Locations

The same noise monitoring locations were used for the 2018 and 2019 surveys. They are described in Table 4-1, and shown in Drawing No. 176482-GIS003A, Appendix A.

Table 4-1: Noise Monitoring Locations

NSR ID	Grid Reference	Location
01	219366 651633	Hunterston Castle
02	220696 652737	Glenside Cottage
03	220824 654908	Fairlie Foreshore
04	221132 655129	Castle Park Drive
05	217560 654448	Cumbrae - Marine Parade

Additional monitoring data was captured at another location on the Isle of Great Cumbrae adjacent to Glasgow Street and College Street, Millport. This data is not considered to be relevant in determining threshold exposure values or assessing impacts in accordance with BS 5228. The location is at a greater distance from the site than NSR05 (Marine Parade) and has limited line of sight by comparison, in addition to generally higher background levels cause by increased traffic and local sources. Any impacts present at NSR05 shall be greater than those further inland, therefore assessment and potential mitigation is focused on NSR05.

4.3 Meteorological Conditions and Observations

The weather conditions and observations noted during the monitoring periods of the 2019 daytime and night-time surveys are summarised in Table 4-2Table 4-3Table 4-4. Daytime weather conditions on Cumbrae from 2019 were noted to be calmer than those observed in 2018 and in line with appropriate parameters for determining thresholds in accordance with BS 5228.

Table 4-2: Baseline Noise Monitoring Weather Conditions

Date	Monitoring Period	Meteorological Conditions
11/06/19	Daytime	Overcast skies, 7 oktas throughout the afternoon monitoring. Some light breezes from the northeast with gusts up to 4 m/s. Temperature approximately 14°C.
11/06 to 12/06/19	Night-time	Overcast skies, 6 - 7 oktas throughout the night-time monitoring. Minimal wind from the northeast, approximately 1 - 2 m/s at all locations. Temperature ranging approximately 11 - 13°C between locations.

Table 4-3: Baseline Monitoring Results and Observations – Daytime

NSR ID	Notes	Start-time	Duration (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{Amax} (dB)
01	Distant road traffic, 3 car movements on local roads within castle grounds, light wind in trees, birdsong.	15:32:38	01:00:00	45.4	38.6	60.9
02	Road traffic on Fairlie Moor Road, distant road traffic, light wind in vegetation, birdsong.	14:12:19	01:00:00	47.0	38.7	67.2
03	Light wind in trees, distant road traffic, birdsong.	12:42:28	01:00:00	43.8	36.8	74.2
04	Position chosen to screen construction noise from near school. Otherwise birds, distant traffic. Skip lorry, helicopter and airplane also audible at times.	12:17:13	01:00:00	45.4	40.6	65.8
05	Reversing alarms and industrial activities from the pier audible (intermittent). Occasional passing traffic (position chosen to reduce this dominating). Birdsong, faint wave noise, high planes and a speedboat.	14:38:43	01:00:00	41.2	29.1	64.0

Table 4-4: Baseline Monitoring Results and Observations – Night-time

NSR ID	Notes	Start-time	Duration (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{Amax} (dB)
01	Infrequent distant road traffic, light wind in trees.	01:34:22	00:15:00	26.0	23.2	40.1
		01:49:22	00:15:00	29.0	24.3	51.6
02		00:51:33	00:15:00	31.4	28.8	46.1

NSR ID	Notes	Start-time	Duration (hh:mm:ss)	$L_{Aeq,T}$ (dB)	$L_{A90,T}$ (dB)	L_{Amax} (dB)
	Water in stream, infrequent distant road traffic, light wind in trees.	01:06:33	00:15:00	31.4	28.7	47.5
03	Waves on shore, distant road traffic, light wind in trees	00:02:04	00:15:00	36.4	33.8	45.1
		00:17:04	00:15:00	35.6	33.0	50.9
04	Distant road traffic, light wind in vegetation	23:15:11	00:15:00	35.0	28.7	55.3
		23:30:11	00:15:00	30.8	27.1	46.2
05	More wave noise than earlier in day, position closer to road to compensate. No passing traffic. Occasional distant traffic from mainland.	23:31:36	00:15:00	32.2	29.6	50.7
		23:46:39	00:15:00	30.7	28.2	46.8

For all measurement locations, the daytime results are similar or quieter than those captured at the same locations in 2018. Using the ABC method presented within BS5228-1:2009+A1:2014 and detailed in Section 3.3, these measurements result in all of the assessed NSRs being subject to Category A thresholds for impact, the most stringent for each of the periods considered. The baseline monitoring results are therefore considered representative and appropriate for assessment of construction noise impacts.

5 CONSTRUCTION NOISE MODELLING AND ASSESSMENT

5.1 Noise Sensitive Receptors

The NSRs considered in this assessment are the same as the noise monitoring locations described in Section and detailed in Table The noise measurement locations are shown in Drawing No.176482-GIS003A, Appendix A.

Receptors have been modelled at 1.5m height at one-story properties, and 4m height at two-storeys.

