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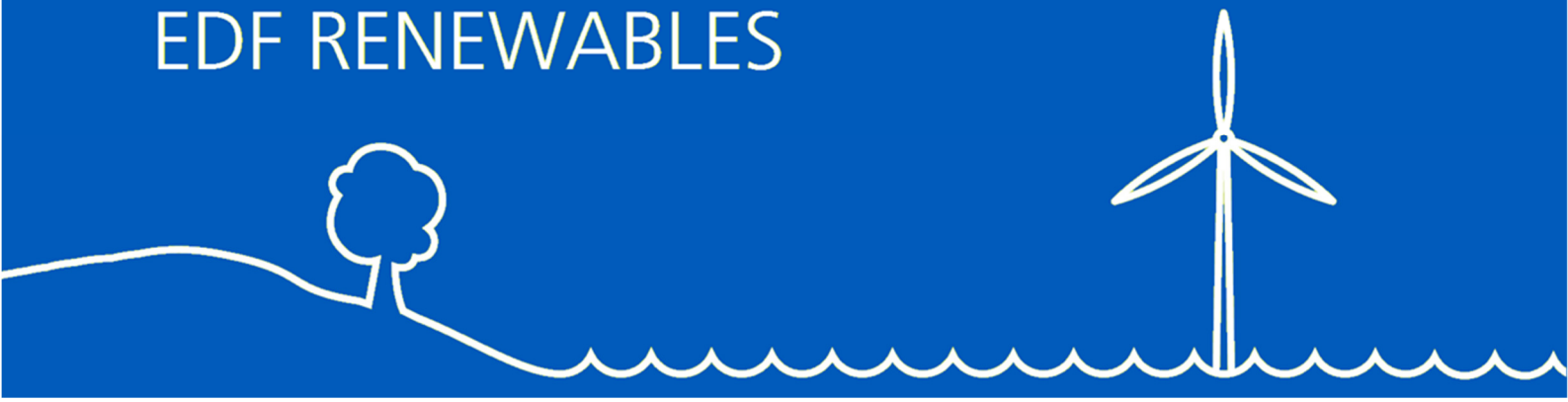

Neart na Gaoithe Offshore Wind Farm

Information to support a Marine Licence application: seabed preparation

Revision 2.0

September 2019

DOCUMENT REFERENCE: NNG-GOB-ECF-REP-0001

NnG OFFSHORE WIND

EDF renewables

Neart na Gaoithe Offshore Wind Farm

Information to Support a Marine Licence Application: Seabed Preparation

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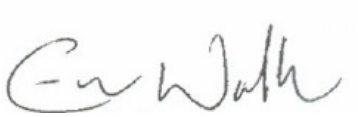
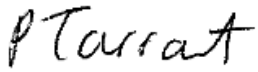
Approved by: Ewan Walker NnGOWL Lead Consents Manager		10/09/2019
Reviewed by: Polly Tarrant NnGOWL Consents		10/09/2019
Prepared by: Steve Bellew GoBe Consultants		09/09/2019

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Acronyms and Abbreviations

TERM	DESCRIPTION
DGPS	Differential Global Positioning Systems
DP	Dynamic Positioning
EIA	Environmental Impact Assessment
FLO	Fisheries Liaison Officer
FPV	Fall Pipe Vessel
GIS	Geographical Information Systems
HRA	Habitats Regulations Assessment
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
MBES	Multi-beam echosounder
MCA	Maritime and Coastguard Agency
MPA	Marine Protected Areas
NLB	Northern Lighthouse Board
NNR	National Nature Reserve
NtM	Notices to Mariners
OSP	Offshore Substation Platforms
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SAR	Search and Rescue
SFF	Scottish Fishermen's Federation
SNH	Scottish Natural Heritage
SSC	Suspended Sediment Concentration
SSSI	Site of Special Scientific Interest
USBL	Ultra-Short Baseline

TERM	DESCRIPTION
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

Defined Terms

TERM	DESCRIPTION
Addendum	The Addendum of Additional Information submitted to the Scottish Ministers by NnGOWL on 26 July 2018.
Application	The Environmental Impact Assessment Report, Habitats Regulations Appraisal Report submitted to the Scottish Ministers by NnGOWL on 16 March 2018; the Addendum of Additional Information submitted to the Scottish Ministers by NnGOWL on 26 July 2018 and the Section 36 Consent Variation Report dated 08 January 2019.
Company	Neart na Gaoithe Offshore Wind Limited (NnGOWL) (Company Number SC356223). NnGOWL has been established to develop, finance, construct, operate, maintain and decommission the Project.
Consent Conditions	The terms that are imposed on the Company under the Offshore Consents that must be complied with
Consent Plans	The plans, programmes or strategies required to be approved by the Scottish Ministers (in consultation with appropriate stakeholders) in order to discharge the Consent Conditions.
Contractors	Any Contractor/Supplier (individual or firm) working on the Project, hired by NnGOWL.
EIA Report	The Environmental Impact Assessment Report, dated March 2018, submitted to the Scottish Ministers by NnGOWL as part of the Application.
Inter-array Cables	The offshore cables connecting the wind turbines to one another and to the OSPs.
Interconnector Cables	The offshore cables connecting the OSPs to one another.
Marine Licences	The written consents granted by the Scottish Ministers under the Marine (Scotland) Act 2010, for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Wind Farm (Licence Number 06677/19/0) and the OfTW (Licence Number 06678/19/1), dated 4 June 2019 and 5 June 2019 respectively.
Offshore Consents	The Section 36 Consent and the Marine Licences.
Offshore Export Cable Corridor	The area within which the offshore export cables are to be located.
Offshore Export Cables	The offshore export cables connecting the OSPs to the landfall site.
OfTW	The Offshore Transmission Works comprising the OSPs, offshore interconnector cables and offshore export cables required to connect the Wind Farm to the Onshore Transmission Works at the landfall.
OfTW Area	The area outlined in red and blue in Figure 1 attached to Part 4 of the OfTW Marine Licence.
OnTW	The onshore transmission works from landfall and above Mean Low Water Springs, consisting of onshore export cables and the onshore substation.
Original Application	The application letter, application form and Environmental Statement (ES) submitted to the Scottish Ministers by NnGOWL on 13 July 2012 for Section 36 Consent and Marine Licences together with the SEIS submitted to the Scottish Ministers by NnGOWL on 7 June 2013
Project	The Wind Farm and the OfTW.

TERM	DESCRIPTION
Section 36 Consent	The written consent granted on 3 December 2018 by the Scottish Ministers under Section 36 of The Electricity Act 1989 to construct and operate the Wind Farm, as varied by the Scottish Ministers under section 36C of the Electricity Act 1989 on 4 June 2019.
Section 36 Consent Variation Report	The Section 36 Consent Variation Report submitted to the Scottish Ministers by NnGOWL as part of the Application as defined above on 08 January 2019.
Subcontractors	Any Contractor/Supplier (individual or firm) providing services to the Project, hired by the Contractors (not NnGOWL).
Wind Farm	The offshore array as assessed in the Application including wind turbines, their foundations and inter-array cabling.
Wind Farm Area	The area outlined in black in Figure 1 attached to the Section 36 Consent Annex 1, and the area outlined in red in Figure 1 attached to Part 4 of the Wind Farm Marine Licence.

1 Introduction

1.1 Project Background

1. The Neart na Gaoithe Offshore Wind Farm (Revised Design) received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 03 December 2018 (the S36 Consent) and was granted two Marine Licences by the Scottish Ministers, for the Wind Farm and the associated Offshore Transmission Works (OfTW), on 03 December 2018 (the Marine Licences).

2. The S36 consent and Wind Farm Marine Licence were revised by issue of a variation to the S36 Consent and Marine Licence 06677/19/0 on 4 June 2019, and the OfTW Marine Licence by the issue of Marine Licence 06678/19/1 on the 5 June 2019. The revised S36 Consent and associated Marine Licences are collectively referred to as 'the Offshore Consents'.

3. The Wind Farm Area is located to the northeast of the Firth of Forth, 15.5 km directly east of Fife Ness on the east coast of Scotland. The Wind Farm Area covers approximately 105 km^2. Offshore export cables will be located within the 300 m wide Offshore Export Cable Corridor, running in an approximately southwest direction from the Wind Farm Area, making landfall at Thorntonloch beach to the south of Torness Power Station in East Lothian.

4. Figure 1-1 shows the Wind Farm Area and Offshore Export Cable Corridor, boundaries and cable route to shore.

5. The Offshore Consents allow for the construction and operation of the following main components, which together comprise the Project:

   - 54 wind turbines generating a maximum total output of 450 MW;
   - 54 jacket substructures installed on pre-piled foundations, to support the wind turbines;
   - Two alternating current (AC) substation platforms, referred to as OSPs, to collect the generated electricity and transform the electricity from 66kV to 220 kV for transmission to shore;
   - Two jacket substructures installed on piled foundations, to support the OSPs;
   - A network of inter-array subsea cables, buried and/or mechanically protected, to connect strings of turbines together and to connect the turbines to the OSPs;
   - One interconnector cable connecting the OSPs to each other;
   - Two buried and/or mechanically protected, subsea export cables to transmit the electricity from the OSPs to the landfall at Thorntonloch and connecting to the onshore buried export cables for transmission to the onshore substation and connection to the National Grid network; and
   - Minor ancillary works such as the deployment of metocean buoys and permanent navigational marks.

6. It is currently anticipated that offshore construction will take approximately three years and will commence in the latter part of Quarter 1 (Q1) 2020.

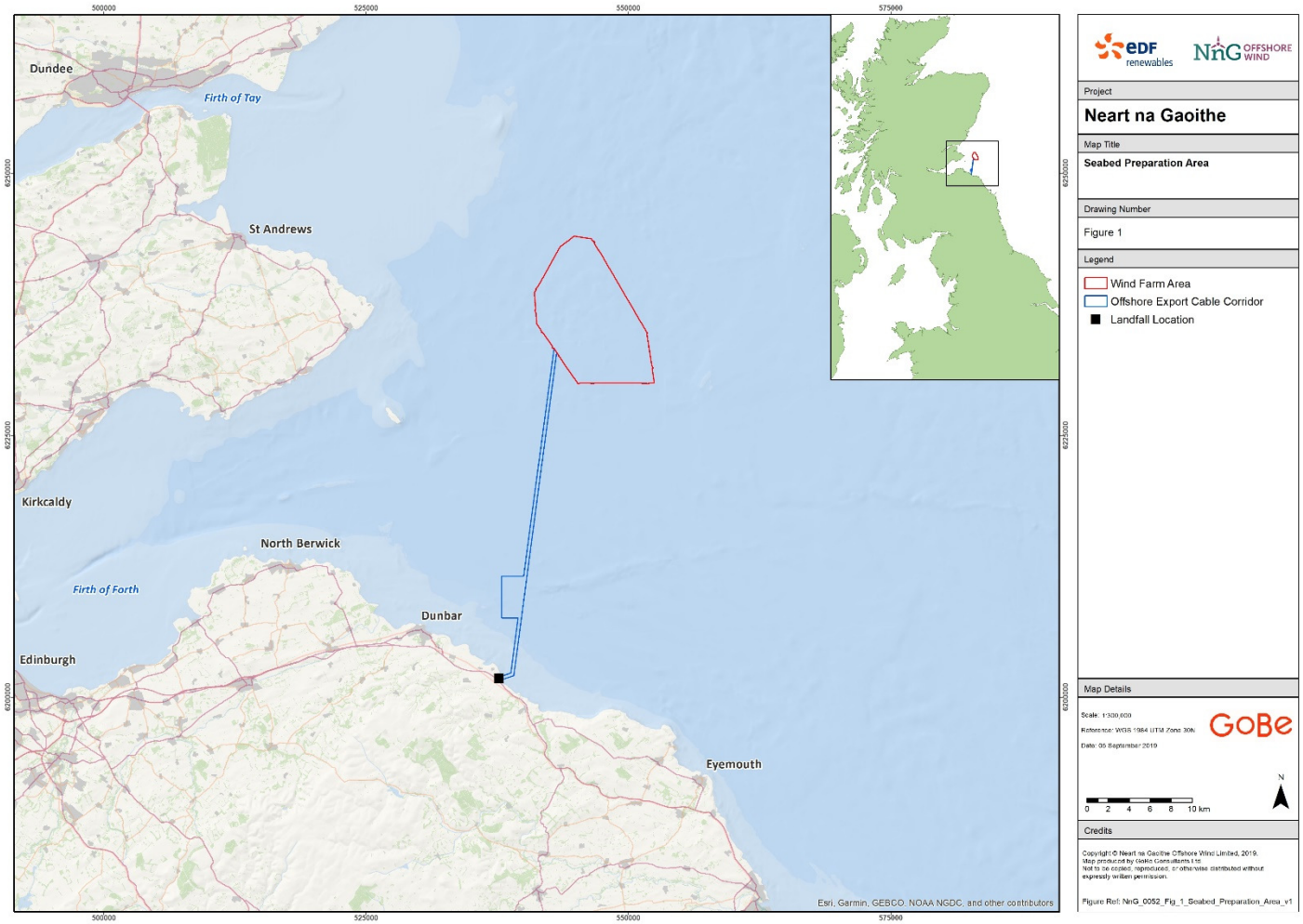

Figure 1-1: Location of Neart na Gaoithe Wind Farm and Export Cable Corridor seabed preparation area

1.2 Document Purpose

7. The Neart na Gaoithe Offshore Wind Farm Limited (NnGOWL) (Revised Design) S36 Consent and Marine Licences contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of any offshore construction works. Offshore construction of the Wind Farm is due to commence in 2020 and NnGOWL is currently undertaking preparatory work to progress the necessary pre-construction conditions under the existing consents.

