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MONA OFFSHORE WIND PROJECT

Outline Construction Noise and Vibration Management Plan

~~F03~~ F04 (Tracked)

Deadline: ~~4~~5

Application Reference: EN010137

~~**Document Reference: J26.3 F03**~~

Document Reference: J26.3 F04

Document Number: MOCNS-J3303-RPS-10164

3 December ~~4 November~~ 2024

~~F03~~F04

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
F01	Application	RPS	Mona Offshore Wind Ltd	Mona Offshore Wind Ltd	Feb 2024
F02	Submission at D2	RPS	Mona Offshore Wind Ltd	Mona Offshore Wind Ltd	Aug 2024
F03	Submission at D4	RPS	Mona Offshore Wind Ltd	Mona Offshore Wind Ltd	4 Nov 2024
F04	Submission at D5	RPS	Mona Offshore Wind Ltd	Mona Offshore Wind Ltd	3 Dec 2024

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Glossary

Term	Meaning
A-weighting	A frequency weighting devised to attempt to account for the fact that human response to sound is not equally sensitive to all frequencies. It consists of an electronic filter in a sound level meter which attempts to build this variability into the indicative sound level reading so that it will correlate, approximately, with the human response.
Attenuation	The reduction in magnitude of sound energy.
Decibel (dB)	A unit used to measure or compare the intensity of a sound by comparing it with a given reference level on a logarithmic scale.
Noise	An unwanted or unexpected sound.
Peak Particle Velocity (PPV)	An indicator of the magnitude of ground vibration which refers to the movement of molecular particles within the ground.
Pink Noise	A noise with frequency spectrum containing equal energy per octave band with higher frequencies being less intense than lower frequencies to better replicate the human response to sound.
Reflection	The phenomena of sound waves bouncing back off a surface or barrier.
Sound	Fluctuations of pressure within a medium (gas, solid or fluid) within the audible range of loudness and frequencies which excite the sensation of hearing.

Acronyms

Acronym	Description
BS	British Standard
CoCP	Code of Construction Practice
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
LOAEL	Lowest Observed Adverse Effect Level
MLWS	Mean Low Water Springs
PPV	Peak Particle Velocity
SOAEL	Significant Observed Adverse Effect Level

Units

Unit	Description
dB	Decibel
dB(A)	A-weighted decibel
mms^{-1}	Millimetres per second

1 OUTLINE CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

1.1 Overview

1.1.1.1 This Outline Construction Noise and Vibration Management Plan (the Plan) is provided as an annex to the Outline Code of Construction Practice (CoCP) (Document Reference J26), which ~~is~~secured through a requirement of the draft Development Consent Order (DCO) (Document Reference C1). It sets out the key management measures that will be implemented during the construction phase of the Mona Offshore Wind Project.

1.1.1.2 The Plan seeks to manage potential impacts that occur from the construction of the onshore and intertidal elements of the Mona Offshore Wind Project. These elements occur landward of Mean Low Water Springs (MLWS) and comprise:

- Mona Landfall
- Onshore Cable Corridor
- Onshore Substation
- 400kV Grid Connection Cable Corridor.

1.1.1.3 In addition to these elements, the Outline Construction Noise and Vibration Management Plan also ~~considers~~applies to the temporary construction compounds, storage areas, mitigation areas and accesses required to support the construction of the Mona Offshore Wind Project.

1.1.1.4 The relevant planning authority for the landfall and the western section of the Onshore Cable Corridor (i.e. west of Bodelwyddan) is Conwy County Borough Council; the relevant planning authority for the eastern section of the Onshore Cable Corridor, the Onshore Substation and the 400kV Grid Connection Cable Corridor is Denbighshire County Council.

1.2 Purpose of the Outline Construction Noise and Vibration Management Plan

1.2.1.1 The draft DCO (Document Reference C1) includes a requirement for the preparation of a ~~final~~ CoCP. The final CoCP will be supported by a series of management plans including a Construction Noise and Vibration Management Plan (as part of the final CoCP), which must be submitted to and approved by the relevant planning authority prior to the commencement of onshore works.