5.2 Construction Noise Model Input Parameters

5.2.1 Construction Schedule

Details of the proposed construction schedule at the Site have been supplied by Arch Henderson. With consideration of worst-case concurrent operations, the proposed works are considered to comprise two key phases. The initial works to provide access and prepare the site for construction shall be followed by a primary construction phase during which there will be overlap of the majority of noise generating activities A summary of the proposed construction schedule is shown in Table 5-1.

Table 5-1: HCY, Proposed Construction Schedule

Phase	Description
Access Road Construction and Site Clearance (ARC)	Access road upgrade and infrastructure installed to main site.
	Erection of temporary site offices and staff welfare buildings to accommodate site workforce.
Infill and Compaction of Drydock, Construction of Quaywall (CON)	Infilling of dry dock using suitable material which is assumed to mainly comprise dredge arisings,
	Creation of berthing by formation of a quay constructed of steel tubular piles with interlocking sheet piles with a further inner tied sheet pile anchor wall
	Ground improvement works including piling at eastern site boundary.
	Excavation of current landform and dock wall base to remove from in front of the new quay wall.
	Dredging adjacent to Quay Wall to provide -12m Chart Datum (CD) water depth.

The anticipated timetable for works is expected to be:

- ARC – Commencing second half of 2024 assuming planning and marine licences can be obtained.
- CON – Proposed to be carried out between second half of 2024 and first half of 2026.

Construction timelines are currently estimated based on similar schemes undertaken in recent years. Timelines also assume no restrictions on vessels, plant, manpower or equipment.

5.2.2 Infill of the Dry Dock

Prior to infilling of the dry dock demolition works will be undertaken to remove the existing dry dock base and any other associated infrastructure. Removal of the concrete dry dock base shall progress using heavy tracked plant to excavate and rip material.

It is anticipated circa 1.3million m^3 of suitable fill material will be required to infill the dry dock, including surcharge material. This is proposed to be primarily achieved through the reuse of the dredge arisings from around the existing dock berth and the offshore dredge area. Should the proposed dredge not provide a sufficient volume of material to complete the infill, suitable material would be sourced from dredging operations in the area, with one possible source identified as routine maintenance dredging activities of the Clyde. Additional infill material may be brought to site by road or by barge. The modelled scenario includes provision for multiple earth moving vehicles including 18T dozers, dump trucks, high capacity excavators and drilling rigs.

This area will require implementation of ground improvement techniques to accommodate operational loads for future land use. Tubular piles shall be installed vertically, employing a mixture of vibro and impact techniques into deep strata. Sheet piles will be installed vertically between the steel tubular piles. Sheet piles are expected to be driven to shallower depths than the tubular piles. Anchor piles shall then constructed behind the tubular piles, with either horizontal or inclined tie rods which connect tubular and anchor piles. In addition to both vibro and impact piling, the assessment includes roller compaction and surfacing operations facilitated by batching plant, with all operating simultaneously to create a worst case scenario.

Additional piling and ground improvement works are also proposed along the eastern site boundary where the access road runs parallel to Southannan Sands and included within the primary construction scenario. This is required as part of the platforming of the site.

Other than the mobilisation of heavy vehicles and plant, the site is to be self-contained during construction. Arch Henderson have indicated that as many 8 dump trucks and 10 excavators may be required to service this.

5.2.3 Quay Wall

The proposed structure for the quay wall will take the form of a tied cofferdam wall consisting of a combined wall to the front and rear, made up of large diameter steel tubular piles with steel sheet piles between. The piling operations are similar to those proposed for the ground improvement techniques proposed for the primary site, though with increases to pile concentration, dimension and depth.

The front wall will be connected to the rear wall using steel tie rods. The tubular piles that will form the cofferdam wall will be approximately 35m long, driven to refusal / into rock in order to create sufficient deep water berthing options to support future operations – subject to final design load requirements. Additional tubular piles may be installed within the structure in order to allow increased loads in specific areas.

At the time of writing the final configuration of the Quay wall has not been determined. For the purposes of this assessment a 570m Quay Wall has been assumed to create a worst-case modelled scenario in terms of noise source locations and quantities.

Additional piling has also been modelled from rigs set on a jack up/hopper barge moored to dolphin platforms offset from the Quay Wall (it is noted that these may not be ultimately included as part of the development), along with tug boats and service vessels. Movement and tipping of dump trucks is also included within the modelled scenario for Quay works.

5.2.4 Dredging

A dredging campaign will be carried out during the construction phase to create the deepwater berthing area at the quayside, with additional dredging carried out offshore to claim fill material for the dry dock area. Dredging has the potential to be carried out over a 24 hour period. The dredge area is shown on Drawing HMY-AHN-01-00-DR-C-0003 P02 WIP.

It has been assumed the dredging will be carried out using trailer suction hopper dredger to remove soft dredge and backhoe for ripping harder material. Backhoe dredging generates higher airborne noise levels than the trailer suction hopper dredger method, therefore this CNIA assumes use of the backhoe method employed at the western extent of the dredge area as a worst-case scenario for propagation to the closest NSR at Marine Parade, Cumbrae. Where trailer suction hopper methods are employed the levels shall be less than those presented in this report.

