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Boulder Clearance Marine Licence Application – Supporting Information

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1. Introduction

Seagreen Wind Energy Ltd (SWEL, hereafter Seagreen) is developing the Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs) off the east coast of Scotland in the outer Firth of Forth and Firth of Tay area (Figure 1). The projects received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers in 2014 (the S36 Consents). The S36 Consents have subsequently been varied to remove capacity limits and to allow for larger wind turbine generators (WTGs) at up to 36 locations. Marine Licences were also awarded by the Scottish Ministers in 2014, for the OWFs and the Offshore Transmission Asset (OTA). An additional Marine Licence was granted in 2019 providing an alternative landfall cable installation method. All licenses have subsequently been varied

The Onshore Transmission Asset (the onshore export cable from landfall at Carnoustie to a new substation at Tealing) was subject to a separate planning application under the Town and Country Planning (Scotland) Act 1997 and was granted Planning Permission in principle by Angus Council in January 2013. This was extended by Angus Council in December 2016, following re-application by Seagreen.

The consents permit the installation of up to 150 wind turbine generators (WTGs) with associated foundations, inter-array cables and offshore substation platforms (OSPs). Offshore installation commenced in September 2021. In advance of those works, Seagreen undertook seabed clearance works to remove unexploded ordnance (UXOs), boulders or other debris within the Seagreen OWF site.

Seagreen submitted a Marine Licence application in March 2021 for these clearance works which, based on 2018 site survey data, was to include the removal of approximately 1900 boulders from around the WTG and OSP locations, from jack-up vessel footprints and from the inter-array cable corridors. Removal was to be completed using an 'orange-peel grab' from a Utility Remotely Controlled Vehicle (UTROV). The Marine Licence was granted by Scottish Ministers on 30/07/2021 and subsequently varied to increase the number of boulders authorised for removal, and to extend the period of validity of the licence (see Table 1). The most recent Marine Licence (MS-00009821) expired on 31/12/2022 and which point clearance works ceased with all originally planned foundation installation locations and inter-array cable routes successfully cleared.

Table 1: Licensing history for boulder clearance works on the Seagreen OWF site

Marine Licence	Validity start	Validity end	Status	Notes
MS-00009392	30/07/2021	30/09/2021	Replaced by MS-00009485	1900 boulder limit
MS-00009485	14/09/2021	30/11/2021	Replaced by MS-00009511	Extension of time only
MS-00009511	24/09/2021	30/11/2021	Replaced by MS-00009569	Extension of time. Increases boulder limit to 2500 (approx.)
MS-00009569	09/11/2021	31/05/2022	Replaced by MS-00009821	Extension of time. Increases boulder limit to 15000
MS-00009821	01/06/2022	31/12/2022	Expired	Extension of time. Increases boulder limit to 18000 (approx.)

Ground conditions at the Seagreen OWF site are variable and, in some areas, it has proven challenging to successfully install the suction caisson foundations in their originally intended locations. As a result, Seagreen has made changes to the array layout, utilising 'spare' locations as detailed in the approved project Development Specification and Layout Plan (DSLPL). The use of spare locations has resulted in changes to the arrangement and routing of the network of inter-array cables. These newly-defined inter-array cable corridors require boulder clearance before the cables are laid and buried. Survey data indicates that all target foundation locations (including spares) that may be used for the installation of the remaining suction caisson jackets are clear of boulders, having been cleared during the previous clearance campaign (or are located in areas of the site where boulder densities are low). However the presence of a small number of as yet undetected boulders in these locations cannot be discounted and may require removal at the point of installation. Boulders may also require clearing from microsite locations and from jack-up vessel (JUV) footprints if a jacket requires micrositing.

To allow the completion of the foundation and inter-array cable installation campaigns, the clearance of approximately 2000 additional boulders is now required and SWEL are making an application to authorise this activity.

2. Supporting Survey Information

In 2018 a full site survey was completed providing bathymetry and shallow sub-surface data to inform initial wind farm engineering and layout site design and layout. Further analysis of the survey data indicated there were approximately 1900 boulders within the construction footprint areas that would be required to be moved ahead of construction start. This information formed the basis of the March 2021 Marine Licence application.

During 2021 a further high resolution geophysical survey was undertaken. This was specifically designed to identify potential UXO targets, for subsequent clearance if required, and to quantify boulder numbers and locations for removal within the wind farm site. This survey specifically focussed on the construction areas. Subsequent data processing identified a greater number of boulders, with dense patches in some areas, than had previously been understood to be present. The outcome of this survey and the implications of the increased boulder numbers were discussed with Marine Scotland and resulted in an application to vary the Marine Licence and increase the boulder limit.