8. However, ahead of the main construction works, pre-construction seabed preparation will need to be undertaken, including clearance works to relocate or remove boulders from the seabed in the vicinity of the wind turbine, and Offshore Substation Platform (OSP) foundations and the inter-array, interconnector and export cables, rock placement to infill seabed depressions in the vicinity of the wind turbine and OSP foundations, and the placement of gravel on the seabed at the OSP locations to protect the spud cans of the jack-up to be used during construction from exposed bedrock.

9. In order to undertake the seabed preparation within the Wind Farm Area and Offshore Export Cable Corridor in advance of discharging conditions for the existing consents, a Marine Licence is required from Marine Scotland Licensing Operations Team (MS-LOT) under the Marine (Scotland Act 2010 and the Martine and Coastal Access Act 2009.

10. In addition, due to the use of Ultra-Short Baseline (USBL) on the Remotely Operated Vehicle (ROVs) that may be employed in the completion of the seabed preparation works, a European Protected Species (EPS) licence is required under the provisions of the Conservation of Offshore Marine Habitats and Species Regulations 2017, an application for an EPS licence will be submitted alongside this Marine Licence application.

11. This Supporting Environmental Information Document has been prepared in support of the Marine Licence application to MS-LOT for the seabed preparation works. This document is intended to provide the regulatory authorities (and their statutory advisers, where relevant) with the necessary supporting information to inform the Marine Licensing process.

1.3 Report Structure

12. This document provides information relating to seabed preparation activities, including the removal or relocation of boulders across the Wind Farm Area and Offshore Export Cable Corridor. The structure and scope of sections is summarised below in Table 1-1: Document Structure

Table 1-1: Document Structure

SECTION		OVERVIEW
1	Introduction	Provides an overview of the project background, the purpose of this document and a summary of the works.
2	Description of the Proposed Works	A description of the requirements for seabed preparation, an estimate of the seabed areas where works will be undertaken and the proposed preparation methodologies.
3	Environmental Appraisal	Describes the screening process and provides a high-level overview of the receiving environment with a consideration of potential effects from the proposed works.
4	Characterisation of Cumulative Effects	Consideration of the potential cumulative effects of the proposed works.

5	Consideration of Likely Significant Effects (LSE)	Provides a screening of the potential for the seabed preparation to result in an LSE on the conservation objectives of any relevant European designated site.
6	Conclusions	Provides a conclusion of the receptors that are potentially sensitive to the proposed works and a summary of the next steps involved with the acquisition of necessary consents and approvals for the work.

2 Description of the Proposed Works

2.1 Introduction

13. The presence of boulders, seabed depressions and exposed bedrock around the OSPs locations in the Wind Farm Area and Offshore Export Cable Corridor represent a material risk to the safe construction of the Project. In order to enable safe construction of the Wind Farm and Offshore Export Cable Corridor, the seabed will, therefore, require preparation prior to construction. The following sections set out the description of the proposed works under the following sections:

- Risks presented by seabed boulders, seabed depressions and exposed bedrock;
- Seabed preparation requirements, including boulder clearance, infill of seabed depressions and gravel placement around the OSP locations;
- Seabed preparation methodology;
- Proposed programme of works; and
- Health and safety and environmental management.

2.2 Risks Presented by Seabed to Construction

2.2.1 Seabed boulders

14. Boulders within the vicinity of the proposed project infrastructure present risks to the construction phase in the following forms:

- Physical interference with the jack up vessel spud cans meaning that vessels may have to be positioned in sub-optimal locations for foundation installation, compromising the health and safety of personnel and reducing the efficiency of installation operations results in a delayed programme;
- Risk of damage to the jack up vessel spud cans and other construction equipment (such as, for example, the sub-sea piling template used for piling at the jacket locations); and
- Risk of damage to the cable installation tools or cables themselves.

15. Due to these reasons, NnGOWL is seeking, as far as reasonably possible, to remove boulders considered to be a risk from the vicinity of the foundations and cables as detailed in the Marine Licence application.

2.2.2 Seabed depressions

16. Seabed depressions within the Wind Farm Area, caused by previous jack up operations, could inhibit the placement and stability of the piling template prior to and during pile drilling operations. As a result, NnGOWL plan to infill the depressions with clean crushed rock from an onshore quarry (equivalent to the size of cobbles and gravel) prior to pile installation to prevent interference with the levelling of the pile drilling template.

2.2.3 Exposed bedrock at OSPs

17. Exposed bedrock within the Wind Farm Area at the two proposed OSP locations could inhibit the safe placement of the spud cans of the jack-up which will be used during the hook-up and commissioning of the platforms during construction. As a result NnGOWL plan to place clean crushed gravel from an

onshore quarry onto the seabed in the locations of each spud can, prior to arrival of the jack-up during construction, to prevent damage to the spud cans.

2.3 Seabed Preparation Areas and Quantities

2.3.1 Seabed preparation for boulder clearance

18. The seabed will require preparation in the following broad areas:

- Wind Farm Area;
- Specific areas within 300m x 300m box around the centre of planned wind turbine locations; (including spare turbine locations);
- Inter-array and interconnector cable routes;
- Specific areas within up to 400m x 400m box around the centre of the planned OSP locations;
- Specific areas within 300m x 300m box around proposed anchor locations;
- Offshore Export Cable Corridor including an additional box on the western side of the cable corridor to accommodate any future rerouting options around protruding bedrock (See Figure 1-1)[1].

19. In order to prepare the site for construction works, preparation of the seabed by the movement of isolated hard items of material will be required from the areas outlined in Table 2-1.

[1] It is recognised that any rerouting of the offshore export cable outside of the current Offshore Export Cable Corridor as detailed in the current OfTW Marine Licence for the Project will be subject to additional marine licensing or variation of the current Marine Licence. The programme for updating the OfTW Marine Licence will be agreed with MS-LOT subject to the completion of current geophysical and geotechnical site investigations.

Table 2-1: Seabed preparation areas

LOCATION	NUMBER OF SITES/LENGTH	PREPARATION FOOTPRINT DESCRIPTION PER LOCATION
Turbine sites (300 x 300 m box)	54 turbine locations 6 spare turbine locations	1 x 50 m diameter circle at each location 8 x 30 m diameter circle at each location
Anchor zone (300 x 300 m box)	7 anchor zones	1 x 50 m diameter circle
Inter-Array Cable routes	Totalling 94 km in length	60 m wide corridor
Interconnector Cables	Approximately 3.5 km	60 m wide corridor
OSPs (400 x 400 m box)	2	1 x 60 m diameter circle 8 x 30 m diameter circle
Offshore Export Cable Corridor including the additional seabed preparation area on the western side of Offshore Export Cable Corridor	1 (export cable corridor)	preparation for 200 m wide corridor (or 2 x 100 m corridors)

20. NnGOWL is planning to undertake, or are currently undertaking, two surveys prior to the completion of the seabed preparation works to provide more precise information on the exact condition of the seabed within these areas and in order to inform the design of the final seabed preparation requirements. These surveys are:

    - Offshore geophysical survey (covering the Wind Farm Area and Offshore Export Cable Corridor to approximately 1.5 km, from the coastal landfall, including the additional area presented in Figure 1-1)
    - Nearshore geophysical and seismic survey (covering nearshore portion of the Offshore Export Cable Corridor, from landfall out to approximately 1.5 km).

21. Therefore, at the time of this application submission the numbers and details of the areas requiring seabed preparation presented above are provided as worst case estimates. The total area of seabed affected within the Wind Farm Area and Offshore Export Cable Corridor, by the seabed preparation works will be approximately 14.7 km^2.

22. Note, for the purposes of defining boulder preparation works, boulders are defined as any seabed material with a grain size in excess of 20 cm.

2.3.2 Seabed preparation for seabed depressions

23. The seabed will require infill for seabed depressions within the Wind Farm Area in the vicinity of the turbines and spare turbine sites in areas affected by previous jack up operations. NnGOWL is planning to undertake, pre- and post-infill surveys.

24. The objectives of the pre-infill survey are:

    - To determine the topography of the un-touched seabed

- To establish topography around the proposed rock placement location;
- To estimate the required quantity of infill material (crushed rock)

25. A maximum of 64 spud can depressions on the seabed, of varying depths are to be filled. Including a contingency for the varying depths the total area of the seabed affected is circa 10,000m^2, with a total maximum volume of circa 75,000m^3 requiring rock placement.

26. During construction, intermediate surveys will be performed to verify the progress, i.e. build-up of backfill, and the quality of the work. The progress of the construction will be monitored 'on-line' by comparing the results of the intermediate survey with data from the corresponding pre-rock placement survey.

27. After completion of the infill scope, a post-infill survey will be carried out. The data gathered will be compared with the corresponding infill design data and pre-infill placement survey to ensure that the backfill operation is built within specifications.

28. All surveys described above will be performed using a multibeam echosounder (MBES) survey spread.

2.3.3 Seabed preparation for OSPs

29. The seabed will require the placement of gravel within the Wind Farm Area in the vicinity of the two OSPs, where the jack-up vessel will jack-up onto the seabed to undertake platform hook-up and commissioning. NnGOWL is planning to undertake, pre- and post-placement surveys.

30. The objectives of the pre-placement survey are:

- To determine the topography of the un-touched seabed
- To establish topography around the proposed rock placement location;
- To estimate the required quantity of infill material (crushed rock/gravel)

31. The jack-up vessel will have four legs each ending in spud cans and will only be jacked up to the seabed in one position per OSP location. Including a contingency for the varying gravel depths the total area of the seabed affected is circa 750m^2, with a total maximum volume of circa 2,250m^3.

32. During construction, intermediate surveys will be performed to verify the progress, i.e. build-up of backfill, and the quality of the work. The progress of the construction will be monitored 'on-line' by comparing the results of the intermediate survey with data from the corresponding pre-rock placement survey.

33. After completion of the placement scope, a post-placement survey will be carried out. The data gathered will be compared with the corresponding infill design data and pre-placement survey to ensure that the operation is built within specifications.

34. All surveys described above will be performed using a multibeam echosounder (MBES) survey spread.

2.4 Seabed preparation methodology

2.4.1 Preparation for boulder clearance

35. The contractor undertaking the seabed preparation activities is still to be selected. Consequently, the precise details of the methods to be used are not yet available and will depend on the outcome of the

contract tendering process currently being undertaken. It is currently expected that seabed preparation works for boulder clearance will be undertaken employing one of two primary methodologies, namely:

- Subsea grab; and/or
- Displacement plough.

36. Further details on these methodologies are presented in the following sections.

2.4.1.1 Subsea grab

37. Seabed preparation using a subsea grab (example shown in Figure 2-1) will be conducted within the Wind Farm Area and Offshore Export Cable Corridor. The vessel will be equipped with a surveillance facility and ROV as required for subsea positioning of the grab onto the boulders and for recording their new position. The ROV will also be equipped with a small mechanical cutter and small jetting machine, which would only be used if an unusually large boulder or anchor/chain is identified for removal or where sediments need to be jetted away to retrieve the boulder.

38. If the jetting tool is utilised, then the maximum sediment to be displaced per boulder would be circa 1 m^3. Nonetheless, it is considered unlikely that the mechanical cutter or jetting tool will be required for most grab operations.

Figure 2-1: Examples of mechanical subsea grabs equipped with (from left to right) small scale jetter cherry picker, grab, cutter or clam grab

39. The presence, position and nature of the boulders will first be visually confirmed through an ROV inspection. The subsea grab will be lowered over the confirmed boulders using the vessel crane. The engagement of the mechanical grab with the boulder will be guided by ROV observations. The boulder will then be lifted off the seabed and relocated, with recordings of its new position.