5.2.5 Modelled Scenarios

The scenarios have been set up to model the worst-case combination of construction activities for the construction phases.

A summary of the combined construction activities and relevant assessment periods for each of the modelled scenarios is shown in Table 5-2. A full breakdown of the individual items of plant and activities for each set of construction activities and scenarios are shown in Appendix C. It should be noted that while the modelling has predicted all operations to be concurrent, this is a conservative assumption, and some activities will in fact be contiguous.

Table 5-2: Modelled Scenarios; Construction Noise

Modelled Scenario	Modelled Combination of Construction Stages (Worst Case)	Relevant Assessment Periods
ARC	Excavation and drilling	Day, Weekend
	HGV movement of material and tipping	
	Rolling/compaction	
	Surfacing	
CON	Excavation and drilling, HGV movement of material and tipping	Day, Evening, Night, Weekend
	Drainage, infill and rolling/compaction	
	Piling of Quay Wall (inc operations from dolphins), former dry dock area and eastern boundary with Southannan Sands	
	Install sheet pile wall	
	Tie rod / anchor walls	
	Surfacing	
	Dredging	

5.2.6 Evening and Night-time Construction Noise

With reference to the assessment periods included in Table 5-2 only the dredging are works scheduled to be carried out over a 24-hour period. All other activities are expected to have finished by 7 pm on a daily basis, therefore impacts are only considered for Daytime and Weekend for operations other than dredging.

5.2.7 Weekend Construction Noise

The proposed construction schedule includes working during daytime hours during the week days and the weekends. The implication of this is that works associated with higher noise levels are likely to be continued during weekend hours (Saturday 07:00 – 19:00 and Sunday 08:00 – 13:00), which are subject to more stringent noise limits than during the weekdays (refer to Table 3-2).

5.2.8 Construction Noise Model Data

3D computer noise modelling of the stages of construction activity at the site has been carried out using CadnaA software. Details on worst case construction activities, operating times, and associated items of noise generating plant for each stage of construction used within the noise models have been supplied by Arch Henderson.

Calculations were carried out using noise data and guidance provided in BS5228-1:2009+A1:2014, to derive predicted noise levels at noise sensitive receptors. Where data was not available within BS5228 it has been sourced from the Environmental Protection Department of Hong Kong's Technical Memorandum on Noise from Construction Work[7]. Noise data for backhoe dredging and impact wrenches was taken from published online sources[8],[9].

Full details of the items of modelled construction plant, noise data (including data source), operating times, durations and source heights for each of the considered scenarios is shown in Appendix C.

5.2.9 Construction Noise Model Assumptions

A number of assumptions have been established during the CadnaA modelling exercise, as detailed below:

- Topographic data for the surrounding area has been sourced from open-source LiDAR data[10];
- For the completed quay/quayside and reclaimed drydock the ground height has been set per site sections provided by Arch Henderson, with height ranging from 6.0m Above Chart Datum (ACD) along the quay at the western site extent to approximately 9.5m ACD at the eastern extent of the site where the site access road runs;
- The heights of buildings surrounding the site have been estimated from photographs and Google Earth satellite/street view imagery;
- Predicted noise levels are calculated in the free-field environment;
- Ground absorption has been set to 1 for areas of soft ground. Areas of hard ground and water have been set to 0 for reflective surfaces;
- Weekend daytime noise levels generated by construction activities have been assumed to be the same as those generated during weekday hours representing a worst case scenario;
- The noise model assumes locations of plant based on descriptions of construction activities provided by Arch Henderson;
- Worst case scenario combination of construction activities likely to occur in any one day during the considered assessment periods have been assumed;

[7] Environmental Protection Department of Hong Kong; *Technical Memorandum on Noise from Construction Work other than Percussive Piling,* 1989.
[8] Waterman. *Aberdeen Harbour Expansion Project, Environmental Statement, Volume 3, Appendix 20C.* Nov 2015.
[9] Markesino et al, *Study of Noise Transmission from an Electric Impact Wrench*, Noise-Con 2004, Baltimore
[10] NT15SE 50cm DTM Phase 6 from https://remotesensingdata.gov.scot

- Offshore piling platforms have been assumed to have a height of 1m above sea level. The height of equipment located on barges (e.g. piling rigs) has been assumed as relative to the height of the barge.
- The following sources have been modelled as line sources within CadnaA;
    - Heavy goods vehicles (HGVs) and dump trucks;
    - Moving construction plant;
- All remaining sources (not outlined above) have been modelled within CadnaA as point sources.

5.2.10 ABC Category Thresholds

The appropriate ABC category thresholds above which there is considered to be a noise impact from construction noise have been calculated following guidance provided in BS5228-1:2009+A1:2014 (refer to Section 3.3). Details of the calculations are shown in Appendix B.

5.3 Construction Noise Model Results and Assessment

The noise model results for each modelled scenario of construction activity, along with the BS5228 assessment at each of the considered noise sensitive receptors are summarised in Table 5-3 to Table 5-7.