The number of boulders eventually removed under the now-expired Marine Licence was in line with the number estimated following the 2021 survey and within the limits defined on that licence, validating the survey data. The number of boulders requiring removal under this application has been calculated with reference to both the 2021 survey data and on-site information on boulder density gathered during the previous clearance campaign.

3. Areas for Clearance

Seagreen has successfully installed 105 suction caisson foundations out of a total of 114 in Stage 1 of the project. The intended installation locations for the remaining 9 foundations have either already been cleared of boulders as part of the previous campaign or are located in areas of the site with low boulder density. As such, no further clearance of foundation locations (or associated jack-up footprints) is expected to be required at these locations. However, where jacket 'refusals' occur, it may be necessary to use alternative locations – either 'primary' locations where refusals have occurred previously but where installation may be reattempted, or other approved 'spare' locations. No alternative locations currently under consideration are expected to require extensive boulder clearance beyond the removal of incidental boulders identified by ROV during the installation process. However where micro-siting is required, clearance of boulders from the microsite location and JUV footprints may be required.

The main focus of the required boulder clearance works is therefore approximately 40km of inter-array cable corridor. The use of spare locations for foundation/WTG installation has resulted in changes to the array layout, the configuration of the WTG 'strings' and therefore the routes of the inter-array cables connecting the WTGs. A further 40km (approximately) of inter-array cable corridor now requires clearance to ensure the installation of the remaining cables can proceed. The final cable alignments will depend on the final array layout. However, it should be noted that the overall installed cable network will generally be in line with that set out in the DSLP since some previously cleared corridors will no longer be utilised due to the change to the array layout.

SWEL are currently surveying a number of cable corridors which *may* be utilised and require clearance. Of these, approximately 12.7 km lies within the boundaries of the Firth of Forth Banks MPA. These corridors connect the following pairs of WTG locations as shown on the site layout in Figure 1 below: J7-H6, H6-L6, L6-L2, U19-R23.

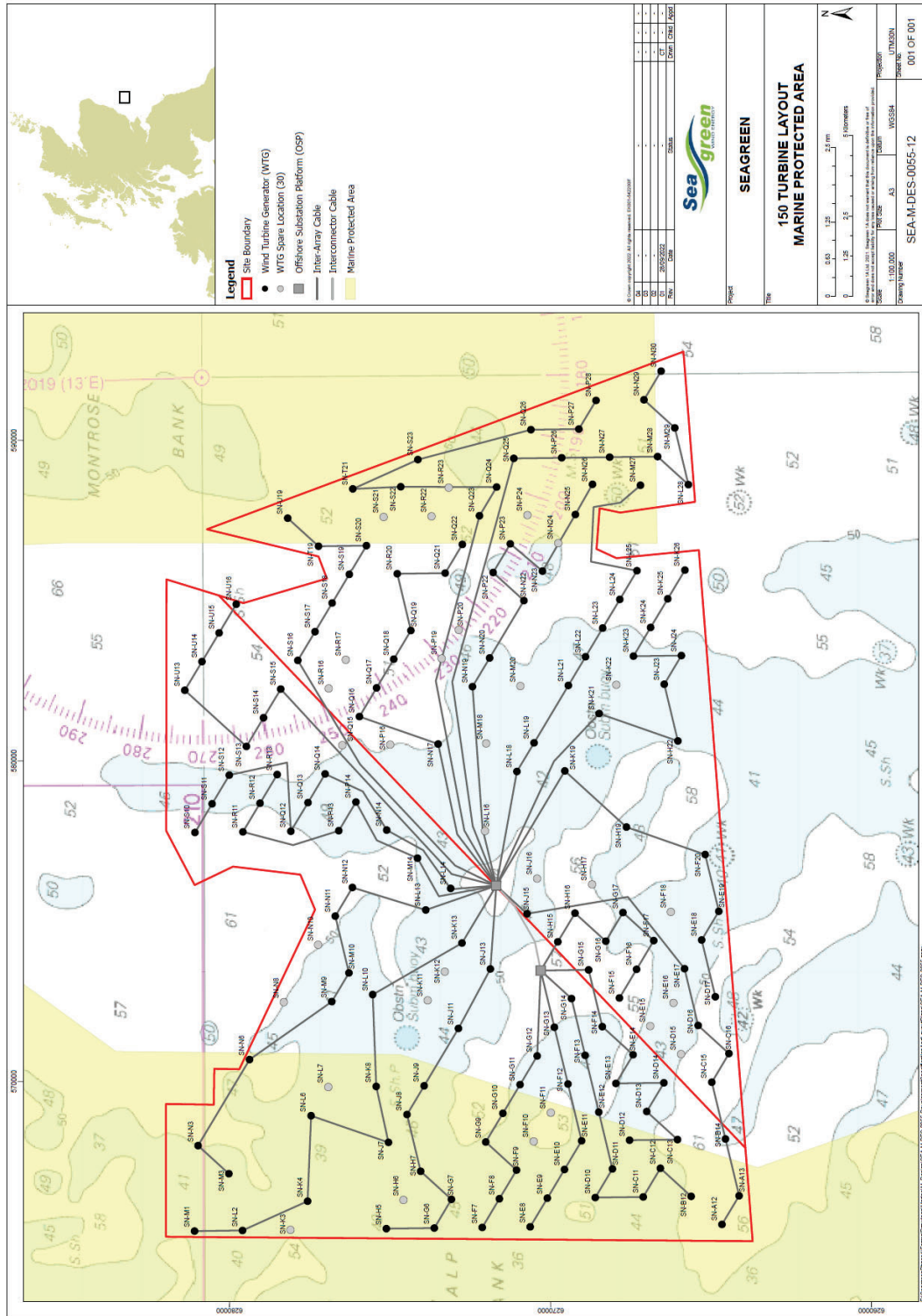
The width of the cable corridors to be cleared is 11m. The total area to be cleared within the MPA is therefore $12.7 \text{ km} \times 11 \text{ m} = 0.14 \text{ km}^2$.