1.2.1.2 The purpose of this Outline Construction Noise and Vibration Management Plan is to set out the key management and monitoring procedures that will be ~~required to adopt~~adopted during construction of the onshore and intertidal elements of the Mona Offshore Wind Project.

1.2.1.3 This is an outline document that is based on the maximum design parameters assessed in the Environmental Statement (see Volume 1, Chapter 3: Project description of the Environmental Statement (Document Reference F1.3)).

1.2.1.4 The Outline Construction Noise and Vibration Management Plan should be read in conjunction with the Outline CoCP (Document Reference J26~~), which is a requirement of the draft DCO (Document Reference C1). Additionally, the~~). The following documents also include relevant contextual information:

- Volume 3, Chapter 9: Noise and vibration~~, of the Environmental Statement~~ (F3.9 F02)
- Volume 7, Annex 9.2: Construction noise and vibration ~~of the Environmental Statement.~~(F7.9.2 F02).

1.3 Scope of this Outline Construction Noise and Vibration Management Plan

1.3.1.1 The scope of this Outline Construction Noise and Vibration Management Plan applies to onshore site preparation works and construction activities of the Mona Offshore Wind Project located landward of MLWS. The Outline Construction Noise and Vibration Management Plan does not consider construction impacts seaward of MLWS.

1.3.1.2 Onshore site preparation works will be undertaken prior to the commencement of construction. These works will be undertaken in line with the following ~~measures~~sections from ~~the certified~~ this Outline Construction Noise and Vibration Management Plan, ~~which is listed in Schedule 15 of~~as certified through the DCO:

- Section 1.6.2: General noise and vibration management
- Section 1.6.3: Erection of physical barriers
- Section 1.8: Construction working hours.

1.3.1.3 The final Construction Noise and Vibration Management Plan will be in accordance with the principles established in ~~the~~this Outline Construction Noise and Vibration Management Plan and will be agreed with the relevant planning authority prior to commencing construction of the relevant stage of the onshore works (above MLWS). For the purpose of this Plan, the term 'construction' includes all related engineering, construction and restoration activities as authorised by the DCO within the Order Limits

1.3.1.4 The Applicant will ensure compliance with relevant legislation, requirements, standards, and best practice relating to construction noise. The main objective with regard to managing construction noise is to ~~minimise~~ensure noise and vibration impacts on nearby residents and other sensitive receptors ~~to~~are at acceptable levels in accordance with British Standard (BS) 5228:2009+A1:2014 or other relevant guidance agreed in consultation with the relevant planning authority. Any measurement of construction phase noise and vibration will be undertaken in accordance with BS 5228:2009+A1:2014 (or the most recent iteration).

1.3.1.5 The ~~detailed~~final Construction Noise and Vibration Management Plan will identify specific areas within the Mona Onshore Development Area that are sensitive to construction noise. ~~The~~Such areas are likely to include residential properties which have been identified in Volume 3, Chapter 9: Noise and vibration (F3.9 F02) and Volume 7, Annex 9.2: Construction noise and vibration ~~control~~ (F7.9.2 F02) as likely to be adversely impacted by the construction works. Measures to control noise and vibration in these areas, examples of which are measures outlined in section 1.6 will be implemented ~~in these areas where practicable~~as set out in this Plan.

1.4 Roles and Responsibilities

1.4.1 Overview

1.4.1.1 The key roles and associated responsibilities with regard to this Outline Construction Noise and Vibration Management Plan are set out below. The Construction (Design

and Management) Regulations 2015 also identify the legal duties, responsibilities and obligations of all the major roles within the construction team.

1.4.1.2 The responsibilities of each role will be refined in the final Construction Noise and Vibration Management Plan.

1.4.2 Applicant

1.4.2.1 The Applicant will be responsible for the following:

- Ensuring that the Construction Noise and Vibration Management Plan is implemented effectively
- Giving necessary direction to contractors (for example, setting contractual obligations)
- Reviewing, revising and refining the Construction Noise and Vibration Management Plan (where necessary) in conjunction with the Principal Contractor.

