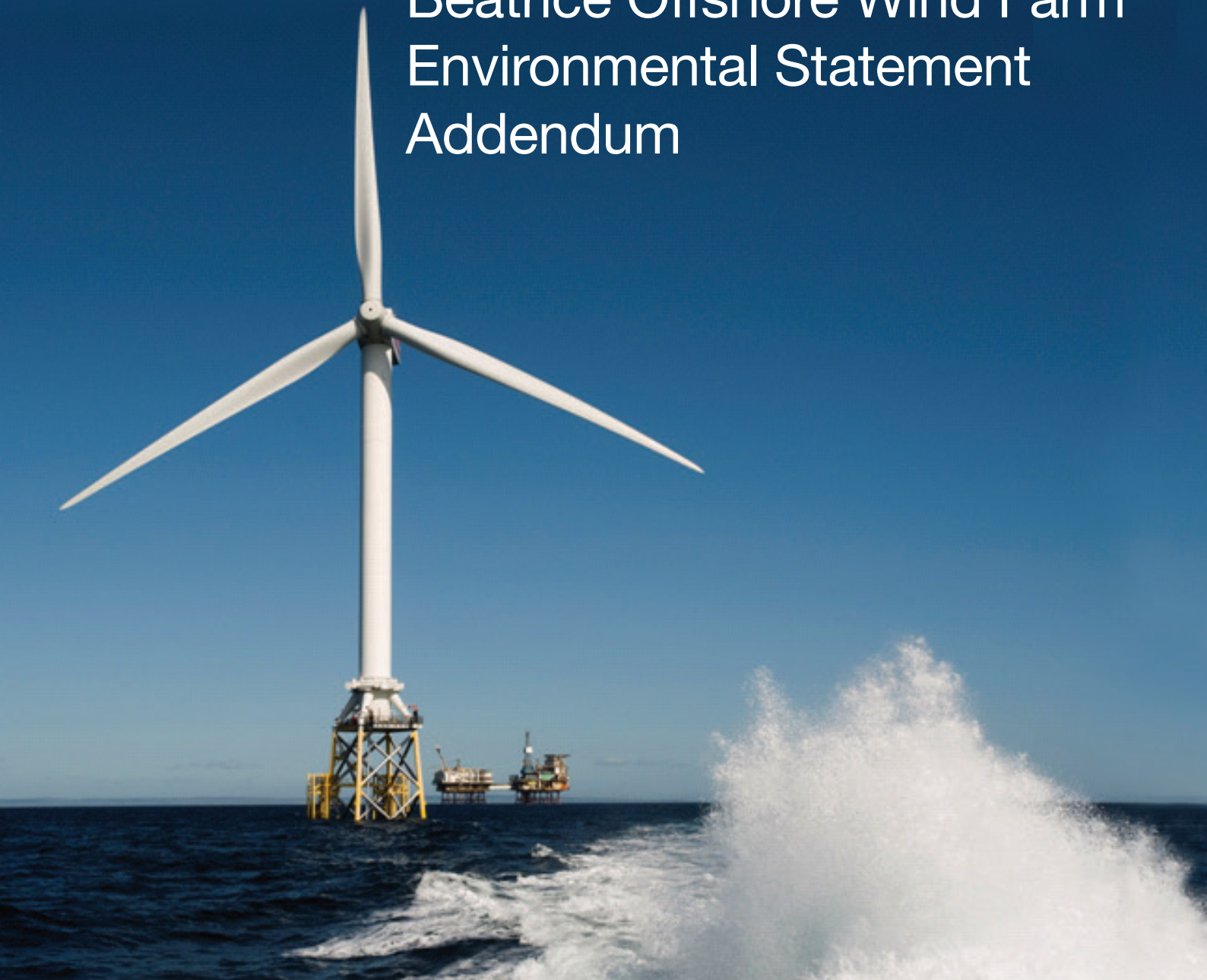


Beatrice Offshore Wind Farm Environmental Statement Addendum



Non Technical Summary

May 2013


Beatrice
Offshore Windfarm Ltd

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ACRONYMS AND KEY TERMS

Term	Definition
BOWL	Beatrice Offshore Windfarm Limited
CCA	Coastal Character Area
CCTV	Closed Circuit Television
EIA	Environmental Impact Assessment
GVA	Gross Value Added
MORL	Moray Offshore Renewables Limited
MS-LOT	Marine Scotland Licensing Operations Team
NTS	Non Technical Summary
OSP	Offshore Substation Platform
RSCT	Regional Seascape Character Type
RSU	Regional Seascape Unit
SLVIA	Seascape, Landscape and Visual Impact Assessment
The Original Project	The offshore development proposal in its entirety, including the Original Wind Farm and the Original OfTW as presented in the Original ES.
The Amended Project	The offshore development proposal in its entirety, including the Wind Farm and the OfTW. This incorporates the minor changes to the Original Project presented in the ES Addendum.
The Original Project Boundary	The Original Project Boundary includes the Wind Farm Site and the Original OfTW Corridor i.e. the whole area to which the consent applications relate.
The Amended Project Boundary	The Amended Project Boundary includes the Wind Farm Site and the Amended OfTW Corridor i.e. the whole area to which the consent applications relate.
The Original Wind Farm	The Original Wind Farm means the Beatrice Offshore Wind Farm as assessed in the Original ES including wind turbines, inter-array cabling and meteorological masts.
The Wind Farm	The Wind Farm itself assessed in the ES Addendum is physically unchanged from that described in the Original ES. However, it is noted that the assessment in the ES Addendum covers the alterations to the size of the footprint of the jack-up vessels proposed to be used during construction of the Wind Farm – references to the ‘Wind Farm’ in this ES Addendum should be read as including this amendment.
The Wind Farm Site	The area within which the Wind Farm will be located.

Term	Definition
The Original OfTW	The Offshore Transmission Works. The OfTW includes the approximate 65 km length of the route of the cable required to connect the Wind Farm to the National Electricity Transmission System. This covers the cable route from the offshore substation platform(s) (OSPs) to the Mean High Water Springs (MHWS) at the landfall west of Portgordon on the Moray coast. For the purposes of this ES Addendum, the OSPs are assessed in the Wind Farm topic sections. The OSPs however form part of the Marine Licence application for the OfTW.
The OfTW	The assessment in the ES Addendum covers the amendment to the OfTW Corridor and the alterations to the anticipated timescales for the installation of cables. References to the 'OfTW' in the ES Addendum should be read as above including these amendments.