40. This relocation will take place on an individual boulder basis, where each boulder within the preparation area would be picked up, moved and placed on the seabed within the surveyed area of the Wind Farm Area or Offshore Export Cable Corridor. The boulders would be relocated from their source to a location within the surveyed area that has been declared 'clear' of other possible hazards or constraints (i.e.

other boulders, Archaeological Exclusion Zones (AEZs) or Unexploded Ordnance (UXO) from review of the geophysical survey results, subsequent inspection surveys and UXO preparation campaigns). Where possible, all boulders will be relocated within the immediate local area (and therefore within the same or similar seabed sedimentary environment).

41. Seabed preparation using a subsea grab can be a very effective way of relocating individual boulders that are found scattered in relatively small to moderate numbers across the seabed and gives the ability to relocate the boulders in a 'natural' scattered manner with only limited interaction with the seabed and therefore does not substantially disturb seabed sediments over a larger area. Operating in good weather and visibility conditions, the subsea grab method can typically relocate approximately 50 boulders per day (but up to 80 to 90).

42. However, there are limitations which come with the use of the subsea grab, these being it is relatively ineffective in areas densely populated with boulders (such as boulder fields where boulders are positioned next to and on top of each other).

43. It is important to note that the installation locations will be designed in such a way as to avoid (as far as reasonably practicable) other potential hazards and or constraints such as AEZs, UXO and Annex I reef features.

2.4.1.2 Displacement plough

44. A displacement plough (example shown in Figure 2-2), is a simple and robust Y-shaped design configured with a 15 m wide boulder board attached to the plough that scrapes along the seabed surface displacing boulders along a path. The plough will be dragged along the seabed using pulling chains and will be lightly ballasted to exclusively clear the way of boulders whilst avoiding a deeper depression in the seabed, which would result in the generation of a large berm on each side. Based on experience from similar projects, this approach is anticipated to produce a small berm approximately 0.25 m in height above the seabed and on either side of the plough.

Figure 2-2: Example of a displacement plough

45. Once launched from the vessel, the tool will be pulled along the seabed to clear boulders and mobile debris to a distance of approximately 7.5 m at either side of the centreline, resulting in a 15 m wide path. It is expected that a maximum of two lateral passes will be executed to increase the width of the corridor within the turbine foundation installation working area where necessary.

46. There are two potential limitations to using the displacement plough, which is why it may be necessary to use the two methods in combination. These limitations are;

- The displacement plough cannot be used in areas where slopes are present in excess of 5°; and
- If the displacement plough encounters an obstacle on the seabed such as a large boulder, that encounters a force greater than 80 Te, a rotational shift may occur in the displacement tool resulting in potential damage to the tool and reduced effectiveness of the clearance tool in these areas.

2.4.2 Preparation for seabed depression

47. Seabed preparation for seabed depressions will be undertaken using rock placement. Graded crushed rock (of sizes equating to that of cobbles and gravel) will be loaded on to the fall pipe vessel via a conveyor belt, incorporating a belt weighing system to measure the deposited quantities.

48. The crushed rock is then deposited to the seabed from the vessel via a fall pipe system. Located at the lower end of the Fall Pipe is a separately suspended ROV, equipped with thrusters to allow for horizontal corrections of the Fall Pipe bottom end position, enabling the ROV to rotate around the Fall Pipe. This provides a stable survey platform essential for the quality of data gathered by the survey sensors installed on the ROV.

49. The placement of the crushed rock is monitored on the vessel using the data provided by the ROV allowing accurate placement of the rock and to monitor volumes placed relative to the profiles of the seabed depressions measured prior to rock placement. In addition, intermediate surveys will be carried out at regular intervals to monitor the progress of the rock placement.

50. Following the rock placement, and where necessary to ensure the seabed where the subsea piling template is deployed is within a 5° gradient, a seabed levelling tool such as a sweep bar or plough may be deployed to ensure the required seabed gradient is achieved.

2.4.3 Preparation for OSPs

51. Seabed preparation to make the locations suitable for safe jack-up vessel operations will be undertaken using rock placement. Graded crushed rock (of size equating to gravel) will be loaded on to the fall pipe vessel via a conveyor belt, incorporating a belt weighing system to measure the deposited quantities.

52. The crushed rock is then deposited to the seabed from the vessel via a fall pipe system. Located at the lower end of the Fall Pipe is a separately suspended ROV, equipped with thrusters to allow for horizontal corrections of the Fall Pipe bottom end position, enabling the ROV to rotate around the Fall Pipe. This provides a stable survey platform essential for the quality of data gathered by the survey sensors installed on the ROV.

53. The placement of the crushed rock is monitored on the vessel using the data provided by the ROV allowing accurate placement of the rock and to monitor volumes placed. In addition, intermediate surveys will be carried out at regular intervals to monitor the progress of the rock placement.

54. Following the rock placement, and where necessary to ensure the seabed is suitable for the jack-up vessel, a seabed levelling tool such as a sweep bar or plough may be deployed to ensure the required seabed gradient is achieved.

2.4.4 Positioning System

55. All vessels undertaking the seabed preparation (the grab, plough and Fall Pipe techniques) will utilise USBL as a means of underwater acoustic positioning. The contractor undertaking the works is still to be selected and consequently, the precise details of the equipment to be used during the works is not yet available and will depend on the outcome of the contract tendering process currently being undertaken. However, the broad types of equipment that will be required are known and the assessment is based on a realistic worst-case scenario. Representative examples of the USBL equipment are presented in Table 2-2.

Table 2-2: Operating frequency and sound source level of USBL equipment.

GEOPHYSICAL EQUIPMENT	OPERATING FREQUENCY	MAXIMUM SOURCE LEVEL REPORTED BY MANUFACTURER (DB)
Subsea Positioning USBL (note only one of these devices will be used per vessel, although multiple vessels (up to four) may be using a USBL at any one time).		
Sonardyne Ranger USBL	35 – 50 kHz	200 (peak), 188 (rms)
Sonardyne Ranger 2 USBL HPT 3000	19 – 34 kHz	194 (peak), 188 (rms)
Sonardyne Scout	30 – 35 kHz	193 (peak)
Easytrak Nexus 2 USBL	18 – 32 kHz	198 (peak), 192 (rms)
Kongsberg HiPAP	21 – 30.5 kHz	207 (peak), 188 – 190 (rms)
Ix Blue GAPS	19 – 30 kHz	191 (rms)
Note – The Kongsberg HiPAP can be operated at differing sound levels depending on the survey requirements. For this survey, the equipment will be operated at 190 dB 0-p.		
Additional Equipment for Rock Placement:		
Multibeam echosounder Typical (only one system used)		
Reson 7125	200-400kHz	Not provided, but similar to below
EM2040	200-400kHz	218
Very High Frequency Obstacle Sonar - for visual inspection (only one system used)		
Aris Explorer 3000	1.8 – 3.0 MHz (1,800 kHz to 3,000 kHz)	200-206
Blueview P900	900 kHZ	Not available

2.5 Vessels

2.5.1 Dynamic Positioning 2 vessels

56. Typically, the vessels used for seabed preparation operations are Dynamic Positioning 2 (DP2) vessels and circa 75 - 100 m in length. An example is shown in Figure 2-3. Up to five separate vessels may be operating simultaneously to complete the seabed preparation works, supported by up to two guard vessels.

Figure 2-3 Example DP2 vessel

2.5.2 Fall Pipe Vessel

57. Fall pipe vessel (FPV) are designed to place rock material onto the seabed. The likely vessel used to infill the seabed depressions will be a Tideway DP2 Rollingstone or similar. FPVs are typically circa 140 m in length, but may vary up to 190 m, and have a loading capacity of up to 31,500 tonnes. Different FPVs may be used for infilling of seabed depressions and deployment of gravel over exposed bedrock at OSP locations.

2.6 Timing

58. The seabed preparation works (including boulder clearance and rock placement) are proposed to be undertaken between October 2019 and May 2021 inclusive. The seabed preparation works will be undertaken on a non-continuous basis throughout the licenced period. During the period when seabed clearance works may be undertaken, work may be undertaken 24 hours per day.

59. The duration of the seabed preparation works for boulder clearance is estimated as follows:

- Turbine sites, anchor zones and OSPs – 80 days (plus weather down time) (this component of the seabed clearance works is currently scheduled to be completed by 30th March 2020);
- Array routes – approximately 70 days (plus weather down time); and

- Export route – approximately 110 days (plus weather down time).

60. The preparation work to infill seabed depressions within the Wind Farm Area will take approximately 21 days to complete.

61. The preparation work at the OSPs for the jack up within the Wind Farm Area will take approximately 10 days to complete and will be undertaken either as part of the same campaign as the infill seabed depressions preparation work or separately.

2.7 Health and Safety and Environmental Management

62. NnGOWL's vision is to be an industry leader in Health, Safety and Environment (HSE) performance setting project safety standards across the renewables industry where with Zero Harm is a core value of the business. NnGOWL has developed a project-specific HSE Plan (NNG-1806-150-EDF-HSE_Plan-PLN-A01) that applies to all project operations, and which has the following objectives:

- NnGOWL will collectively deliver and construct the project safely and without harm to the environment, where every opportunity is taken to eliminate risk through engineering and task design to protect the individuals working on the project, those who will operate the asset through its life cycle and the environment in which it operates;
- NnGOWL will manage the project in a manner where the wellbeing of all personnel engaged on the Project are a priority;
- NnGOWL will ensure suitable and sufficient asset information is handed over upon completion of the Project to ensure the safe operation and maintenance of the asset though its operational life;
- NnGOWL will empower everyone on the Project to challenge actions and behaviours where there are opportunities for improvement to protect our employees, supply chain partners, members of the public and/or the environment;
- NnGOWL will be a learning organisation, taking experience previous projects and current performance to drive our performance; and
- NnGOWL will deliver the project sustainably where respect for the Environment will be seen as a key deliverable.

63. The NnG HSE Plan is underpinned by project-specific HSE Management Standards, covering a number of topics including the HSE Management System and Governance, Risk Management, Competency and Training, Observation and Incident Standards and Reporting and Emergency Response. All contractors will be obliged to comply with the HSE Plan.

3 Environmental Appraisal of Seabed Preparation Activities

3.1 Introduction

64. This section provides an overview of the baseline environment and an environmental assessment of the seabed preparation works. It is intended to represent a concise summary of information drawn largely from that collated to inform the Environmental Statements (ES) and Supplementary Environmental Information Statement (SEIS) (NnGOWL, 2013) produced to support the Original Application (NnGOWL, 2012) and the Application for the Project Offshore Consents including the Environmental Impact Assessment (EIA) Report (NnGOWL, 2018).

65. Effects on environmental receptors (as outlined in the following sections) associated with the seabed preparation works will be predominantly:

- Temporary habitat disturbance during grab or displacement plough deployment;
- Disturbance due to presence of construction vessels; and
- Habitat loss.

66. When considering effects from these sources, there a number of important points to consider which have a bearing on both the magnitude of effect and sensitivity of the receptor:

- The footprint of the works will be significantly smaller than for the realistic worst-case scenario assessed within the Original ES and comparable to the footprint assessed in the EIA Report for the Project;
- The footprint of the works will be relatively small in relation to the known distribution of similar benthic habitats;
- Rock placement for infill of seabed depressions and deployment of gravel over bedrock at OSP locations will be predominantly within the footprint of the main construction works;
- Boulders will be cleared to areas in close proximity to the works and that have boulder densities similar to that of the cleared area; and
- The total duration of the seabed preparation works will be circa 9 months (weather dependent).

67. The assessment criteria and EIA terminology used in the EIA Report (NnGOWL 2018) have been adopted for the purpose of this document. Further information and detail are presented within Chapter 6 of the EIA Report – EIA Methodology.

3.2 Screening of Potential Effects

68. The Original ES (NnGOWL, 2012) and the EIA Report produced to support the revised design (NnGOWL, 2018) have been reviewed to identify the environmental receptors that may be sensitive to the proposed works. Each of the relevant receptors that have potential for impact have been subject to a screening exercise. Table 3-1 sets out the results of this screening having considered the potential impacts that may arise, namely the temporary habitat disturbance during plough and grab deployment associated with seabed preparation work, habitat loss due to infilling of depressions and the presence of construction vessels.