1.4.3 Principal Contractor

1.4.3.1 Section 72 of the Control of Pollution Act (CoPA) highlights that contractors are required to adopt best practicable means to minimise noise disturbance ~~as best as reasonably practicable.~~. The Principal Contractor will be appointed by the Applicant and has the overall responsibility for:

- Updating and delivering the final Construction Noise and Vibration Management Plan on behalf of the Applicant
- Ensuring all procedures in this Construction Noise and Vibration Management Plan are followed
- Ensuring all contractors are suitably qualified and experienced in implementing the measures within this Construction Noise and Vibration Management Plan
- Ensuring that all legal and contractual requirements relating to this Construction Noise and Vibration Management Plan are met by ensuring adequate plans/procedures, licences and certificates are in place, and that they can be achieved
- Establish procedures for the regular review and recording of the quality of the works as part of its Quality Management System
- Maintain records relevant to this Outline Construction Noise and Vibration Management Plan.

1.4.4 Contractors/Subcontractors

1.4.4.1 Contractors and subcontractors will be required to understand their responsibilities and implement the measures within the Construction Noise and Vibration Management Plan.

1.4.5 Training

1.4.5.1 The Applicant will ensure that all Principal Contractors and subcontractors are made aware of the final Construction Noise and Vibration Management Plan and their responsibilities. Training will be provided to ensure that all relevant members of the onshore construction teams, including subcontractors' personnel, receive focused

Construction Noise and Vibration Management Plan training to ensure their competence in carrying out their duties.

1.4.5.2 Any training related to the Plan will be additional to the mandatory training requirements on site Health and Safety.

1.5 Regulatory Framework and Guidance

1.5.1.1 The regulatory framework and guidance that underpins this Construction Noise and Vibration Management Plan is set out below:

- British Standard 5228:2009+A1:2014 (BS 5228) - 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' - Part 1: Noise and Part 2: Vibration'
- Design Manual for Roads and Bridges (DMRB) – LA 111 – Noise and Vibration
- Environmental Protection Act 1990
- Sections 60, 61, and 72 of the Control of Pollution Act 1974
- Noise and Statutory Nuisance Act 1993.

1.5.1.2 The guidance within BS 5228 and DMRB have been used to derive the reasonable limits of construction-induced vibration for the purposes of assessing the impacts associated with vibratory compaction and vibratory piling activities. Where vibration levels are predicted to exceed 'just perceptible' levels, as defined in Table 1.2, appropriate mitigation measures would be introduced to control the effects.

1.6 Management Measures

1.6.1 Selection of measures

1.6.1.1 This section sets out the ~~selection of~~ general and specific construction noise and vibration mitigation measures that will be implemented by the Applicant.

1.6.1.2 This Outline Construction Noise and Vibration Management Plan includes general measures to mitigate noise and vibration impacts from construction activities. The Plan also includes examples of noise control measures that can be applied to specific construction activities~~, subject to requirement.~~. These measures will be defined as the detailed design progresses and will be agreed with the relevant authority via the final Construction Noise and Vibration Management Plan. Examples of these mitigation measures and an indication of the noise reduction they may provide, are given in Table 1.1 below.

Table 1.1: Example noise control mitigation measures relating to noise and vibration.