Table 5-3: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 1 Hunterston Castle

NSR 01	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
ARC	65	48	Neutral	55	48	Neutral	N/A	N/A	N/A	N/A	N/A	N/A
CON	65	49	Neutral	55	48	Neutral	55	48	Neutral	45	26	Neutral

Table 5-4: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 2 Glenside Cottage

NSR 02	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
ARC	65	49	Neutral	55	48	Neutral	N/A	N/A	N/A	N/A	N/A	N/A
CON	65	51	Neutral	55	49	Neutral	55	49	Neutral	45	31	Neutral

Table 5-5: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 3 25A Main Road Fairlie

NSR 03	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
ARC	65	47	Neutral	55	44	Neutral	N/A	N/A	N/A	N/A	N/A	N/A
CON	65	47	Neutral	55	44	Neutral	55	44	Neutral	45	31	Neutral

Table 5-6: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 4 Castle Park Drive

NSR 04	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
ARC	65	44	Neutral	55	41	Neutral	N/A	N/A	N/A	N/A	N/A	N/A
CON	65	44	Neutral	55	41	Neutral	55	41	Neutral	45	36	Neutral

Table 5-7: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 5 Marine Parade

NSR 05	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
ARC	65	44	Neutral	55	42	Neutral	N/A	N/A	N/A	N/A	N/A	N/A
CON	65	53	Neutral	55	53	Neutral	55	53	Neutral	45	48	Moderate Adverse

The outcome of the BS5228 assessment is that Neutral impacts are predicted at the surrounding residential receptors as a result of all construction phases during the daytime and evening periods for weekdays and weekends.

During the night-time period NSR05 is predicted to be subject to an excess above threshold level of 3dB, with a Moderate Adverse Significance of Impact. The predicted impact is owing to dredging which has been assumed to be occurring at the closest possible point to this receptor using the backhoe method which generates significantly more noise than the cutter suction method. Employing cutter suction dredging at this location results in a neutral Significance of Impact.

In accordance with the guidance provided in the Technical Advice Note (TAN) 1/2011 and the adopted significance criteria shown in Table 3-3, “These effects, if adverse, while important, are not likely to be key decision making issues.”

6 MITIGATION

In order to reduce the significance of impact at NSR05 during the night-time period, it is recommended that dredging is scheduled such that backhoe dredging is not undertaken during the night in close proximity to the isle of Great Cumbrae. Mitigation of dredging noise at source is not considered practicable. There are no impacts associated with backhoe dredging during daytime hours.

In the modelled scenario, the backhoe dredger is modelled as a point source at the north western extent of the proposed dredge area at coordinates 218090 653552, at a distance of approximately 1040m from NSR05 and 500m from the Quay Wall. Reducing the distance between backhoe dredging operations and the Quay wall will therefore reduce the significance of impact at NSR05 in the event that night-time use of backhoe dredging is required. The Significance of Impact due to backhoe dredging at night is predicted to be reduced at the following distances from the Quay Wall:

- 350 metres: Slight Adverse - These effects may be raised but are unlikely to be of importance in the decision-making process.
- 125 metres: Neutral - No effect, not significant, noise need not be considered as a determining factor in the decision-making process.

Employing trailing suction hopper dredging at the northwestern extent of the dredge area is also noted to result in a neutral Significance of Impact during both daytime and night-time.

In accordance with the scoping determination issued by NAC, a CNMP has also been prepared to minimise any potential significant impacts associated with construction noise. This is presented in full in Appendix D.

7 CONCLUSIONS

A construction Noise Impact Assessment (NIA) has been carried out for the proposed upgrade to Hunterston Construction Yard (HCY) into a harbour facility with a large working platform suitable for renewable industries. The NIA has been undertaken in accordance with Planning Advice Note (PAN) 1/2011 on Planning and Noise, and the corresponding Technical Advice Note (TAN) 1/2011 on Assessment of Noise.

Changes to noise levels have been predicted for a number of noise sensitive receptors (NSRs) under the worst case combined construction activity scenarios using Computer Aided Noise Abatement (CadnaA) modelling software.

While day-time noise levels have been predicted for most construction activity scenarios, there is the potential for dredging activity to be carried out over a 24-hour period, therefore, evening and night-time noise levels have been predicted for this scenario.

The NIA predicted neutral impacts for all construction activity scenarios at all NSRs during the day-time and evening. In accordance with TAN 1/2011, neutral impacts are not significant, and noise need not be considered as a determining factor in the decision-making process.

The NIA also predicted a moderate adverse effect for dredging activity using a backhoe dredger at one NSR during the night-time. In accordance with TAN 1/2011, moderate impacts, if adverse, while important, are not likely to be key decision-making issues.

This impact may be mitigated by means of an adjusted dredging schedule whereby backhoe dredging is prioritised during day-time, and only carried out during night-time in close proximity to the HCY site and, therefore, at the furthest distance from the NSR. It should be noted that the NIA predicts a neutral impact for dredging activity using alterative dredging plant (i.e., a trailing suction hopper dredger) during both the daytime and night-time.

In accordance with the scoping determination from North Ayrshire Council (NAC), a Construction Noise Management Plan has been prepared for the site. This includes details of noise control measures and best practices which shall be effective in minimising any potential construction noise impacts. Following implementation of the CNMP and with appropriate planning and scheduling of night-time dredging activities, there should be no significant adverse effects on any NSRs.