Of the spare locations where clearance of foundation microsite locations or JUV footprints may be required, one location is within the MPA. The previous marine licence application used a worse-case value of 0.024 km^2 as the area at each WTG foundation location requiring boulder clearance. This is an over-estimate since the clearance works under this application will be more localised - covering microsites and JUV positioning only – and therefore represents the worst case.

The total area of clearance within the MPA is therefore $0.14 + 0.024 = 0.164 \text{ km}^2$. This equates to 0.13% of the MPA that lies within the Seagreen site boundary, or 0.008% of the total MPA area

Based on the survey data described in section 2, and the number and densities of boulders removed during the 2022 campaign, it is estimated that approximately 2000 boulders will require removal from foundation location microsites, JUV footprints and inter-array cable corridors across the Seagreen site.

Figure 1 – Seagreen OWF indicative array layout (including spare locations) showing areas overlapping the Firth of Forth Banks Complex MPA



4. Boulder Removal Methodology

The boulder size limits for removal from the construction areas are as follows:

- 400mm in WTG foundation footprints
- 500mm in installation JUV footprints
- 300mm in inter array cable corridors

The upper size limit for removal is constrained by the UTROV capacity and is a boulder of approximate volume 1m^3 . A boulder of any greater size than this will be avoided during installation activities (by micro-routing of the cable).

Individual boulders will be lifted from the construction areas using an 'orange peel grab' attached to a UTROV. Boulders will be lifted and moved the minimum distance out of the area being cleared. The boulders will be replaced on the seabed, not dropped from height, and will not be clustered in any way on removal, resulting in minimal seabed disturbance.

Figure 2: UTROV and Orange Peel Grab



The duration of the works is expected to extend until July 2023. The vessel utilised for the works will be the MMA Pinnacle or equivalent.

Figure 3: MMA Pinnacle



Following boulder clearance, a pre-lay grapnel operation will be undertaken to confirm the array cable corridors are free of other debris, for example discarded fishing gear. The grapnel will be towed from the stern of the PLGR vessel to 'snag' and recover any debris. The PLGR vessel will tow the grapnel rig along the centreline of the cable route with a tolerance of ± 5 m giving a 10 m corridor. The majority of debris encountered will be placed to the side of the cable route. Larger debris (i.e. rock outcrops) will be left in-situ and the cable route diverted around it. Any debris to be recovered and disposed of onshore in a licensed facility is anticipated to be limited to linear debris (e.g. abandoned ropes, fishing gear) that would impede the cable burial tool as it tracks along the seabed. The grapnel will consist of a seabed riding element and a hook/share that engages with the seabed, and ultimately the item of debris. The grapnel hooks will be dragged across the seabed and are expected to penetrate <1 m into the seabed, subject to soil type (see Figure 4).

Figure 4: Grapnel assembly for PLGR



5. Assessment of Potential Impacts

A Supporting Environmental Information Report (SEIR) (document LF000009-CST-OF-LIC-REP-0005) was submitted with the original site clearance Marine Licence application. The report identified the following receptors as potentially impacted by boulder clearance and PLGR works using the above site clearance works.

- Physical environment – seabed disturbance
- Benthic ecology – seabed disturbance
- Fish and shellfish ecology – seabed disturbance
- Marine mammals – vessel activity
- Ornithology – vessel activity
- Protected sites – seabed disturbance and vessel activity
- Commercial fisheries – seabed disturbance and presence of vessels
- Shipping and navigation – presence of vessels
- Marine archaeology – seabed disturbance

The conclusions of the SEIR remain relevant to this application and a summary of the potential impacts is provided below.