Mitigation Measure	Indicative Noise Level Reduction	Justification for indicative noise level reduction
Localised acoustic screening, including earth bunds, partially reducing the line of sight between noise source and receiver	Up to 5 dB(A)	Section F.2.2.2 of BS 5228:2009+A1:2014 states: *'if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver'.*
Localised acoustic screening, including earth bunds, preventing any line of sight between noise source and receiver	Up to 10 dB(A)	
Fitting more efficient exhaust sound reduction equipment to earth moving plant	5 to 10 dB(A)	Table B.1 of BS 5228:2009+A1:2014
Enclose breakers and rock drills in portable or fixed acoustic enclosures with suitable ventilation	Up to 20 dB(A)	Table B.1 of BS 5228:2009+A1:2014
Use rotary drills and boring plant inside acoustic shed with adequate ventilation	Up to 15 dB(A)	Table B.1 of BS 5228:2009+A1:2014
Reduction of simultaneous use of plant	Up to 3 dB(A)	Halving the amount of plant being utilised simultaneously thus halving the sound energy being generated could provide a 3 dB reduction.
Re-positioning plant as far away from noise sensitive receptors as reasonably practicable	Up to 6 dB(A)	Doubling the distance between a noise source and a receiver can provide up to a 6 dB reduction.
Not using particularly noisy items of plant pieces at night as far as reasonably practicable	Up to 3 dB(A)	Reducing the quantity of plant operating simultaneously at night-time will reduce the overall construction noise level at the receptor. As an example, halving the amount of plant being utilised simultaneously, thus halving the sound energy being generated, could provide a 3 dB reduction.
Limiting or eliminating certain works during more sensitive periods	Varies	Would depend on what works/plant was limited or eliminated.

Mitigation Measure	Indicative Noise Level Reduction	Justification for indicative noise level reduction
Use of electric or hybrid construction plant	Varies	Dependent on item of plant.

1.6.2 General noise and vibration management

1.6.2.1 The best practicable means (as defined in Section 72 of the Control of Pollution Act 1974) will be applied to all construction works to ensure noise and vibration effects are minimised. Noise control measures will be consistent with the recommendations of the current version of BS 5228 - Part 1: Noise and Part 2: Vibration. Statutory requirements and legislation will be fully complied with during the construction works. Construction contractors would carry out the works in a manner which minimises the noise and vibration wherever feasible giving consideration to the following measures:

- Core working hours ~~will be~~are included in the Outline CoCP and are proposed as 7am to 7pm from Monday to Saturday. Many construction works will only be undertaken during daylight hours and thus the core construction hours may be reduced depending on the season
- There will be a preference given to the use of plant fitted with effective silencers and noise insulation. Where ~~required~~necessary, works will limit the use of particularly noisy plant at certain times of the working day, i.e. ~~do~~ not ~~use~~using particularly noisy plant equipment early in the morning
- The number of plant items in use at any one time will be limited, where practicable
- Plant maintenance operations will be undertaken as far away from noise-sensitive receptors as practicable
- The works will be phased, where practicable, to maximise the benefit from perimeter structures
- Any compressors brought to the construction works site will be silenced or will be sound reduced models which are fitted with acoustic enclosures
- The speed of vehicle movements within the construction site will be limited to below 15 miles per hour
- Activities will be designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors where practicable
- A banksman may be used to minimise the use of reversing alarms. Where reversing alarms are required, the use of pink noise reversing alarms that produce a “static” sound as opposed to a beep will be used where reasonably practicable to reduce the noise generated by the reversing bleepers of on-site vehicles
- Construction plant will be regularly serviced, maintained, and operated in accordance with manufacturer’s instructions
- Plant that is intermittently used should be shut down in the intervening periods between work or throttled down to a minimum
- The use of local noise screening or site hoardings to reduce noise where necessary

