



amey·BLACK & VEATCH

Ardersier WwTw – Outfall Construction Noise Assessment



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1. UNDERWATER NOISE

1.1 Introduction

The construction of the new Ardersier WwTw Outfall pipe will require a number of noise generating activities to be undertaken, with the major noise source being the chosen construction method of the marine piles. As detailed within the Marine Scotland License Application there is a potential for disturbance, injury or death of marine mammals and fish. Hence appropriate steps to minimise and mitigate underwater noise are required.

1.2 Noise Predictions

1.2.1 Piling Quantities

Pile Quantities for Ardersier WwTw based on design drawings;

- 106 number 324 x 16 CHS Support Piles

The support piles will be constructed to depths of around -14.5m below seabed level.

1.2.2 Piling Noise Levels

The proposed programme intends for piling operations to be completed between January to March 2016. Seasonal factors and sea conditions will directly impact site production and programming, with the 106 support piles along the outfall route not permitted to extend in April 2016 or beyond.

The support piles dimensions are 324mm x 16 CHS. The noise levels associated with percussion piling a cylindrical pile is calculated utilising the following equation.

$$\text{Source Level (dB re } 1\mu\text{Pa, peak to peak, 1t 1m)} = 179 + 24.3 \times \text{pile diameter (m)}$$

Equation: Source Level Associated with Cylindrical Piles of a Given Diameter

Hence the percussion piling of cylindrical piles with a diameter of 0.324m (324mm) would have a source level of 186.8dB re $1\mu\text{Pa}$, peak to peak, at 1m.

Noise level comparisons between hammer and vibrator piling on Offshore Wind Projects have identified that vibro-piling has noise levels 15-20dB lower than hammer piling. A water jet will also reduce the vibration and hence noise levels. It has been assumed that the vibro-piling with water jets (bubble curtains) will reduce noise levels by 20dB, hence the 0.324m support piles is calculated to give rise to noise levels of approximately 166.8dB.



1.2.3 Bubble Curtains

A simple bubble curtain utilised to mitigate underwater noise can reduce noise levels by between 5dB and 20dB (Spencer et al (2012)).

The bubble curtain system produces bubbles in a defined arrangement in water, for this application it will be around the piling barge. The technique is based on the release of air, as the bubbles rise through the water they act as a barrier.

1.2.4 Hydrographic Survey

For the delivery of the scheme, there will be a requirement to complete a minimum of two hydrographic multibeam surveys. *(These may be a stipulation on the marine license)*

ABCO require an initial In-Survey completed in advance of the main construction activities, this is to confirm existing seabed levels against the design information. Seabed levels on-site can change, especially an area of seabed mobility like Ardersier. The seabed level needs to be confirmed to further to support the support pile design and for uploading the site specific information to the vessel GPS positioning systems.

The project will also require an Out-Survey, in line with marine license requirements, to ensure seabed is returned to acceptable levels and to ensure no marine deposits of equipment remain on the seabed after demobilisation of marine equipment.

The multibeam survey will be undertaken at approximately 455 kHz, within the mid-range for the water depth applicable to Ardersier.

1.2.5 Continuous Noise Source

A critical element of the site construction process will be the marine mammal management, with the Marine License possibly proposing a Marine Mammal Observer (MMO) on-site for the duration of the construction phase. The procedures adopted for the MMO and soft-start would require soft start procedure to be observed every time there is drop in the construction sound source, say 30 minutes. If this is the case, then a full soft-start would have to be followed, which can only be completed in day-light hours when the observation zone of 500m can be viewed.

To mitigate against this site delay, ABCO would propose utilising and deploying a suitable continuous sound source (echo sounder &/or acoustic positioning beacon) for the full duration of the project. The sound source would be established onsite prior to the construction operations during the site mobilisation phase, with the continuous sound source in-situ, as a deterrent to marine mammals encroaching into the works area.