NOISE DEFINITIONS

The following definitions relating to noise are used in this report:-

Ambient Sound Level: As defined in BS4142:2014; equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, at the assessment location. The ambient sound level includes the contribution from the residual sound level and the specific sound level. Measured with $L_{Aeq,T}$.

Background Sound Level: The background sound level represents baseline conditions, filtering out intermittent noises, and can be thought of as a baseline over which a continuous noise would be heard. Defined in BS 4142 as the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of any given time interval, T, $L_{A90,T}$.

Free-field: Sound can propagate from a source to a receiver through a direct path as well as reflected paths. The free-field represents a scenario where there are no contributions from reflections. In environmental assessments this largely refers to the scenario where the contribution from reflections is negligible.

Façade Effect: When sound is reflected back towards its source, off a surface, such a wall, the reflected and incident sound waves sum. One metre from the façade of a building this typically results in an increase in level, compared to that of the free-field, by approximately 3 dB, referred to as the façade effect.

$L_{Aeq,T}$: Equivalent continuous A-weighted sound pressure level. This is the single number that represents the average sound energy over a given time period, T. It is the sound level of a notionally steady sound that has the same energy as a sound that fluctuates over the specified measurement period.

$L_{A10,T}$: The noise level exceeded for 10% of the measurement period, T.

$L_{A10,18h}$: The average noise level exceeded for 10% of the time in each of the eighteen one hour periods between 06:00 to 24:00 hours. This takes into account the fluctuation in traffic volumes over time to provide a single figure for assessment purposes and is typically used in road traffic assessments.

$L_{A90,T}$: The noise level exceeded for 90% of the measurement period.

L_{Amax}: The maximum A-weighted sound pressure level over the specified period.

Octave: A range of frequencies whose upper frequency limit is twice that of its lower frequency limit.

Octave Band: Sound pressure level is often measured in octave bands, the centre frequencies of the bands are defined by ISO – 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, 16kHz to divide the audio spectrum into 10 equal parts. The sound pressure level of sound that has been passed through an octave band pass filter is termed the octave band sound pressure level. Additionally, sound is often represented by one-third octave bands, which divides each octave band into three.

Rating Level: The specific sound level with the addition of any character correction penalties.

Residual Sound Level: The continuous A-weighted sound pressure level at a given location in the absence of the specific sound level. This, unlike the background sound level, includes the contribution from fluctuating sounds.

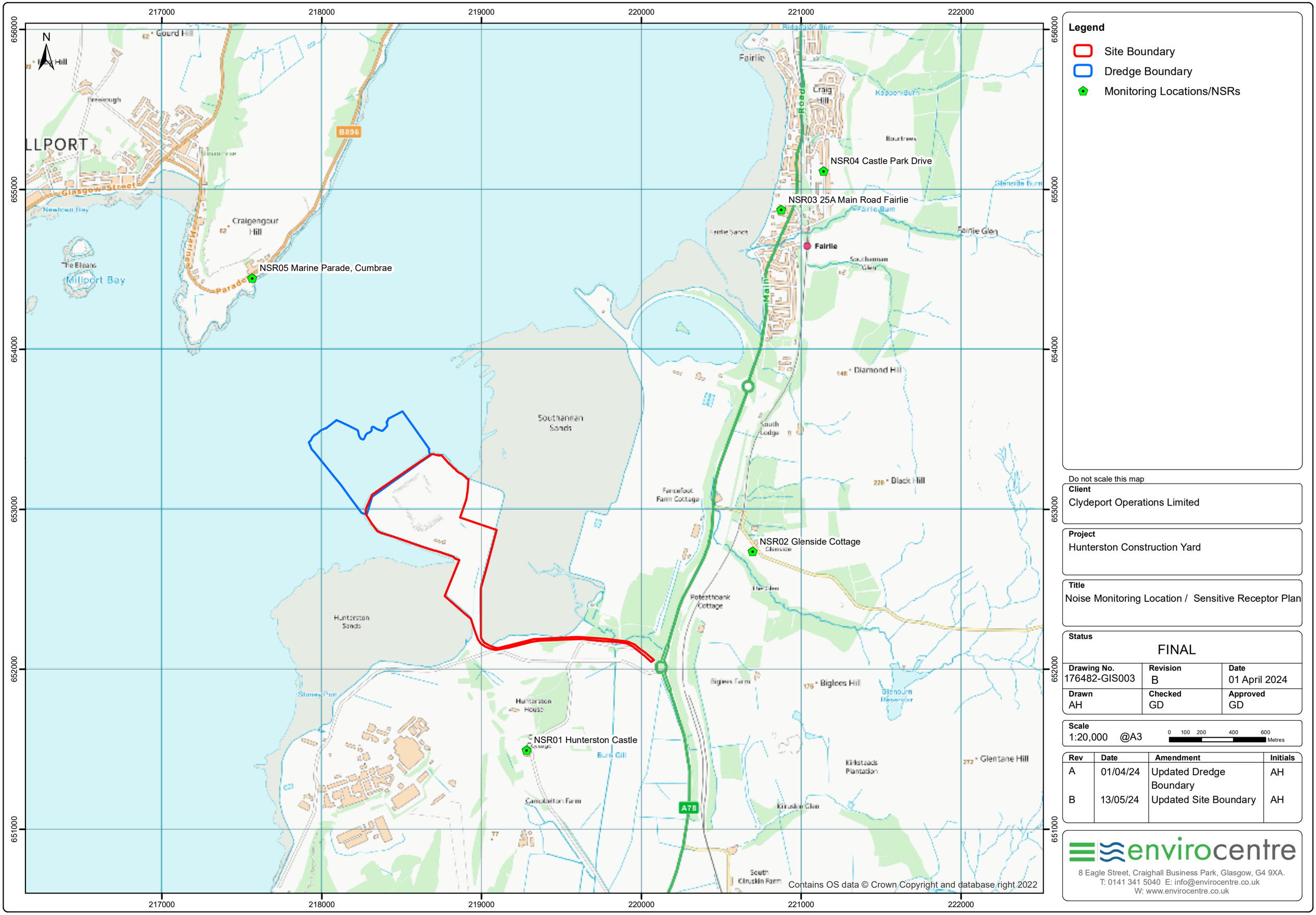
Specific Sound Level: The continuous A-weighted sound pressure level at a given location of the isolated industrial noise source.