Table 3-1: Screening of potential environmental receptors

RECEPTOR	DISTURBANCE TO SEABED	PRESENCE OF VESSELS	HABITAT LOSS	JUSTIFICATION
Marine Processes	✓	×	✓	There is no impact pathway for the presence of associated vessels to affect marine processes.
Benthic Subtidal and Intertidal Ecology	✓	×	✓	The presence of associated vessels will have no potential to significantly impact the benthic and epibenthic environment, particularly as a result of the limited temporal and spatial scale of the works relative to the receiving environment. There will be long term habitat loss directly under the turbine foundations, however the overall impact is considered to be of minor significance.
Fish and Shellfish Ecology	✓	×	✓	Due to the limited temporal and spatial scale of the works (relative to the receiving environment) there is no potential for significant impacts on fish ecology with respect to the presence of associated vessels. Although there will some habitat loss associated with the seabed preparation. The overall impact is considered to be of minor significance.
Marine Mammals	×	✓	×	As a result of the localised and short term nature of the works, it is not considered that there will be any significant direct or indirect impacts on marine mammal species with respect to disturbance to the seabed. Secondary effects on marine mammals resulting from reduced prey resource are therefore not considered further within this assessment.
Ornithology	×	✓	×	As a result of the localised and short-term nature of the works, it is not considered that there will be any significant direct or indirect impacts on ornithology with respect to disturbance to the seabed.
Nature Conservation (National)	✓	✓	×	All potential impacts associated with the works have the potential to impact upon nature conservation. However, the effect on habitat loss is considered not significant.
Commercial Fisheries	✓	✓	×	All potential impacts associated with the seabed preparation works have the potential to impact upon commercial fisheries. However, impact to habitat is considered not significant.
Shipping and Navigation	×	✓	×	There is no potential pathway of effect upon shipping and navigation resulting from disturbance to the seabed.
Marine Archaeology and Ordnance	✓	×	×	There is no potential pathway of effect upon archaeological receptors resulting from the presence of associated vessels.

RECEPTOR	DISTURBANCE TO SEABED	PRESENCE OF VESSELS	HABITAT LOSS	JUSTIFICATION
Aviation and MoD	×	×	×	There are no aviation and MoD receptors that could be impacted by the works.
Infrastructure	×	×	×	Any interaction with infrastructure and other users will be managed during the works to avoid and therefore there is no potential for significant impacts on this receptor.

3.3 Physical Environment

3.3.1 Summary of baseline

69. A range of studies and site-specific surveys have been completed by NnGOWL to establish the physical characteristics of the Wind Farm Area and Offshore Export Cable Corridor. These studies informed the EIA process for the Project and are presented in the Original ES (NnGOWL, 2012), and form the basis for this section of the report.

3.3.1.1 Bathymetry

70. Bathymetry across the Wind Farm Area ranges from 40 m to 58 m below Lowest Astronomical Tide (LAT). The shallowest water is located in the southern half of the Wind Farm Area, along a linear ridge orientated northwest to southeast, which rises 2 m above seabed level to 40.5 m. The deepest water, at approximately 58 m, occurs in the west of the Wind Farm Area close to the boundary within a channel orientated northwest-southeast.

71. Water depths in the Offshore Export Cable Corridor reach 58 m LAT adjacent to the Wind Farm Area boundary. Depths in the nearshore section of the Offshore Export Cable Corridor out to approximately 2 km from the shoreline are highly variable due to the presence of exposed folded bedrock that comprises the seabed here. Further offshore, out to approximately 7 km, the seabed gradient decreases and is generally flat and featureless, especially where soft-sediment makes up the seabed surface. Linear ridges, comprising east-west outcropping igneous dykes, are notable from 7.2 km to 8.5 km in 45 m to 50 m depths. These features rise up to 3 m above the surrounding seabed. From 8.5 km to 25.7 km the seabed deepens gradually to approximately 50 m to 60 m. From approximately 25 km northward to the Wind Farm Area, the bathymetry shallows to 46 m LAT.

3.3.1.2 Geological Characteristics

72. Studies undertaken as part of the Original EIA (NnGOWL, 2012) reported that the sediments mainly comprise muddy sand, fine to very fine sand and gravelly sand. These are underlain by Quaternary sediments, which reach up to 73 m thick in two palaeochannels that cross the site. The bedrock beneath this consists of Carboniferous limestones in the east and sandstones in the west. Along the Offshore Export Cable Corridor, the sediment is mainly muddy sand, but this is interrupted by a series of igneous dykes about 10 km offshore. The seabed then transitions to bedrock at the coast, consisting of Carboniferous limestone.

3.3.1.3 Tidal Processes

73. The hydrodynamic conditions are relatively uniform across the Wind Farm Area and Offshore Export Cable Corridor, with a mean spring tidal range of 4.6 m. Current speeds reach approximately 0.6 m/s on

the flooding mean spring tide, and 0.4 m/s on the flooding mean neap tide. The flood tide is stronger than the ebb tide. The 50-year return storm surge current is of comparable strength, at about 0.6 m/s. The absence of bedforms across the offshore site and along the cable route suggests little sediment transport and a relatively stable seabed, classed as 'slightly mobile'.

3.3.1.4 Wave Regime

74. The Wind Farm Area and Offshore Export Cable Corridor receives waves most frequently from a north-northeasterly direction (22.5 degrees); mean wave periods range between 2 and 9 s; and significant wave heights are up to about 6 m. Waves also arrive from both the southeastern and southwestern quadrants, but these form only a minor component of the wave direction spectrum.

75. The wave climate across the Wind Farm Area and Offshore Export Cable Corridor is uniform, with little spatial variation in either significant wave height or mean/peak wave period. The significant wave height is shown to vary between 1.2 m and 1.4 m (50%ile) and 5.2 m and 5.4 m (99%ile), with the mean wave period varying between 4.5 s and 5.0 s (50%ile) and 8.5 s and 9.0 s (99%ile), and peak wave period varying between 9.5 s and 10.0 s (50%ile) and 14.0 s and 15.0 s (99%ile).

3.3.2 Assessment of potential effects on the physical environment

76. The proposed works will result in the disturbance of small amounts of sediment, with the sediment being released into the water column and subsequently dispersed with the tide. Ploughing has the potential to create the greatest effect when compared to the use of the subsea grab and associated mechanical cutter or small jetting works (although as stated in Section 2.4.2 it is currently considered unlikely that the mechanical cutter or jetting tool will be required). In addition, the use of the plough and the grab will result in the redistribution of surficial sediments.

77. The Original ES (NnGOWL, 2012) covered the habitat loss associated within the foundation footprint of the project. The use of rocks to infill the seabed depressions beneath the drilling template will be within this footprint. It is therefore anticipated that the used of rock placement within the footprint of the jacket installation will not have an additional impact on the environment.

78. The Original ES (NnGOWL, 2012) assessed the realistic worst-case scenario for the burial of the export and inter-array cables by trenching. The use of trenching was assessed as generating the greatest volume of disturbed seabed sediment (effects associated with the subsea grab or the mechanical cutter or jetting tool would result in a more localised disturbance to Suspended Sediment Concentration (SSC)).

79. The Original ES (NnGOWL, 2012) concluded that there would be short-term increases in SSC that may temporarily exceed background levels; however, the resulting plumes would not be advected beyond the near field and would be rapidly dispersed by the tidal regime in the area, settling out within a few hours of disturbance. The ES concluded that the resulting deposition would occur over the Wind Farm Area and Offshore Export Cable Corridor. Settled material will be the same as that occurring naturally and will be subject to the natural processes of erosion/deposition experienced at the site. The levels of sediment disturbance and SSC resulting from the use of the displacement plough are expected to be substantially less that the effects of trenching, given that trenching involves cutting into the seabed and disturbing greater volumes as compared to the displacement plough which is drawn over the seabed surface and does not cut into the sediment.

80. As a result, the effects on sediment disturbance are considered to be negligible and localised and will therefore not affect the ambient sediment regime, especially given the fact that the deposited material will be similar to the prevailing surface sediment. Based on the conclusions of the Original ES (NnGOWL,

2012) and in consideration of the methods being employed for seabed preparation, effects are expected to be short lived and will not significantly change SSC beyond the immediate vicinity of the works.

3.4 Benthic Environment

3.4.1 Summary of Baseline

81. The dominant sediment type found in the Wind Farm Area is slightly gravelly muddy sand, although patches of coarser sediment (e.g., sandy gravel and gravelly sand) were also recorded within the Wind Farm Area. Benthic characterisation surveys undertaken to inform the Original ES (NnGOWL, 2012) reported that the Wind Farm Area is characterised by the biotope complex SS.SMu.CSaMu (circalittoral sandy mud) with epifaunal species present including seapens (e.g., *Virgularia mirabilis*) and brittlestars (e.g., *Amphiura* spp.). Infaunal species include polychaetes (e.g., *Spiophanes bombyx*) and bivalves (e.g., *Mysella bidentata*, *Abra* spp. and *Nuculoma* spp.).

82. Video analysis indicated biotopes more typical of soft sediments with polychaete tubes, megafauna burrows, seapens (e.g., *Pennatula phosphoracea* and *V. mirabilis*) and *Chaetopterus* tubes. These features suggest the presence of the Priority Marine Feature 'burrowed mud' and the component biotope SS.SMu.CFiMu.SpnMeg (Seapens and burrowing megafauna in circalittoral fine mud), covering a proportion of the wind farm area.

83. A series of rocky substrates corresponding to the exposure of the Wee Bankie Formation were also observed during video analysis with areas of a highly variable seabed comprising a mix of habitat types. These included large boulders and cobbles supporting a mosaic of the biotopes CR.MCR.EcCr.FaAlCr.Pom (faunal and algal crusts with *Pomatoceros triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock) and CR.MCR.EcCr.FaAlCr.Adig (*A. digitatum, P. triqueter, algal and bryozoan crusts on wave-exposed circalittoral rock*).

84. The Offshore Export Cable Corridor is characterised by deep circalittoral mud and gravelly muddy sand, typical of the outer Firth of Forth. The additional area to the west of the Offshore Export Cable Corridor was partially covered by the offshore geophysical survey campaign that informed the Original EIA. The geophysical data exhibited similar mixed sediment ground conditions as the Offshore Export Cable Corridor. Further inshore, the cable route is characterised by deep circalittoral coarse sediment and low energy rock habitats.

85. The habitat complexes along the Offshore Export Cable Corridor closer to the Wind Farm Area comprised muddy sand biotope complexes. Further inshore, the area is characterised by coarse sediment (e.g., SS.SCS.CCS) comprising cobbles, pebbles, gravel and coarse sand. Conspicuous fauna identified from the video images comprised keel worms *Pomatoceros* spp. and crustaceans such as *Munida rugosa*.

86. Discrete areas of both the Wind Farm Area and the Offshore Export Cable Corridor supported dense areas of the brittlestar *Ophiothrix fragilis* which fitted the biotope SS.SMx.CMx.OphMx.

87. The Wind Farm Area and Offshore Export Cable Corridor do not overlap with any sites currently designated for benthic habitats.

3.4.2 Assessment of potential effects on the benthic environment

88. Potential effects on benthic ecology during seabed preparation activities may arise from direct physical disturbance to the seabed and/or habitat loss or alteration, increases in suspended sediment concentrations (SSC) and subsequent sediment deposition. These impacts may have direct effects on certain benthic species, particularly filter feeders and visual predators. Effects from grab clearance will

be very localised in nature and the seabed preparation works, including the infill of seabed depressions, will occur at the same locations as the main construction (i.e. the foundation locations and cable routes) affecting broadly the same area of seabed.

89. Seabed preparation activities using the displacement plough resulting in direct disturbance and increased SSC will affect the benthos over a somewhat greater footprint and will be more analogous to the effects described for cable installation using a plough considered in the Original ES (NnGOWL, 2012) (noting that the plough cuts a trench into the seabed whereas the displacement plough for seabed preparation does not).

90. The Original ES (NnGOWL, 2012) suggested long term habitat loss directly under the turbine foundations with an overall impact on benthic communities predicted to be of minor significance. The required rock placement to infill the seabed depressions will be located mostly within the footprint of the jackets piling template (and therefore within the footprint of the jacket foundations) and therefore no additional impact to benthic habitats is anticipated. Deposition of gravel over bedrock will take place directly adjacent to the OSP platforms and whilst this will not ultimately be within the footprint of the jackets, impacts will have a small localised footprint. The overall area of habitat loss remains well within the design envelope footprint considered in the Original ES.

91. The footprint for seabed disturbance assessed within the Original ES (NnGOWL, 2012), considered preparatory works across the Wind Farm Area and Offshore Export Cable Corridor resulting in a far greater footprint than the works required for seabed preparation to remove boulders and for rock placement in this Marine Licence Application.

92. The Original ES (NnGOWL, 2012) assessed that the majority of biotopes recorded within the turbine array to have negligible vulnerability to temporary habitat disturbance associated with cable installation, as the fauna there is either burrowing or tolerant of higher sediment loads than those predicted to occur during the construction of the Neart na Gaoithe wind farm.