- The appointment of a site contact to whom complaints/queries about construction activity can be directed - any complaints should be investigated, and action taken where appropriate
- Local residents and businesses will be kept informed of construction activities, including working hours through measures set out in the Construction Communications Plan (an outline version of this document is provided in Document Reference J26.4). In certain circumstances, specific works may have to be undertaken outside the core working hours to maintain time critical activities. These activities will be agreed by giving at least 48 hours notice in advance of the works to the relevant planning authority.
- Emergency works may also be undertaken outside of the core working hours. In the event of any emergency, notification of the emergency will be given to the relevant planning authority and highways authority as soon as reasonably practicable
- The relevant local planning authority will be notified of any emergency works required within five working days after the event, including the hours during which they were undertaken and their duration
- Where noise complaints are received, construction noise and vibration monitoring may be undertaken at the relevant receptors to ensure the threshold values are not exceeded and notify the Principal Contractor if exceedances occur
- Any idling vehicles will have their engines switched off while stationary
- Construction traffic control measures will be implemented such as agreed routes and the number of vehicle movements at any given time. A Construction Traffic Management Plan (CTMP) (Document Reference: J26.13) will be included in the final CoCP and will outline measures to manage the daily profile of HGV movements and deliveries to site to ensure distribution across the working day. The CTMP is an annex to the Outline CoCP (Document Reference J26), which is a requirement of the draft Development Consent Order (DCO) (Document Reference C1)
- Construction which would be closest to nearby residential receptors will be undertaken as efficiently and quickly as reasonably possible
- All plant and equipment would be expected to be shut down when it is not in use with the exception of generators, pumps and electric plant
- Site personnel will be informed about the need to minimise noise as well as about the health hazards of exposure to excessive noise. Their training should include advice relating to the proper use and maintenance of tools and equipment, the positioning of machinery on site to reduce noise emissions to neighbouring residents. As well as ensuring where possible unnecessary noise is avoided when carrying out manual operations and operating plant and equipment
- No audible music or radios will be played on the construction sites
- Construction contractors will adhere to the codes of practice for construction working set out in BS 5228:2009+A1:2014 insofar as these are reasonably practicable and applicable to the construction works.

1.6.3 Erection of physical barriers

1.6.3.1 The erection of temporary noise barriers to minimise the effects of construction noise to the nearest receptors may be required at appropriate locations. The barriers will be located to ensure that an enhanced level of noise reduction is provided to the most sensitive receptors.

1.6.3.2 The barrier locations will be defined by the Applicant in consultation with the relevant planning authority considering the methods of construction to be used. Particular consideration will be given to the following methods:

- Where required, temporary noise barriers or bunds of an equivalent height will be constructed prior to ~~the site preparation of~~ establishing the temporary construction ~~compound or~~ compounds and undertaking site clearance along the Onshore Cable Corridor ~~and~~. These measures will remain in place until the site ~~preparation~~clearance phase is completed
- Temporary noise barriers, where required, will be installed around works areas or equipment in order to provide screening for sources located at low heights (note however that it is likely to be impractical to provide noise barriers that are high enough to screen the drilling rigs associated with trenchless techniques).
- ~~Consideration~~ Acoustic barriers will be ~~given~~designed having regard to ~~the potential effect of~~ noise reflection ~~from acoustic barriers~~ effects impacting upon other sensitive receptors
- Earth bunds will be established along a majority of the Onshore Cable Corridor during the construction of the haul road ~~and~~, installation of the onshore export cable, and ~~at temporary~~the construction ~~compounds. The bunds will be located along the edge~~ of ~~the Onshore Cable Corridor and will provide a temporary barrier to noise impacts including from~~ joint bays ~~and trenchless technique crossings.~~. An indicative cross section of the bunds is illustrated in document reference S_D1_5.6 (REP1-018~~.~~). The creation and management of the bunds will be in accordance with the Outline Soil Management Plan (REP2-054~~).~~), with bunds being no more the 3 m in height.
- Earth bunds, or barriers of equivalent height, will also be established at locations along the Onshore Cable Corridor where construction noise associated with trenchless technique crossings works has the potential to result in adverse impacts at nearby properties.

1.7 Vibratory compaction and piling

1.7.1.1 BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels.

1.7.1.2 Many people are known to be very sensitive to vibration, the threshold of perception being typically in the peak particle velocity (PPV) range of between 0.14 mms^{-1} and 0.30 mms^{-1}. Vibration levels above these values can cause disturbance. BS 5228-2:2009+A1:2014 provides guidance on the effects of vibration shown in Table 1.2.

Table 1.2: Risk of complaints from vibration levels.

Vibration level (mms^{-1})	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30	Vibration might be just perceptible in residential environments.
1.00	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.00	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

1.7.1.3 The precise technologies and construction methods that will be employed during the construction of the Mona Offshore Wind Project have not been selected. This includes any requirement for percussive piling during construction as well as the type of piler and ram weight (if required).