Character Penalty: A penalty applied to a specific sound source to account for inherent character of a source as perceived at the position of the noise sensitive receptor. For example a tonal penalty can be derived subjectively (2 dB for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible). The tonal penalty can be derived objectively through two procedures. The first is to assess the one-third octave band spectrum, where if certain criteria are met a 6 dB penalty is applicable. If a tone is not identified using the one-third octave band spectrum the penalty should be derived using the reference method, a more in depth narrow-band method based on a psychoacoustic model for tonal audibility.

Weighting: Human hearing is most sensitive to frequencies between about 500Hz and 6kHz and less sensitive to frequencies above and below these. In order to measure noise levels representative of human hearing a filter is applied termed a Frequency Weighting which is a prescribed frequency filter provided in a sound level meter. An A-weighted sound pressure level in decibels (denoted as dB(A)) is designed to reflect the sharpness of the human ear, which does not respond equally to all frequencies

APPENDICES

A DRAWINGS



Legend

- Site Boundary
- Dredge Boundary
- Monitoring Locations/NSRs

Do not scale this map

Client
Clydeport Operations Limited

Project
Hunterston Construction Yard

Title
Noise Monitoring Location / Sensitive Receptor Plan

Status
FINAL

Drawing No.	Revision	Date
176482-GIS003	B	01 April 2024
Drawn	**Checked**	**Approved**
AH	GD	GD

Scale
1:20,000 @A3
0 100 200 400 600 Metres

Rev	Date	Amendment	Initials
A	01/04/24	Updated Dredge Boundary	AH
B	13/05/24	Updated Site Boundary	AH

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B ABC CATEGORY THRESHOLDS

The appropriate ABC category thresholds for each of the noise sensitive receptors has been calculated following guidance provided in Annex E of the standard (refer to Section 3.3 for assessment criteria).

Calculations for each of the noise sensitive receptors, based on measured day and night-time ambient noise levels in the absence of construction noise is shown in Tables B-1 to B-5. Evening and Weekend ambient noise levels have been assumed to be Category A to ensure a conservative assessment.

Table B-1: ABC Category Thresholds, NSR 1 Hunterston Castle

NSR 01	Measured Daytime dB(A)	Measured Night-time dB(A)	Weekend dB(A)	Evening dB(A)
Ambient Levels	45.4	26.0	42.4	42.4
Ambient Levels Rounded	45	25	40	40
BS5228 ABC Category	A	A	A	A
Threshold Value	65	45	55	55

Table B-2: ABC Category Thresholds, NSR 2 Glenside Cottage

NSR 02	Measured Daytime dB(A)	Measured Night-time dB(A)	Weekend dB(A)	Evening dB(A)
Ambient Levels	47.0	31.4	44.1	44.1
Ambient Levels Rounded	45	30	45	45
BS5228 ABC Category	A	A	A	A
Threshold Value	65	45	55	55

Table B-3: ABC Category Thresholds, NSR 3 25A Main Road Fairlie

NSR 02	Measured Daytime dB(A)	Measured Night-time dB(A)	Weekend dB(A)	Evening dB(A)
Ambient Levels	43.8	35.6	41.4	41.4
Ambient Levels Rounded	45	35	40	40
BS5228 ABC Category	A	A	A	A
Threshold Value	65	45	55	55

Table B-4: ABC Category Thresholds, NSR 4 Castle Park Drive

NSR 02	Measured Daytime dB(A)	Measured Night-time dB(A)	Weekend dB(A)	Evening dB(A)
Ambient Levels	45.4	30.8	42.5	42.5
Ambient Levels Rounded	45	30	45	45
BS5228 ABC Category	A	A	A	A
Threshold Value	65	45	55	55