93. The Original ES (NnGOWL, 2012) stated that the magnitude of temporary sediment disturbance would be low as it will be short term and localised, and of minor significance (with a low uncertainty ascribed to the assessment).

94. Whilst there is the potential for localised direct habitat disturbance as a result of the seabed preparation activities, it is expected that any impacts on the seabed will be negligible and have only a localised effect, especially when set in the context of the habitats and species present. Similarly, the infill of seabed depressions will affect only a small area which lies predominantly within the footprint of the foundation installations. Given the localised nature of the works and the low sensitivity of the benthic communities it is considered that there will be no significant impacts on benthic habitats from the seabed preparation works.

3.5 Fish and Shellfish Ecology

3.5.1 Summary of baseline

95. The fish and shellfish assemblage within the Wind Farm Area and Offshore Export Cable Corridor is typical of coastal areas in this region of the North Sea (Barne et al., 1997; Eleftheriou et al., 2004).

96. Demersal species that inhabit the muddy sand and gravel habitats in the region include cod, haddock, monkfish, flatfish species and sandeel. Pelagic species that may be present in the area include herring, sprat and mackerel. Elasmobranchs such as lesser spotted dogfish, tope and thornback rays are also common within the wider region. A number of these species have feeding, nursery and spawning

habitats that overlap with the Wind Farm Area and Offshore Export Cable Corridor (Coull et al., 1998; Ellis et al., 2012).

97. Freshwater riverine habitats along the east coast of Scotland and England support a number of migratory species that may pass through the wind farm area during the ocean-going phase of their lifecycle (Malcolm et al., 2010). Migratory species include Atlantic salmon, sea trout, eel and lamprey species.

98. A number of shellfish species are also typically found in the region and have distribution that overlaps the Wind Farm Area and Offshore Export Cable Corridor including Nephrops and squid.

99. Several of the fish and shellfish species found to characterise the region are of commercial importance locally and regionally, and some are also of conservation importance due to their rarity or sensitivity, such as Atlantic salmon which is a qualifying feature of a number of designated Special Areas of Conservation (SACs) on the east coast of Scotland and in the north east of England.

3.5.2 Assessment of potential effects on the fish and shellfish ecology

100. The seabed preparation works have the potential to affect fish and shellfish resources as a consequence of direct disturbance to seabed sediments, resulting in increases in SSC as well as the potential to directly affect spawning, nursery or feeding habitats, particularly for demersal species.

101. Most of the fish species with defined spawning grounds in the wider area are pelagic spawners, which release their eggs into the water column and therefore spawning activity of these species will not be directly affected by the proposed works. Exceptions to this are herring and Ammodytidae (sandeels). In the particular case of sandeels, not only do they lay demersal eggs, but they also spend the majority of the time buried in the sediment.

102. Results of the site specific survey and analysis presented in the Original ES (NnGOWL, 2012) indicated that due to the relatively high mud content, habitats within the Wind Farm Area are unlikely to be suitable for sandeel populations. Results from the site specific faunal analysis supported this, with the total number of sandeel recorded being very low. The ES also concluded that the Wind Farm Area does not coincide directly with the herring spawning areas, which are located to the north off the Aberdeenshire coast and to the south with no evidence of spawning activity within the Wind Farm Area.

103. The Original ES (NnGOWL, 2012) concluded that the effects associated with installation of turbines, subsea cables and associated structures in relation to habitat disturbance, increases in SSC and subsequent deposition, will be of minor significance for all fish and shellfish receptors. Long term habitat loss directly under the turbine foundations, was also assessed in the Original ES (NnGOWL, 2012) which suggested that adult fish stocks will be unaffected by this loss, with the overall impact on fish and shellfish communities considered to be of minor significance. The placement of rock to infill the seabed depressions will be predominantly within the footprint of the installed jackets for the project, resulting in no additional impact. This assessment takes into account the low magnitude of the effect due to temporal (during construction) and spatial (local to the source) limitation. Given the limited scale of the seabed preparation works including boulder clearance and rock placement it can therefore be concluded that there will be no significant impacts on fish and shellfish species.

3.6 Marine Mammals

3.6.1 Summary of baseline

104. A series of marine mammal surveys were used to inform the EIA for the Project to determine the number and distribution of marine mammals within the Wind Farm Area. Visual boat surveys, acoustics surveys and aerial survey data was collected between 2009 and 2010 (NnGOWL, 2018).

105. Six species of marine mammals were recorded from the survey work: harbour porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*), white-beaked dolphin (*Lagenorhynchus albirostris*), killer whale (*Orcinus orca*) and grey (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*). The most abundant species recorded was harbour porpoise which was recorded regularly throughout the year. The second most frequently recorded marine mammal was grey seal with the majority of grey seal sightings in the spring and autumn periods. The remaining species, white-beaked dolphin, harbour seal and minke whale and killer whale, were recorded infrequently and in low numbers. There were no records of bottlenose dolphins during site-specific survey, however, due to the know distribution and presence of the resident Moray Firth population, it is considered likely that they will be present close to the Wind Farm Area to the north and west.

106. The results from the baseline surveys indicate that the Wind Farm Area does not support particularly high numbers or densities of marine mammals.

3.6.2 Assessment of potential effects on marine mammals

107. Increased vessel traffic associated with seabed preparation works has the potential to affect marine mammals. The potential impacts from vessel noise and the presence of vessels on marine mammals were assessed in the Original ES (NnGOWL, 2012) as being not significant (and were identified as not requiring further assessment during Scoping for the EIA for the Project (NnGOWL, 2018) and, given the duration on site of the construction vessels associated with main foundation and turbines installation and commissioning is now likely to be much reduced due to reduced scale of the Project.

108. As the seabed preparation works will be temporary and the operations localised, and involving only a small number of vessels, it is predicted that effects on marine mammals from increased vessel traffic associated with seabed preparation works will not be significant. Furthermore, the impact on prey resource and marine mammal foraging as a result of habitat loss is considered to be not significant and was not considered within the HRA (NnGOWL, 2018a).

109. Although no significant effect has been identified, further consideration is given to LSE on marine mammals as features of Natura 2000 sites in Section 6 of this document.

3.7 Ornithology

3.7.1 Summary of baseline

110. Three years of monthly boat-based surveys were undertaken to inform the Original EIA between 2009 and 2012 (NnGOWL, 2012). A total of 29 seabird species were identified during the site-specific surveys. The three most abundant species recorded during the surveys were gannet (*Morus bassanus*), puffin (*Fratercula arctica*) and guillemot (*Uria aalge*). Together these three species accounted for 62.3% of all birds recorded in the offshore site in Year 1, and 77.1% of all birds recorded in the offshore site in Year 2. All three species were recorded in all months.

111. Thirteen species of seabird were considered to be key species and were assessed in greater detail on account of the high numbers present at certain times of year, the likely high connectivity to Special Protection Areas (SPAs) (nine species), and their sensitivity to potential effects. These key species were fulmar (*Fulmarus glacialis*), sooty shearwater (*Puffinus griseus*), gannet, little gull (*Hydrocoloeus minutus*), lesser black-backed gull (*Larus fuscus*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), kittiwake (*Rissa tridactyla*), Arctic tern (*Sterna paradisaea*), guillemot, razorbill (*Alca torda*), puffin and little auk (*Alle alle*). All other species occurred only sporadically and in low or very low numbers.

3.7.2 Assessment of potential effects on ornithology

112. Seabed preparation activities have the potential to impact on ornithological receptors through displacement of seabirds from foraging habitat and may also cause flying birds to detour their flight routes. Although, there will be habitat loss of minor significance associated with the rock placement, no significant impacts are considered likely to occur on fish, shellfish or benthic receptors, (see Section 3.4 and Section 3.5) and as a result, secondary effects resulting from disturbance to prey species are not considered further in this assessment.

113. The Original ES (NnGOWL, 2012) concluded that for vessel disturbance, all the regularly occurring seabird species that forage in the Wind Farm Area are considered to have low susceptibility to vessel disturbance and consequently the impacts on ornithological receptors arising from increased vessel activity and construction noise were considered to be not significant. Given the comparable footprint and shorter duration of the seabed preparation operations, it is considered that there will be no significant effect on the ornithological receptors as a result of vessel activity associated with the works.

3.8 Marine Archaeology and Cultural Heritage

3.8.1 Summary of baseline

114. A desk-based study and archaeological assessment of geophysical and geotechnical survey data was carried out to identify potential archaeological assets that may be affected and to establish their current condition. This work also provided information upon which to base the assessment of archaeological potential (NnGOWL, 2012).

115. The desk-based assessment reviewed existing maritime records to identify potential wrecks in the Wind Farm Area or within the Offshore Export Cable Corridor and compared the locations with magnetic anomalies picked up in the geophysical survey of the site. There are nine recorded or charted wrecks and obstructions from the Seazone dataset located within the Wind Farm Area and one live wreck within the Export Cable Corridor.

116. Eight anomalies of high archaeological potential and seven of medium archaeological potential were identified across the Wind Farm Area through the archaeological review of site-specific geophysical survey data. All eight anomalies of high archaeological potential are located within the wind farm footprint and correspond with six known wreck sites recorded in the SeaZone/UKHO records. The remains of two military submarines designated as Protected Places under the Protection of Military Remains Act 1986 lie within the Wind Farm Area.

3.8.2 Assessment of potential effects on marine archaeology and cultural heritage

117. Identified archaeological sites within the Wind Farm Area are subject to Archaeological Exclusion Zones (AEZs) within which seabed works will not occur. The AEZs are identified in the Project Written Scheme

of Investigation (WSI), which is applicable to all pre-construction activities. Seabed preparation works will not occur within the AEZ areas. Impacts on known archaeology will therefore not occur.

118. The potential for interaction with unexpected archaeological features is also recognised, with the seabed preparation works having the potential to have a negative effect on features of unexpected archaeological interest. Any such discoveries that come to light during the course of the works will be addressed by following the protocol for archaeological discoveries outlined in the WSI.

119. Given the mitigation detailed within the WSI, and the avoidance of the AEZs, it can be concluded that there will be no significant effect on marine archaeological receptors as a result of the seabed preparation works.

3.9 Shipping and Navigation

3.9.1 Summary of baseline

120. A shipping survey conducted in 2010 found that between 16 and 17 vessels per day pass within 10 NM of the Wind Farm Area, with an average of 2 per day passing directly though the Wind Farm Area (NnGOWL,2012). A desk based review of this data was undertaken in 2017 using AIS data to confirm the validity of the 2010 data to inform the EIA (NnGOWL, 2018). A busy shipping route lies to the south of the Wind Farm Area, intersecting the Offshore Export Cable Corridor. This is mainly used by tankers and cargo vessels heading in/out of the Firth of Forth. Navigational features include a general practice and submarine exercise area that overlies the Wind Farm Area and Offshore Export Cable Corridor, and the Forth Ports Ltd authority area which is 8.4 NM west of the wind farm.

121. The Wind Farm Area is north and east of areas of high fishing vessel activity and approximately 4 NM west of recreational racing and sailing areas. Some recreational craft may be seen during summer daylight hours on a route that passes through the Wind Farm Area; and two similar routes intersecting the Offshore Export Cable Corridor.

3.9.2 Assessment of effects on shipping and navigation

122. During seabed preparation works, there will be a maximum of 6 vessels operating offshore at any one time. Standard mitigation measures will be implemented during the works to minimise any impact on shipping and navigation. Such measures include advanced warning of the seabed preparation activities promulgated by the issuing of Notices to Mariners (NtMs) and advertisement through the Kingfisher Fortnightly Bulletin as well as Navigation Information broadcasts, and the use of an offshore Fisheries Liaison Officer (FLO).

123. Given these mitigation measures, and the fact the works will be of a temporary duration and localised in nature, with only a maximum of 6 vessels in operation, it is concluded that there will be no significant effect on shipping and navigation as a result of the seabed preparation works.

3.10 Commercial Fisheries

3.10.1 Summary of baseline

124. The principal fishing activities were identified through assessment of available data and consultation with local fishery stakeholders to inform the EIA (NnGOWL, 2018). The active fisheries in the region are:

- Potting for crustacea species such as lobster, brown crab and velvet crab, and seasonally deploying hook and lines for mackerel;

- Bottom otter trawls targeting Nephrops using single or twin gears;
- Boat dredges targeting scallops; and,
- Other (hydraulic) dredging vessels targeting razor shell and soft-shelled clam.