1.7.1.4 It is anticipated that PPV levels from dynamic compaction have the potential to exceed 1.0 mms^{-1} due to dynamic compaction operations and vibratory plant at the nearest vibration sensitive receptors along the Onshore Cable Corridor. However, PPV levels at the nearest vibration sensitive receptors to any percussive piling operations, which may be required for the Onshore Substation, cannot be known at this stage as the precise ground conditions and therefore foundation design has not been determined. The percussive piling operations will be defined following the detailed design of the foundations. The final Construction Noise and Vibration Management Plan will include an assessment of PPV arising from all construction activities likely to result in construction vibration impacts, informed by the detailed design, and mitigation if required. The final Construction Noise and Vibration Management Plan will be submitted for approval by the relevant authority in advance of any vibration generating works taking place.

1.8 Construction working hours

1.8.1.1 The Principal Contractor(s) will undertake construction activities associated with the Mona Offshore Wind Project in accordance with the controls on working hours as stated in the Outline CoCP (Document Reference J26) which ~~will be~~is secured as a requirement of the DCO.

1.8.1.2 Impact criteria for construction noise for different construction periods have been determined in accordance with DMRB LA111 and Annex E of BS 5228-1:2009+A1:2014. Table 3.12 of DMRB LA111 provides the following guidance (as summarised in Table 1.3~~Table 1.3~~ below) for determining the Lowest Observed Adverse Effect Level (LOAEL~~)~~). and Significant Observed Adverse Effect Level (SOAEL) for construction noise ~~and for determining the magnitude of impacts (see Table 1.4 below).~~

Table 1.3: Construction time period – LOAEL and SOAEL.

Time Period	LOAEL	SOAEL
Weekdays (7am-7pm) and Saturdays (7am-1pm)	Baseline noise levels, $L_{Aeq,T}$	Threshold level determined as per BS 5228-1:2009+A1:2014.

Time Period	LOAEL	SOAEL
Evening (7pm-11pm) and Weekends (1pm-11pm on Saturdays and 7am-11pm on Sundays)		
Night (11pm-7am)		

1.8.1.3 DMRB guidance was also used for determining the magnitude of impacts (see Magnitude of impact and construction noise descriptions.

Table 1.4: Magnitude of impact and construction noise descriptions.

Magnitude of impact	Construction noise level over time period *T*
High	$L_{Aeq,T} \geq$ SOAEL + 5 dB
Medium	SOAEL $\leq L_{Aeq,T} <$ SOAEL +5 dB
Low	LOAEL $\leq L_{Aeq,T} <$ SOAEL
Negligible	$L_{Aeq,T} <$ LOAEL

~~1.8.1.2~~1.8.1.4 Construction noise will be controlled to levels below the SOAEL by adopting the measures outlined in section 1.6.2 and will be minimised to below the LOAEL where reasonably practicable.

1.9 Monitoring

1.9.1.1 The noise and vibration mitigation measures will be monitored by the Applicant throughout the construction phase. Regular audits of the construction work areas will be undertaken ~~over the construction phases. If~~and non-conformity with any of the mitigation measures is identified, it will be recorded and appropriate remedial actions will be implemented. Further details of the approach to monitoring, audit and remedial actions will be developed during the detailed design phase and included in the final Construction Noise and Vibration Management Plan for approval by the relevant planning authority.

1.10 References

British Standards Institution (2014a) '*British Standard 5228-1:2009+A1:2014 (2014) Code of practice for noise and vibration control on construction and open sites - Part 1: Noise'*

British Standards Institution (2014b) '*British Standard 5228-2:2009+A1:2014 (2014) Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration'*

Control of Pollution Act 1974, Chapter 40, Part III

Environmental Protection Act (1990), Chapter 43, Part III

Highways England, Transport Scotland, Llwyodraeth Cymru, Department for Infrastructure (2020), *'Design Manual for Roads and Bridges – LA111: Noise and vibration'*

Noise and Statutory Nuisance Act 1993