5.1 Ecological Receptors

In all cases the effects were predicted to be highly localised to the activities in question with negligible impact on the receptors considered. This conclusion was based on the limited extent of the works and the nature of the works. The lifting of boulders from the seabed within the works footprint and placing them on the seabed a short distance away outside the footprint will result in minimal sediment or habitat disturbance. Any disturbance that does occur is expected to be short term, temporary and likely to recover relatively quickly, as evidenced from other wind farm sites. The consequences of any disturbance will be minimal on any benthic or fish and shellfish species present due to the limited extent and duration and will be negligible relative to the wind farm construction activities that are already consented.

The presence of any surface vessels undertaking the works could potentially result in disturbance of sensitive species. However, only one vessel will be involved in this activity, the effects of any disturbance will make negligible difference to the effects of routine shipping traffic in the area and will be indistinguishable relative to the ongoing wind farm construction activities.

5.2 Human Activities

Static gear fishing activity and scallop dredging are the primary commercial fishing activities recorded in the wind farm site. Static fishing gear has been removed from the site under Cooperation Agreements reached with the fishermen involved. The scallop fishery generally targets the sandy gravelly sediments rather than areas where large numbers of boulders are present. Where boulders are present in areas targeted by scallop dredging the seabed and the associated habitats are not expected to be further impacted by the proposed clearance activities. The areas more favoured by the static gear fishery generally shallower and have a greater presence of boulders and cobbles more suited to the targeted crabs and lobsters. The clearance of boulders along an 11m corridor is expected to result in negligible impact on the target species or on the resumption

of the activity post construction. It is therefore concluded that there will be negligible effects on commercial fishing activities as a result of the proposed boulder clearance activities.

The initial and final locations of all boulders that are moved from the construction areas will be recorded. If required, this information can be provided to fishermen in a suitable format for input to a plotter to support continued fishing activities.

The wind farm site has been marked off as a construction area since September 2021. Shipping traffic, including fishing vessels, is expected to reroute around the site as a result for the duration of construction, including these the activities considered in this document.

Potential archaeological features identified in the 2012 EIA have been protected through the introduction of Archaeological Exclusion Zones (AEZ). These are avoided by all works activities. Further potential features that have been identified during subsequent survey activities are also protected by AEZs. The boulder clearance activities and all subsequent construction activities will avoid the AEZs and the potential impact on archaeological features will be negligible. A procedure is in place for the reporting of any previously unidentified potential archaeological features and these will also be protected.

5.3 Protected Sites

The Firth of Forth Banks Complex MPA is designated for;

- Ocean quahog aggregations (*Arctica islandica*)
- Offshore subtidal sands and gravels
- Shelf banks and mounds
- Moraines representative of the Wee Bankie Key Geodiversity Area

The proposed areas for boulder clearance overlap the MPA areas in the west of the site and the east of the site (see Figure 1). The total overlap between the MPA areas and the Seagreen wind farm site is 123.8km². The total construction area to be cleared within this overlap with the MPA areas is 0.164km². It is estimated that approximately 450 boulders are required to be cleared within this area.

The overlap of 123.8km² with the wind farm site equates to approximately 5.8% of the total area of the Firth of Forth Banks Complex MPA. The proposed boulder clearance works may overlap with some of the features of the MPA, however the anticipated extent of the proposed works within the MPA is small and represents approximately 0.13% of the overlapping area and less than 0.008% of the total MPA area. The works will also be short term in nature and temporary, with any effects being highly localised around the area of impact. As was concluded in the SEIR, the shelf bank and mound large-scale features and the moraines key geomorphological feature are considered unlikely to be adversely affected by the proposed works due to the very small scale of the impact footprints in relation to these large-scale features. With respect to the subtidal sands and gravels and ocean quahog features, the impact will be small in extent, relative to the total area of the MPA. As already discussed, any effects on benthic receptors are likely to be small, with a rapid recovery following any disturbance. There is therefore no significant risk of the proposed boulder clearance works hindering the conservation objectives of the Firth of Forth Banks Complex MPA.

5.4 Cumulative Effects

Cumulative effects were considered in the SEIR. The conclusions from this document are still considered to be valid due to the localised and temporary nature of any impacts arising from the additional boulder clearance works required. No cumulative effects with other works are anticipated. The clearance works will take place in the context of and overlapping with the overall construction works for the consented Seagreen wind farm project.

6. Conclusions

This document has been prepared to support an additional Marine Licence application for boulder removal on inter-array cable routes and at foundation installation locations that are now required following changes to the wind farm array layout. Boulder clearance works will commence upon determination of the licence application and may continue until the end of July 2023, depending on construction progress, vessel availability, weather and other external factors.

Consideration has been given to the potential impacts expected during these clearance works on the associated receptors. No receptors are predicted to be significantly or cumulatively impacted given the localised and temporary nature of the clearance works.