The Original OfTW Corridor	The area within which the OfTW cable was to be located as presented in the Original ES.
The Amended OfTW Corridor	The area within which the OfTW cable will be located as amended and presented in the ES Addendum.
The OnTW	The Onshore Transmission Works. All components and operations for the onshore elements. The EIA of these elements is reported in a separate ES and is subject to a separate consent application.
The Original ES	The Environmental Statement as submitted in April 2012 accompanying the Section 36 and Marine Licence applications.
The ES Addendum	The Addendum to the Original ES.
ZTV	Zone of Theoretical Visibility

1 INTRODUCTION

1. This Non Technical Summary (NTS) provides a summary of the Environmental Statement Addendum (ES Addendum). The ES Addendum to the Original Environmental Statement (Original ES) submitted in April 2012 has been prepared to accompany the consent applications to construct, operate and decommission the Beatrice Offshore Wind Farm (the Wind Farm) and associated Offshore Transmission Works (OfTW).
2. The ES Addendum has been prepared to incorporate the following into the Environmental Impact Assessment (EIA):
 - Advances in certain assessment methodologies and knowledge of the environmental receptors which have occurred since submission of the Original ES;
 - Responses received from consultees on the Original ES, including requests for clarification and further information. This includes a request for a description and discussion of a 'most likely' scenario, further population modelling in relation to bottlenose dolphins, revised ornithology modelling and assessment of Coastal Character Areas in the seascape, landscape and visual assessment;
 - Further information which has become available on cumulative developments, in particular the Moray Firth Round 3 Zone, for which a consent application was submitted in August 2012;
 - Alterations to the size of the footprint of the jack-up vessels proposed to be used during construction of the Wind Farm;
 - Alterations to the anticipated timescales for the installation of OfTW cables; and
 - A minor amendment to the OfTW Corridor, as shown on Plate 2.
3. The final three bullets in this list above constitute amendments to the Original Project itself assessed in the ES Addendum which is now referred to as the 'Amended Project'. Plate 1 shows the Amended Project Boundary.
4. The information in the ES Addendum is either supplemental to, or replaces that presented in the Original ES. The relationship between the ES Addendum and the Original ES is clearly stated throughout the ES Addendum and this NTS. This NTS should therefore be read in conjunction with the NTS for the Original ES (Original NTS). It may also be useful to read this NTS in conjunction with Section 15: Summary of Residual Effects in Volume 1 of the ES Addendum.
5. The ES Addendum presents a supplemental or revised assessment for the topics detailed in Table 1.