125. Consultation with fishermen suggested that fishing grounds for Nephrops coincide with the Wind Farm Area and Offshore Export Cable Corridor although the fishery primarily targets grounds further inshore. The Nephrops fishery also seasonally targets squid within the same area. Potting regularly occurs across the Wind Farm Area and Offshore Export Cable Corridor and is ubiquitous in the region. Vessels targeting this area are predominantly located within the Anstruther and Eyemouth Fishery Districts.

126. Pittenweem is the principal fishing port in the area, followed by Dunbar and Eyemouth. Other ports that receive fewer catch landings are Crail, Methil and Leven, Anstruther, St Andrews, and West Wemyss.

3.10.2 Assessment of effects on commercial fisheries

127. The seabed preparation works have the potential to impact upon commercial fisheries operations through temporary exclusion from fishing grounds and through the disturbance to the seabed. On similar offshore wind farms, it has been reported that the seabed preparation activities produced a small berm of circa 0.25 m height above the existing seabed level and on either side of the ploughed area, where the cleared boulders slump into the shallow berm substrate. This small berm would not be expected to present a snagging risk to towed gear and as such it can be concluded that there will be no significant effects on commercial fisheries receptors from this activity.

128. The ES (NnGOWL, 2012) assessed the potential for displacement during construction as a continual phase for a maximum of 3 years' duration. The ES concluded effects minor adverse significance for all fleets with the exception of potting vessels across the Wind Farm Area and demersal otter trawlers across the offshore export cable route which were assessed as moderate significance. A number of mitigation measures will be implemented for the project in relation to commercial fisheries which, together with liaison with fisheries representatives, reduced the magnitude of this effect to low and the residual effect to minor adverse significance.

129. By comparison, the seabed preparation works, including boulder clearance and rock placement, will be localised in nature, be coincident with the areas within which the main construction works will occur, and occur over a relatively short period when compared to the main wind farm construction works. It can therefore be concluded that there will be no significant effect on commercial fisheries receptors from the seabed preparation works.

130. The FLO will be responsible for liaising with local fishermen regarding the seabed preparation works and also for posting the appropriate notices, including the Kingfisher Fortnightly Bulletin and NtM.

3.11 Nature Conservation Designations

3.11.1 Summary of baseline

131. A number of European designations are located along the east coast of Scotland and north east of England that are designated as protected areas for nature conservation or biodiversity purposes and which have the potential to have connectivity to the Wind Farm Area and Offshore Export Cable Corridor. Section 5 of this document presents an assessment of the potential impacts of the proposed works on relevant European proposed, candidate and designated sites. As such, only nationally designated sites such as Sites of Special Scientific Interest (SSSIs), Marine Protected Areas (MPAs) and National Nature Reserves (NNRs) are considered within this section.

132. The Original ES (NnGOWL, 2012) considered all sites of nature conservation interest in the vicinity of the Wind Farm Area and Offshore Export Cable Corridor that could be affected by the construction, operation and decommissioning of the project. A network of SSSIs and NNRs in Scotland are managed under the provisions of the Nature Conservation (Scotland) Act 2004 and the Wildlife and Countryside Act 1981 (as amended). These protect species and habitats of nature conservation importance. However, they are largely terrestrial and do not extend below the low water mark and will therefore not be affected.

133. There are a number of SSSIs located along the coast of eastern Scotland, as shown in Figure 3-1, which encompass a variety of intertidal habitats. The closest of these is the Isle of May SSSI, which also covers an area also designated as a SAC. The site has grey seal as a notified feature which aligns with the SAC qualifying feature. No SSSIs fall within the Export Cable Corridor. The Firth of Forth complex nature conservation MPA designated for ocean quahog aggregations, offshore subtidal sand and gravels, shelf banks and mounds and moraines representative of the Wee Bankie Key Geodiversity Area is located in offshore waters but does not directly overlap with the Wind Farm Area and Export Cable Corridor, see Figure 3-1.

3.11.2 Assessment of effects on nature conservation designations

134. Seabed preparation activities will not have a significant impact on marine mammal receptors, (including grey seal, the relevant feature for the SSSI designated sites as described above) as assessed under Section 3.6.2 above. Therefore, no significant impacts are predicted to the grey seal feature of this SSSI. No direct or indirect impacts will occur to any other SSSIs in the region.

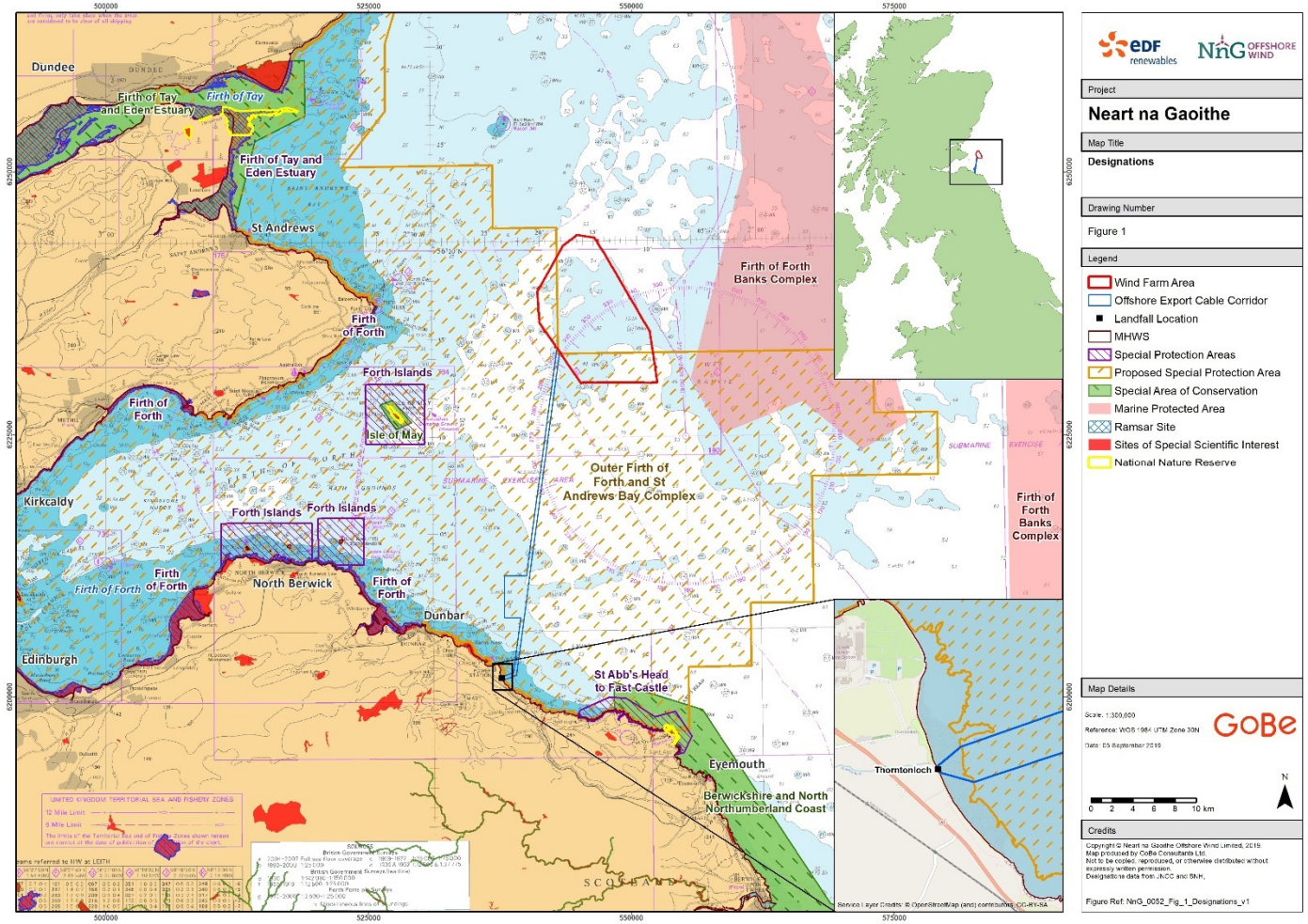

Figure 3-1: Location of nature conservation designated sites in the vicinity of NNG Wind Farm and Offshore Export Cable Corridor seabed preparation area

4 Characterisation of Potential Cumulative Effects

135. The assessment of cumulative effects presented in the Original ES (NnGOWL, 2012) and updated ES (NnGOWL, 2018) included both current and proposed projects, plans and activities. The assessment included not only other existing, proposed or planned offshore wind farms but also other types of development or activities taking place in the wider area. This information has been utilised in order to provide consideration of any potential cumulative effects from the seabed preparation works. Potential cumulative impacts identified within the original and updated ESs included potential disturbance of fish and marine mammals, displacement of birds, and restricted access for vessels as a result of the construction and operation of a number of offshore projects.

136. The characterisation of effects, as presented within Section 3 of this report, has identified that all effects will be highly localised and short term in nature and will not result in significant adverse impacts. When these effects are then considered in the context of the information on the current and proposed projects, plans and activities detailed in the original and updated ESs, (still considered valid for this assessment) the potential for the seabed preparation works contributing in a cumulative manner is also considered to be unlikely.

137. In addition, the seabed preparation works need to be considered cumulatively with the existing licensed works for the Wind Farm Area and Offshore Export Cable Corridor – i.e. the main construction of the Project, particularly in respect of seabed disturbance. The seabed preparation works will occur at the same locations as the main construction (i.e. the foundation locations and cable routes) affecting broadly the same area of seabed. As a result, the total amount of seabed habitat affected will not be substantially increased by the seabed preparation works when compared to the main construction, although the works will represent another disturbance event. Given the overall area of habitat affected will not be substantially increased and the habitats subject to temporary disturbance will recover, no significant cumulative effect is predicted.

138. When considering the potential for disturbance or displacement from vessels alongside existing licensed works for the Project and the application for UXO clearance works, the numbers of vessels within the Wind Farm Area and Offshore Export Cable Corridor will increase. The ES (NnGOWL, 2018) concluded that effects from construction vessels transiting to and from areas undergoing construction works related to the construction of the Project were not considered significant, however impacts relating to displacement from construction activities and loss or restricted access to fishing grounds were assessed as moderate significance.

139. The Original ES (NnGOWL, 2012) assessed the potential for displacement during construction for fishing vessels as a continual phase for a maximum of 3 years' duration, as opposed to the seabed preparation works which will occur over a non-continuous 9 month period. Fishing vessels will not be able to safely resume activities until the seabed is returned to an acceptable level for fishing to be safely resumed, although the frequency and duration of the cumulative impact is considered moderate, the fishing grounds impacted are low intensity on a regional scale. The seabed preparation works will occur broadly within the same footprint as the main construction works, as a result, the total area of fishing grounds affected will not be substantially increased. A number of measures will be implemented for the Project in relation to commercial fisheries which, together with liaison with fisheries representatives will mitigate any impacts.

5 Consideration of Likely Significant Effect

5.1 Introduction

140. This section is intended to provide an informal consideration of the potential for the seabed preparation works to lead to Likely Significant Effect (LSE) on the conservation objectives of any relevant European designated (Natura 2000) or Ramsar site.

141. Under the Conservation (Natural Habitats, &c.) Regulations 1994 (the Habitats Regulations), the competent authority would be required to make an Appropriate Assessment of the implications of a proposed activity in view of the conservation objectives for any potentially affected Natura 200 site, should it be determined that the proposed activity represents an LSE. The information presented in this section, is intended to provide the competent authority with the relevant information to enable them to determine the potential for LSE and therefore the need for an Appropriate Assessment.

142. This section provides a preliminary consideration of whether a qualifying feature is likely to be directly or indirectly affected. Where there is not a clear cut case for there being no LSE on the interest feature or conservation objectives, a fuller consideration should then be applied, using further analysis and information, to confirm and justify the presence or absence of LSE. Appropriate Assessment is needed in cases where an LSE cannot be ruled out.

143. An LSE is defined, in this context, as any effect (either alone or in-combination with other projects) that may be reasonably predicted as a consequence of a plan or project to affect the conservation objectives of the features for which the site was designated but excluding trivial or inconsequential effects.

144. The information in this section has been substantially informed by the Habitats Regulations Assessment (HRA) that was produced in support of the Project Application (NnGOWL, 2017).

5.2 Designated Sites

145. The Natura 2000 and Ramsar sites identified as relevant to this assessment were selected due to their immediate proximity to the proposed seabed preparation works and existence of potential impact pathways relevant to the site features. The seabed preparation activities referred to within this report were not specifically considered within the Original ES (NnGOWL, 2012) or HRA (NnGOWL, 2017)). However, the associated effects of seabed preparation activities can be considered with reference to the worst case effects described in the ES and considered in the HRA from the main construction activities.