Table B-5: ABC Category Thresholds, NSR 5 Marine Parade, Great Cumbrae

NSR 02	Measured Daytime dB(A)	Measured Night-time dB(A)	Weekend dB(A)	Evening dB(A)
Ambient Levels	41.2	30.7	38.6	38.6
Ambient Levels Rounded	40	30	40	40
BS5228 ABC Category	**A**	**A**	**A**	**A**
Threshold Value	65	45	55	55

C CONSTRUCTION NOISE MODEL DATA

Construction Activities	Modelling Scenarios	Individual Plant / Activities	No. of Units	Lp at 10m dB(A)	Data Source	Source Height (m)	Operating Times	% On-time of Operating Hours	Operating Periods			
									D	W	E	N
Access Road Construction	ARC	Dump truck movements	2 p/h	90	BS5228 C.9 ref 21	0.5	07:00 – 19:00	80	X	X		
		Dump truck tipping fill	2 p/h	80	BS5228 C.1 ref 11	0.5		25	X	X		
		Tracked Hydraulic Drilling Rig	4	86	BS5228 C.6 ref 35	1		80	X	X		
		40T Excavators	4	79	BS 5228 C.2 ref 14	1		80	X	X		
		16T Twin Drum Rollers	2	73	BS 5228 C.2 ref 38	0.5		80	X	X		
HGV Deliveries	ARC CON	HGV delivery full	2 p/h	80	BS5228 C.6 Ref 21	0.5	07:00 – 19:00	7 p/h	X	X		
		HGV delivery empty	2 p/h	83	BS5228 C.6 Ref 22	0.5		7 p/h	X	X		
		Dump truck tipping fill	2 p/h	80	BS5228 C.1 Ref 11	0.5		7 p/h	X	X		
Infill and Compaction	CON	D6 Dozers - 18T	8	81	BS 5228 C.2 ref 12	1	07:00 – 19:00	80	X	X		
		Dump truck movements	8	90	BS5228 C.9 ref 21	0.5		80	X	X		
		Dump truck tipping fill	8	80	BS5228 C.1 ref 11	0.5		25	X	X		
		Tracked Hydraulic Drilling Rig	4	86	BS5228 C.6 Ref35	1		80	X	X		
		40T Excavators	10	79	BS 5228 C.2 ref 14	1		80	X	X		
		16T Twin Drum Rollers	2	73	BS 5228 C.2 ref 38	0.5		80	X	X		
		26T High Energy Impact Compaction Roller	1	80	BS5228 C.5 ref 19	0.5		80	X	X		
		9T Rapid Impact Compaction (compactor rammer)	1	91	BS5228 D.3 ref 121	0.5		80	X	X		
		Diesel water pump	1	91	BS5228 D.11 ref 1	0.5		80	X	X		
Surfacing	ARC CON	Asphalt spreader	1	82	BS5228 D.8 Ref 22	0.5	07:00 – 19:00	80	X	X		
		Batching Plant	1	78	BS5228 D.6 Ref 10	1		100	X	X		
		Truck mixer	1	81	BS5228 D.5 Ref 15	1		80	X	X		
		Lorry mounted Concrete pump	1	81	BS5228 D.5 Ref 16	1		80	X	X		
Dolphin Operations and Quay Works	CON	40T Excavators on vessels	2	79	BS 5228 C.2 ref 14	1	07:00 – 19:00	80	X	X		
		Jack up barge	1	76	CNP 061	1		100	X	X		
		Tug boat/Mooring vessels	2	82	CNP 221	1		80	X	X		
		Dump truck movements	1	90	BS5228 C.9 ref 21	0.5		80	X	X		
		Dump truck tipping	1	80	BS5228 C1 Ref. 11	1		25	X	X		
		Tracked crusher	1	82	BS 5228 C.1 Ref 14	1		80	X	X		
Install Sheet Pile Wall	CON	100t crawler crane	3 west, 1 east	67	BS5228 C.3 Ref 28	1	07:00 – 19:00	80	X	X		
		Large capacity vibrating hammer	6 west, 2 east	88	BS5228 D.4 Ref 43	0.5		80	X	X		

Construction Activities	Modelling Scenarios	Individual Plant / Activities	No. of Units	Lp at 10m dB(A)	Data Source	Source Height (m)	Operating Times	% On-time of Operating Hours	Operating Periods			
									D	W	E	N
		Vibrating hammer generator	6 west, 2 east	74	BS5228 C.4 Ref 84	0.5		80	X	X		
Tie Rod, Anchor Walls	CON	Hydraulic hammer rig	2 west, 1 east	89	BS 5228 C.3 Ref 01	1	07:00 – 19:00	80	X	X		
		Impact wrenches	4 west, 2 east	70	Markesino et al. Study of noise transmission from impact wrench.	1		80	X	X		
		Hammer	4 west, 2 east	79	BS5228 D.7 Ref 80	0.5		20	X	X		
Dredging	CON	Backhoe dredge	1	88	Aberdeen Harbour Expansion Project, Vol 3, Appendix 20C. Waterman, Nov 2015.	1	24 hours	100	X	X	X	X
		Vessel engine (for consideration of Trailer Suction Hopper)	1	72	Internoise 2010, Noise From Moored Ships, Rob Witte	0.1		100	X	X	X	X
		Hopper barge	1	76	CNP 061	1		100	X	X	X	X

D CONSTRUCTION NOISE MANAGEMENT PLAN

The Construction Noise Assessment of Hunterston Construction Yard includes use of baseline noise survey data, and modelled construction scenarios to calculate potential impacts at noise sensitive receptors in the proximity of the development site. No potential significant impacts associated with construction have been predicted, however there are potential impacts associated with dredging operations.