146. As the purpose of this report is to identify the potential for any LSE and given the comparable footprint and shorter duration of the seabed preparation operations when compared to the main construction works, effect pathways to more distant designated sites were considered unlikely and have therefore been discounted.

5.3 Consideration of LSE

147. Potential sources of impacts from each aspect of the seabed preparation activities are considered below, as applicable and/or relevant to each of the following designated sites being considered (listed in no particular order) shown in Figure 3-1:

- Moray Firth SAC;
- Firth of Forth and Eden Estuary SAC;

- Isle of May SAC;
- Berwickshire and North Northumberland coast SAC;
- Forth Islands SPA;
- St Abb's Head to Fast Castle SPA; and
- Outer Firth of Forth and St Andrews Bay Complex pSPA.

5.3.1 Presence of vessels

148. A maximum of 6 vessels are proposed for the seabed preparation works. The potential for impact on the designated sites from the use of the above vessels will primarily relate to indirect disturbance, both in terms of noise and physical presence. This impact would be of a limited spatial impact and limited duration (intermittent during a maximum of circa 9 months over the entire licence period).

5.3.2 Physical disturbance to the seabed

149. Seabed preparation activities will result in both direct and indirect impacts on the seabed and species such as the physical loss/removal and/or smothering of habitat; physical damage from siltation, abrasion or selected extraction; increase in turbidity; and release of contaminants from disturbed sediments.

5.4 Summary of Potential for Impact

150. Table 5-1 to Table 5-7 briefly summarise the key features of each designated site and associated conservation objectives and present the outcomes of the assessments of LSE.

5.4.1 Moray Firth SAC

Table 5-1: Moray Firth SAC - Supporting Information

Description of the site	The Moray Firth SAC lies approximately 170 km (in a direct line) to the north of the Wind Farm Area and Offshore Export Cable Corridor. The site covers an area of 1,512 km^2 and is a marine site. Qualifying feature relevant to this assessment: • Bottlenose dolphin *Tursiops truncatus*	
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are established then maintained in the long term: • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the species; and • No significant disturbance of the species.	
Potential for LSE	**Presence of vessels**	The presence of vessels and underwater sounds created by large ships are unlikely to cause physical trauma to bottlenose dolphins but has the potential to make preferred habitats somewhat less attractive as a result of disturbance (habitat displacement, area avoidance). Although bottlenose dolphins are known to occur within the area, there were no sightings of bottlenose dolphin during the two years of boat-based surveys undertaken across the Wind Farm Area and Offshore Export Cable Corridor suggesting the area does not support key habitats for this species. The potential impacts from vessel noise and the presence of vessels on marine mammals were assessed in the Original ES (NnGOWL, 2012) as being not significant (and the issue was scoped out from further assessment in the EIA (Marine Scotland, 2017)); given this conclusion was in relation to the main construction works, the effect would be of even smaller scale for the seabed preparation works (noting also that vessel activity already occurs in the vicinity of the Wind Farm Area and Offshore Export Cable Corridor). Further, based on advice in the Scoping Opinion (Marine Scotland 2017) and the conclusions of the HRA Report (NnGOWL, 2018a) the only potential for LSE on bottlenose dolphin from the Moray Firth SAC were effects due to potential physical injury and disturbance arising from pile driving during construction of the Wind Farm on its own and in-combination with other offshore wind farms.

		As the seabed preparation works will be temporary and the operations localised and involving only a small number of vessels in the area over a relatively short duration, no LSE (alone or in-combination) are predicted on bottlenose dolphin as a feature of the Moray Firth SAC.
	Physical disturbance to seabed	Due to the local spatial extent and intermittent nature of the impacts on the seabed habitats and associated prey items and the highly mobile and wide ranging nature of bottlenose dolphins (coupled with empirical evidence indicating movement of animals back to the area of impact following cessation of offshore wind farm construction activity), no LSE are predicted on bottlenose dolphin as a feature of this site. The effects associated with physical disturbance to the seabed associated with the main construction works were not screened into the assessment presented within the HRA Report (NnGOWL, 2018a). As such, it can be concluded that there is no potential for LSE alone or in-combination.
	Habitat loss	There is no spatial overlap between the Wind Farm Area and Moray Firth SAC, therefore the effects associated with habitat loss from seabed preparation were not screened in the assessment presented within the HRA Report (NnGOWL, 2018a). Therefore, it can be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation.

5.4.2 Firth of Tay and Eden Estuary SAC

Table 5-2: Firth of Tay and Eden Estuary SAC Supporting Information

Description of the site	The Firth of Tay and Eden Estuary SAC lies approximately 30 km to the west of the Wind Farm Area and Offshore Export Cable Corridor Project. The site covers an area of 154 km^2 and is a coastal site comprising mainly of estuaries, tidal rivers, mud flats and sand flats. Qualifying feature relevant to this assessment: • Harbour seal *Phoca vitulina*
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are established then maintained in the long term: • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the species; and • No significant disturbance of the species.

Potential for LSE	**Presence of vessels**	There is the potential for localised avoidance of vessels by seals. During three years of boat-based surveys harbour seals were infrequently recorded within the Wind Farm Area and buffer area (extending 8 km around the Wind Farm Area), the majority of sightings were outside of the Wind Farm Area with most observations to the south-east of the site. It is known that harbour seals are opportunistic feeders, feeding up to 40-50 km from their haul out sites, and taking a wide variety of prey. Given that the seabed preparation works will be temporary and the operations localised, occurring intermittently and over a relatively short duration, and involving only a small number of vessels, it is predicted that increased vessel traffic associated with seabed preparation works will not lead to a significant effect. The potential impacts from vessel noise and the presence of vessels on marine mammals were assessed in the Original ES (NnGOWL, 2012) as being not significant (and the issue was scoped out from further assessment in the EIA (Marine Scotland, 2017)); given this conclusion was in relation to the main construction works, the effect would be of even smaller scale for the seabed preparation works (noting also that vessel activity already occurs in the vicinity of the Wind Farm Area and Offshore Export Cable Corridor).
	Physical disturbance to seabed	Due to the local spatial extent and intermittent nature of the impacts on the seabed habitats and associated prey items and the highly mobile and wide ranging nature of harbour seals (and their ability to forage on a wide range of prey species), no adverse effects are predicted on harbour seals as a feature of this site. The effects associated with physical disturbance to the seabed associated with the main construction works were not screened into the assessment presented within the HRA Report (2018a). As such, it can be concluded that there is no potential for LSE alone or in-combination. It is noted that the effects associated with physical disturbance to the seabed (for the main construction works) were not screened into the assessment presented within the HRA Report (NnGOWL, 2018a).
	Habitat loss	There is no spatial overlap between the Wind Farm Area and Firth of Tay and Eden Estuary SAC, therefore the effects associated with habitat loss from seabed preparation were not screened in the assessment presented within the HRA Report (NnGOWL, 2018a). Therefore, it can be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation

5.4.3 Isle of May SAC

Table 5-3: Isle of May SAC – Supporting Information

Description of the site	The Isle of May SAC lies approximately 16 km to the west of the Wind Farm Area and Offshore Export Cable Corridor. The site covers an area of 3.56 km^2 and is an island site comprising mainly of marine habitat. Qualifying features relevant to this assessment: • Grey seal *Halichoerus grypus*
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are established then maintained in the long term: • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the species; and • No significant disturbance of the species.

Potential for LSE	**Presence of vessels**	There is the potential for localised avoidance of vessels by seals. Grey seals are known to occur regularly in the waters around the Wind Farm Area and Offshore Export Cable Corridor. Data from existing offshore wind farms suggesting a low sensitivity to disturbance and rapid returns to construction sites, together with the ability of grey seals to forage widely indicate that there would no effect on their foraging behaviour. As the seabed preparation works will be temporary and the operations localised and involving only a small number of vessels working intermittently over a relatively short duration, it is predicted that effects on grey seal from increased vessel traffic associated with seabed preparation works will not be significant. The potential impacts from vessel noise and the presence of vessels on marine mammals were assessed in the Original ES (NnGOWL, 2012) as being not significant (and the issue was scoped out from further assessment in the 2018 EIA (Marine Scotland, 2017); given this conclusion was in relation to the main construction works, the effect would be of even smaller scale for the seabed preparation works (noting also that vessel activity already occurs in the vicinity of the Wind Farm Area and Offshore Export Cable Corridor). The most recent scoping opinion provided by Marine Scotland (Marine Scotland, 2017) advised that the only impacts from the proposed Project alone and in-combination that could have a likely significant effect on seals are the impacts from noise arising from pile driving during. This being the case for the main construction works, a similar conclusion is drawn for the seabed preparation works. As such, it can be concluded that there is no potential for LSE alone or in-combination.
	Physical disturbance to seabed	There will be no direct impacts on the distribution and extent of habitats supporting the species, but the potential for indirect impacts on habitats that support prey items. Due to the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of grey seals coupled with empirical evidence indicating movement of animals back to the area of impact following cessation of the activity, no significant effects are predicted on grey seals. The effects associated with physical disturbance to the seabed, from the main construction works, were screened out of the assessment presented within the HRA Report (NnGOWL, 2018a). As such, it can be concluded that there is no potential for LSE alone or in-combination.
	Habitat loss	There is no spatial overlap between the Wind Farm Area and Isle of May SAC, therefore the effects associated with habitat loss from seabed preparation were not screened in the assessment presented within the HRA Report (NnGOWL, 2018a). Therefore, it can be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation

5.4.4 Berwickshire and North Northumberland Coast SAC

Table 5-4: Berwickshire and North Northumberland Coast SAC supporting Information

Description of the site	The Berwickshire and North Northumberland Coast SAC lies approximately 33 km to the south of the Wind Farm Area and Offshore Export Cable Corridor. The site covers an area of 652 km^2 and is a coastal and marine site comprising mainly of marine areas, tidal rivers, estuaries, mud flats, sand flats and lagoons Qualifying feature relevant to this assessment: • Grey seals *Halichoerus grypus*	
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are established then maintained in the long term: • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the species; and • No significant disturbance of the species.	
Potential for LSE	**Presence of vessels**	There is the potential for localised avoidance of vessels by seals. Grey seals are known to occur regularly in the waters around the Wind Farm Area and Offshore Export Cable Corridor. Data from existing offshore wind farms suggesting a low sensitivity to disturbance and rapid returns to construction sites, together with the ability of grey seals to forage widely indicate that there would no effect on their foraging behaviour. As the seabed preparation works will be temporary and the operations localised and involving only a small number of vessels working intermittently over a relatively short duration, it is predicted that effects on grey seal from increased vessel traffic associated with seabed preparation works will not be significant. The potential impacts from vessel noise and the presence of vessels on marine mammals were assessed in the Original ES (NnGOWL, 2012) as being not significant (and the issue was scoped out from further assessment in the 2018 EIA (Marine Scotland, 2017) given this conclusion was in relation to the main construction works, the effect would be of even smaller scale for the seabed preparation works (noting also that vessel activity already occurs in the vicinity the Wind Farm Area and Offshore Export Cable Corridor). The most recent scoping opinion provided by Marine Scotland (Marine Scotland 2017) advised that the only impacts from the proposed Project alone and in-combination that could have a likely significant effect on seals are the impacts from noise arising from pile driving during. This being the case for the main construction works, a similar conclusion is drawn for the seabed preparation works.