North Ayrshire Council has requested that a Construction Noise Management Plan should be prepared to ensure that the best practicable means are adopted to minimise disruption to occupiers of nearby noise sensitive properties

Presented below is a summary of comment and best-practice with respect to construction phase noise. For example, the project will follow the working hours as stipulated in the planning conditions from North Ayrshire Council.

General Principals

Noise is ‘unwanted sound’ and noise and vibration emissions can negatively impact on local residents that may give rise to noise pollution, nuisance and result complaints. Examples of noisy and vibrating activities include: foundation excavations activity, piling, water pumping, diesel generators and concrete pours.

This section defines the measures to control and limit noise emissions and vibration levels for potential sensitive receptors in the vicinity of the proposed substation and construction compound. Best practicable means of noise control will be applied during construction works to minimise Noise (including vibration) toward these neighbouring properties and other sensitive receptors such as wildlife. The general principles of noise management are given below:

Control at Source:

- Equipment - Noise emissions limits for equipment used at site.
- Equipment – Method of directly controlling noise e.g. by retrofitting controls to plant and machinery.
- Equipment – Indirect method of controlling noise e.g. acoustic screens.
- Equipment - Indirect method of controlling noise e.g. benefits and particularly use of alternative construction methodology to achieve objective such as vibratory piling techniques as opposed to more controversial but noisier techniques; selection of quieter tools/machines; application of quieter processes.

Control across site by:

- Administrative and legislative control;
- Control of working hours;
- Control of delivery areas and times;
- Careful choice of compound location;
- Control of noise via contract specification of limits;
- Noise monitoring, to check compliance with noise level limits, cessation of works until alternative method is found; and

- Many of the alternate activities which generate noise can be mitigated to some degree by careful operation of machinery and use of tools. This may best be addressed by toolbox talks and onsite inductions.

Noise and Vibration Control Measures

In addition to any specific requirements of North Ayrshire Council, the following measures will be adopted.

The recommendations set out in BS5228:20014 shall be complied and in particular with the following requirements:

- All plant will be operated with covers closed on silencers on equipment fitted where available;
- Plant not in use will be switched off;
- Vehicles not in use will be switched off. BB operate a no idling policy;
- Shouting and the use of radios when entering to and from site and when working on site will be minimised;
- All plant and equipment will be fully maintained. All machinery will be well maintained to remove noise often associated with wear and tear/indicative of mechanical failure;
- Where practicable, materials will be handed in a manner that reduces noise and vibration to an acceptable level;
- Static plant will be shielded or provided with screens or enclosures where practicable;
- Where possible, working hours will be planned to minimise impact on local residents;
- Daytime working hours should be adhered to - where evening or night time working hours are expected, consultation with local authority and local community will be carried out.
- Site speed limits will be adhered to;
- For site personnel, exclusion zones and exposure limits will be set and monitored around the noisiest activities to ensure no adverse occupational health impacts occur; and
- Generators for temporary lighting to be operated only when required. The position of temporary lighting, will be positioned downwards on the working areas that will avoid light spillage out with the work area.

Notifications

Occupiers of surrounding properties will be informed a minimum of two weeks in advance of any high level of disturbance works taking place, Including the details of the duration on the likely noise and vibration effects.

In the case of work required in response to an emergency, any local residents will be advised as soon as reasonably practicable the emergency works are taking place. Potentially affected residents will also be notified of the helpline number for BB.

Noise and Vibration Monitoring

It is not proposed that ongoing monitoring of the construction operation is undertaken during the programme of works. However, an ongoing complaint handling and recording register will be put in place to document all complaints. The construction works and construction noise levels at nearby receptors will be checked if complaints are recurring.

Construction Traffic

The following measures will be incorporated into the scheme to reduce noise related impacts from construction traffic:

- Vehicles will not wait or queue up with engines running on the site or the public roads accessing the site;
- Vehicles will be properly maintained to comply with noise emission standards; and
- Design and routine of access routes will limit vehicle noise in the need to perform reversing manoeuvres.

In the event of work being required out with normal working hours, e.g. abnormal load deliveries, commissioning works or emergency mitigation works, North Ayrshire Council will be notified prior to these works taking place.

Operational Hours

Operational hours during the construction period are as follows in accordance with guidance from North Ayrshire Council. Any changes must be consulted and agreed in advance with North Ayrshire Council.

Working Hours	Time	Days	Comment
Summer (March to October)	07:00 – 19:00	Monday to Sunday	*All deliveries to site to meet these timescales*
Winter (November to February)	07:30 – 17:00 as daylight allows	Monday to Sunday	