		As such, it can be concluded that there is no potential for LSE alone or in-combination.
	Physical disturbance to seabed	There will be no direct impacts on the distribution and extent of habitats supporting the species, but the potential for indirect impacts on habitats that support prey items. Due to the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of grey seals coupled with empirical evidence indicating movement of animals back to the area of impact following cessation of the activity, no significant effects are predicted on grey seals. The effects associated with physical disturbance to the seabed, from the main construction works, were screened out of the assessment presented within the HRA Report (NnGOWL, 2018a). As such, it can be concluded that there is no potential for LSE alone or in-combination.
	Habitat loss	There is no spatial overlap between the Wind Farm Area and Berwickshire and North Northumberland SAC, therefore the effects associated with habitat loss from seabed preparation were not screened in the assessment presented within the HRA Report (NnGOWL, 2018a). Therefore, it can be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation

5.4.5 Forth Islands SPA

Table 5-5: Forth Islands SPA Supporting Information

Description of the site	The Forth Islands SPA lies approximately 16 km to the west of the Wind Farm Area and Offshore Export Cable Corridor. The site comprises a series of islands supporting the main seabird colonies in the Firth of Forth including the Isle of May, Bass Rock, Craigleith, Inchmickery, Fidra and The Lamb. Qualifying features relevant to this assessment (* indicates assemblage qualifier only) • Arctic tern *Sterna paradisaea*; Common tern *Sterna hirundo*; Cormorant *Phalacrocorax carbo**; Fulmar *Fulmarus glacialis**; Gannet *Morus bassanus*; Guillemot *Uria aalge**; Herring gull *Larus argentatus**; Kittiwake *Rissa tridactyla**; Lesser black-backed gull *Larus fuscus*; Puffin *Fratercula arctica*; Razorbill *Alca torda**; Roseate tern *Sterna dougallii*; Sandwich tern *Sterna sandvicensis*; Shag *Phalacrocorax aristotelis*; and Seabird assemblage.
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the species; and

	• No significant disturbance of the species.	
Potential for LSE	**Presence of vessels**	Marine Scotland (2011) presented a summary of the potential for adverse effects on bird features associated with offshore wind farms, including a review of the potential for noise and visual disturbance associated with the use of vessels for the seabed preparation works. In general, the review found that sudden noises tended to disturb birds, while birds have the ability to habituate to regular sound as long as there is no large amplitude 'startling' component. When viewed in the wider context of the shipping and navigation in the area, the impacts associated with vessels present to complete the seabed preparation works will be localised, short term and intermittent over a relatively short duration. The duration, magnitude and extent of impacts resulting from vessel activity on the SPA qualifying species is, therefore, assessed as being unlikely to compromise the conservation objectives the SPA. Consequently, no potential for LSE is predicted (alone or in-combination).
	Physical disturbance to seabed	There is potential for a sediment plume to occur that could affect the ability of birds to forage in the water column. The Original ES (NnGOWL, 2012) concluded that there would be only short-term increases in SSC that may temporarily exceed background levels (from the main construction works); however, the resulting plumes would not be advected beyond the near field and rapidly dispersed by the tidal regime in the area and will settle out within a few hours of disturbance. The Original ES concluded that the resulting deposition would be limited and would occur over the whole project area. Settled material will be the same as that occurring naturally and will be subject to the natural processes of erosion/deposition experienced at the site. The levels of sediment disturbance and SSC resulting from the use of the displacement plough are expected to be very substantially less that the worst case impacts assessed within the ES. The increase in sediment in the water column will, therefore, relatively low, localised, short term and occur intermittently over the duration of the works; this will not impact on the ability of seabirds to forage. As such, the duration, magnitude and extent of impacts resulting from increased suspended sediment concentrations and prey availability in the water column on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of the SPA. Consequently, no potential for LSE is predicted (alone or in-combination).
	Habitat loss	The effects associated with habitat loss from seabed preparation were not screened in the assessment presented within the HRA Report (NnGOWL, 2018a). Therefore, it can be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation and seabird foraging.

5.4.6 St Abb's Head to Fast Castle SPA

Table 5-6: St Abb's Head to Fast Castle SPA Supporting Information

Description of the site	St Abb's Head to Fast Castle SPA lies approximately 31 km to the south of Wind Farm Area and Offshore Export Cable Corridor. The site comprises an area of sea cliffs and coastal strip stretching over 10 km along the Berwickshire coast, north of St Abb's. Qualifying features relevant to this assessment (* indicates assemblage qualifier only) • Guillemot *Uria aalge**; Herring gull *Larus argentatus**; Kittiwake *Rissa tridactyla**; Razorbill *Alca torda**; Shag *Phalacrocorax aristotelis** and Seabird assemblage	
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the species; and • No significant disturbance of the species.	
Potential for LSE	**Presence of vessels**	Marine Scotland (2011) presented a summary of the potential for adverse effects on bird features associated with offshore wind farms, including a review of the potential for noise and visual disturbance associated with the use of vessels for the seabed preparation works. In general, the review found that sudden noises tended to disturb birds, while birds have the ability to habituate to regular sound as long as there is no large amplitude 'startling' component. When viewed in the wider context of the shipping and navigation in the area, the impacts associated with vessels present to complete the seabed preparation works will be localised, short term and intermittent over a relatively short duration. The duration, magnitude and extent of impacts resulting from vessel activity on the SPA qualifying species is, therefore, assessed as being unlikely to compromise the conservation objectives the SPA. Consequently, no potential for LSE is predicted (alone or in-combination).

	Physical disturbance to seabed	There is potential for a sediment plume to occur that could affect the ability of birds to forage in the water column. The Original ES (NnGOWL, 2012) concluded that there would be only short-term increases in SSC that may temporarily exceed background levels (from the main construction works); however, the resulting plumes would not be advected beyond the near field and rapidly dispersed by the tidal regime in the area and will settle out within a few hours of disturbance. The Original ES concluded that the resulting deposition would be limited and would occur over the whole project area. Settled material will be the same as that occurring naturally and will be subject to the natural processes of erosion/deposition experienced at the site. The levels of sediment disturbance and SSC resulting from the use of the displacement plough are expected to be very substantially less that the worst case impacts assessed within the Original ES. The increase in sediment in the water column will, therefore, relatively low, localised, short term and occur intermittently over the duration of the works; this will not impact on the ability of seabirds to forage. As such, the duration, magnitude and extent of impacts resulting from increased suspended sediment concentrations and prey availability in the water column on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of the SPA. Consequently, no potential for LSE is predicted (alone or in-combination).
	Habitat loss	The effects associated with habitat loss from seabed preparation were not screened in the assessment presented within the HRA Report (NnGOWL, 2018a). Therefore, it can be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation and seabird foraging.

5.4.7 Outer Firth of Forth and St Andrews Bay pSPA

Table 5-7: Outer Firth of Forth and St Andrews Bay pSPA Supporting Information

Description of the site	The Outer Firth of Forth and St Andrews Bay Complex pSPA partially overlaps with the Wind Farm Area and the whole of the Export Cable Corridor (see Figure 3-1). The site comprises of marine and coastal habitat. Qualifying features relevant to this assessment: • Arctic tern *Sterna paradisaea*, Black-headed gull *Chroicocephalus ridibundus*, Common gull *Larus canus*, Common scoter *Melanitta nigra*, Common tern *Sterna hirundo*, Eider *Somateria mollissima*, Gannet *Morus bassanus,* Goldeneye *Bucephala clangula,* Guillemot *Uria aalge*, Herring gull *Larus argentatus*, Kittiwake *Rissa tridactyla*, Little gull *Hydrocoloeus minutus*, Long-tailed duck *Clangula hyemalis*, Manx shearwater *Puffinus puffinus*, Puffin *Fratercula arctica*; Razorbill *Alca torda*, Red-breasted merganser *Mergus serrator*, Red-throated diver *Gavia stellata*, Shag *Phalacrocorax aristotelis*, Slavonian grebe *Podiceps auratus,* Velvet scoter *Melanitta fusca*.
Conservation objectives of the site	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species; and to ensure for the qualifying species that, subject to natural change, the following attributes are maintained in the long term:

	• The species as a viable component of the site; • No significant disturbance of the species or significant reduction in ability of the species to utilise important parts of the site; and • Distribution and extent of habitats and the structure, function and supporting processes of the habitats supporting the qualifying species and their prey are maintained.	
Potential for LSE	**Presence of vessels**	Marine Scotland (2011) presented a summary of the potential for adverse effects on bird features associated with offshore wind farms, including a review of the potential for noise and visual disturbance associated with the use of vessels for the seabed preparation works. In general, the review found that sudden noises tended to disturb birds, while birds have the ability to habituate to regular sound as long as there is no large amplitude 'startling' component. When viewed in the wider context of the shipping and navigation in the area, the impacts associated with vessels present to complete the seabed preparation works will be localised, short term and intermittent over a relatively short duration. The duration, magnitude and extent of impacts resulting from vessel activity on the SPA qualifying species is, therefore, assessed as being unlikely to compromise the conservation objectives the SPA. Consequently, no potential for LSE is predicted (alone or in-combination).
	Physical disturbance to seabed	There is potential for a sediment plume to occur that could affect the ability of birds to forage in the water column. The ES (NnGOWL, 2012) concluded that there would be only short-term increases in SSC that may temporarily exceed background levels (from the main construction works); however, the resulting plumes would not be advected beyond the near field and rapidly dispersed by the tidal regime in the area and will settle out within a few hours of disturbance. The Original ES concluded that the resulting deposition would be limited and would occur over the whole project area. Settled material will be the same as that occurring naturally and will be subject to the natural processes of erosion/deposition experienced at the site. The levels of sediment disturbance and SSC resulting from the use of the displacement plough are expected to be very substantially less that the worst case impacts assessed within the ES. The increase in sediment in the water column will, therefore, relatively low, localised, short term and occur intermittently over the duration of the works; this will not impact on the ability of seabirds to forage. As such, the duration, magnitude and extent of impacts resulting from increased suspended sediment concentrations and prey availability in the water column on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of the SPA. Consequently, no potential for LSE is predicted (alone or in-combination).
	Habitat loss	During construction, there is the potential for indirect effects on bird communities resulting from impacts on prey availability to occur, the HRA Report (NnGOWL, 2018a) considered the loss of habitat as a result of construction and presence of turbines and cable protection. The HRA concluded that the very small area of seabed habitat lost within the pSPA as a result of turbine installation and cable protection will not cause a significant reduction in the extent, distribution or quality of habitats that support the qualifying species or their prey. The habitat loss associated with rock placement is within close proximity to the foundation footprint and represents a small proportion of the habitat type present across the region and within the SPA. It can therefore be concluded that there is no potential for LSE alone or in-combination relating to habitat loss associated with the seabed preparation.

5.5 Implications of the Nature Conservation Advice

151. For the relevant designated sites detailed in this section, it can be concluded with confidence that the seabed preparation works will not affect the population or distribution of the qualifying features of the Natura 2000 sites. This is due to the limited duration, magnitude and extent of the impact related to the physical presence of the vessels, and the physical disturbance of the seabed as a result of the seabed preparation works. Therefore, it can be concluded that there will be no LSE as a result of the proposed seabed preparation works on these designated sites.

5.6 In-Combination Effects

152. Given that alone, the seabed preparation works have been assessed to have no LSE on the species and habitats for which the sites are designated, it is concluded that the seabed preparation works therefore would not contribute towards any significant in-combination impact.

5.7 No LSE Conclusions

153. The purpose of Section 5 of this document is to determine if the proposed seabed preparation works constitute an LSE on the relevant designated sites. Should the proposed works have the potential to lead to an LSE, then it would be necessary to ascertain the potential for adverse effect on the integrity of the relevant designated site, to enable the Competent Authority to undertake an Appropriate Assessment.

154. The proposed seabed preparation works either fall with, or are in close proximity to the following relevant designated sites, which are identified as follows:

- Forth Islands SPA
- St Abb's Head to Fast Castle SPA
- Outer Firth of Forth and St Andrews Bay Complex pSPA
- Moray Firth SAC
- Firth of Forth and Eden Estuary SAC
- Isle of May SAC
- Berwickshire and North Northumberland coast SAC

155. The assessment undertaken in this section has established that given the nature of the effects predicted (both in magnitude and duration), the scale of the features present and the existing activity levels taking place in the area, there is no potential for LSE on these features and the works will not conflict with the Conservation Objectives for the sites.

6 Conclusion

156. This Supporting Environmental Information report has been prepared in advance of proposed seabed preparation works associated with Neart na Gaoithe Offshore Wind Farm. This document is intended to provide the regulatory authorities (and their statutory advisers, where relevant) with the necessary supporting information to inform the Marine Licensing process for the proposed works.

157. This report has undertaken a consideration of environmental effects resulting from proposed seabed preparation works. The seabed preparation works will be undertaken in discrete campaigns throughout the licence period, with works expected to take a maximum of circa 9 months to complete, commencing in November 2019.

158. Receptors that may be affected by the seabed preparation works have been identified and assessed. No significant effects (alone or cumulatively) are predicted to occur given the small scale and temporary duration of the works, and when considering the mitigation already in place for the Project.

159. The LSE assessment undertaken within this document has been established through a review of the following:

- The nature of the effects predicted (both in magnitude and duration);
- The scale of the features present; and
- The existing activity levels taking place in the area.

160. No LSE is concluded for the sites considered.

161. The following mitigation will be adopted to in relation to the seabed preparation works:

- Advanced warning of activities through the promulgation of Notice to Mariners, advertisement on Kingfisher charts and VHF radio transmissions;
- Vessels will be lit appropriately (i.e., they will display lights and signals in accordance with the UK Standard Marking Schedule for Offshore Installations, and in accordance with the requirements of the International Regulations for the Prevention of Collisions at Sea);
- Compliance with agreed archaeological AEZs and adherence to the WSI at all times during the seabed preparation works; and
- The use of a FLO to communicate with local commercial fisheries interests.

7 References

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