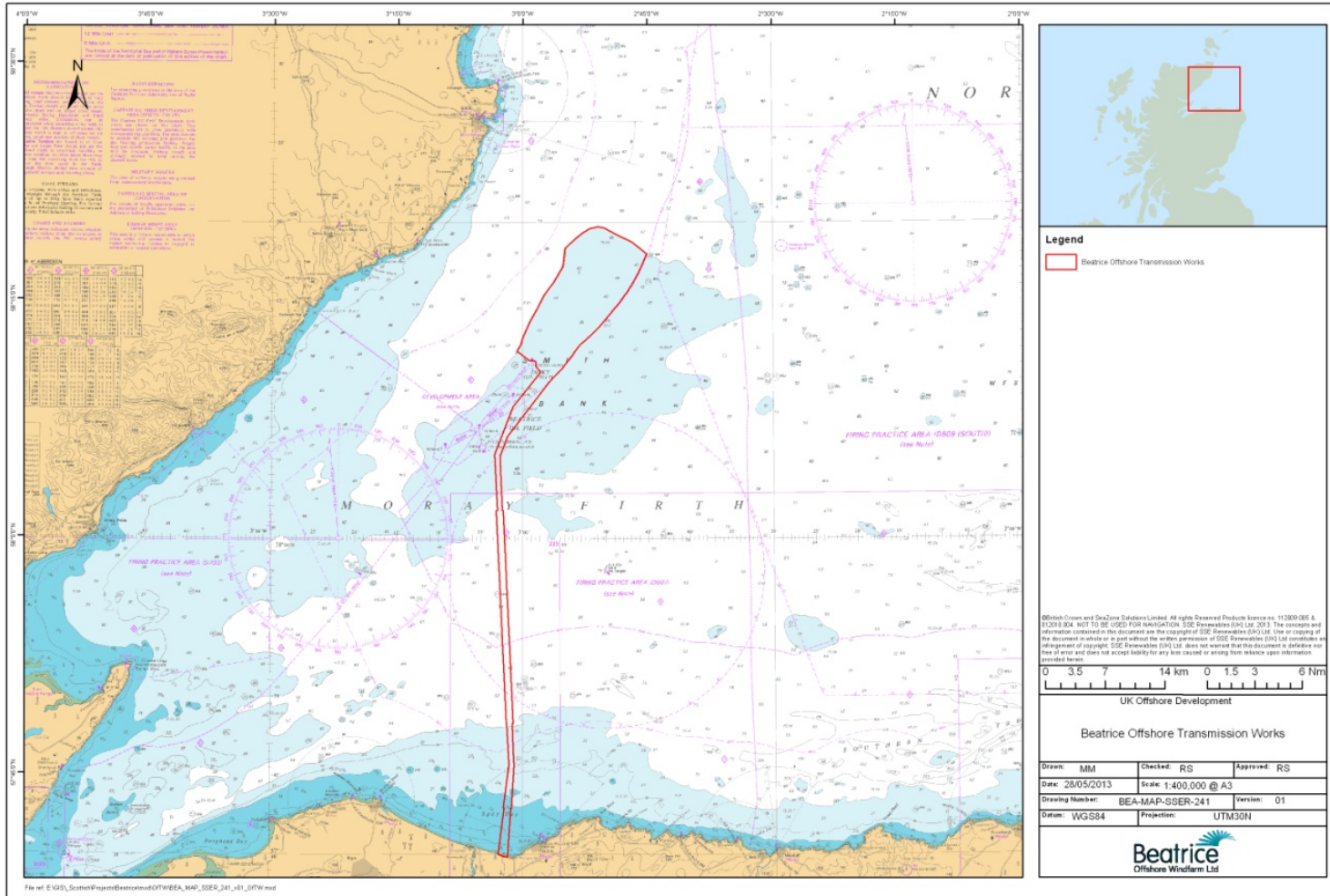


Plate 1: Map of the Amended Project Boundary and Location

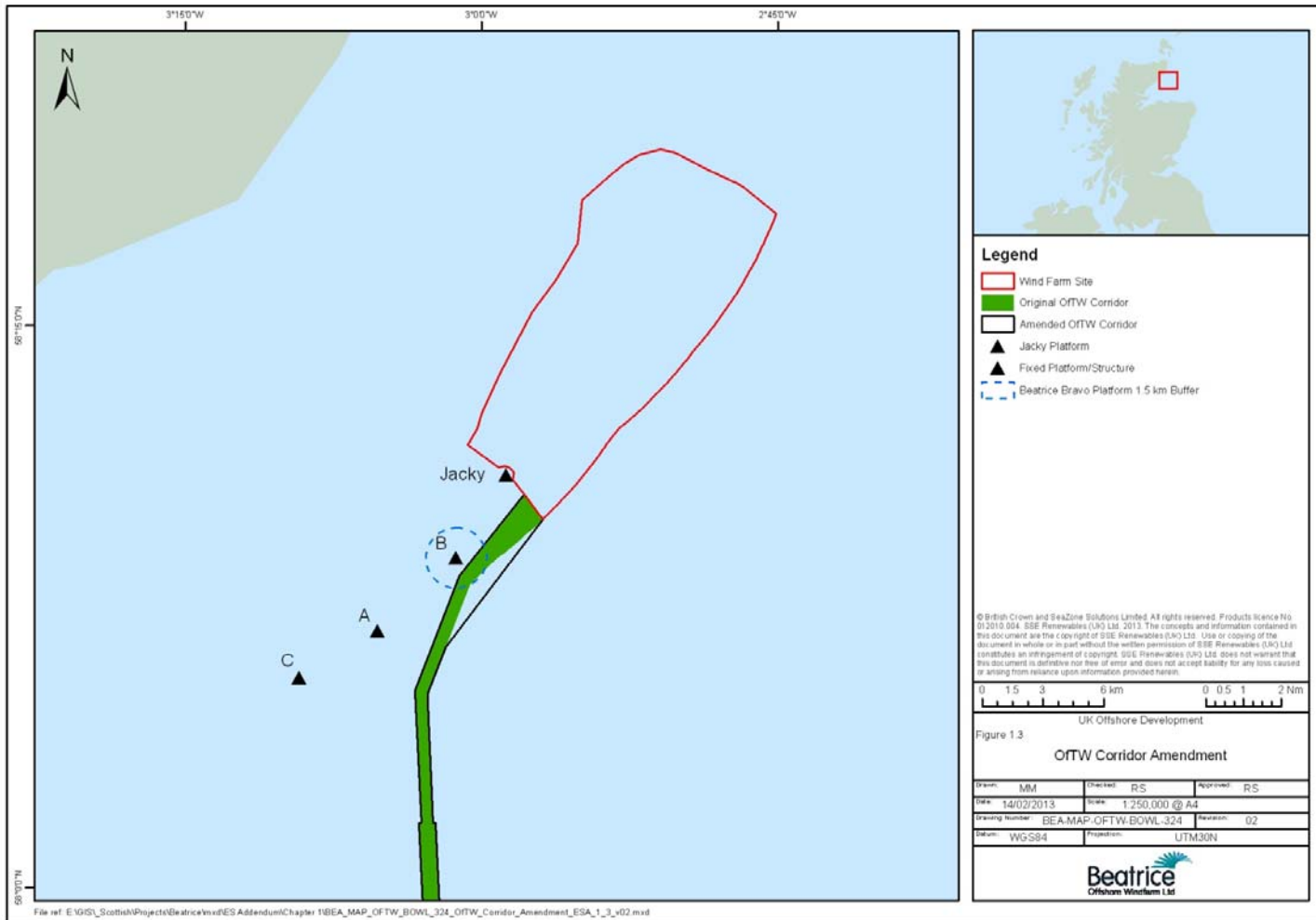


Plate 2: OFTW Corridor Amendment

Table 1: Topic Areas Included within the ES Addendum

Topic Area	Original ES	ES Addendum
Physical Processes and Geomorphology	✓	✓
Benthic Ecology	✓	✓
Fish and Shellfish Ecology	✓	✓
Marine Mammals	✓	✓
Ornithology	✓	✓
Seascape, Landscape and Visual	✓	✓
Marine Archaeology and Cultural Heritage	✓	✓
Commercial Fisheries	✓	✓
Airborne Noise	✓	x
Shipping and Navigation	✓	✓
Aviation	✓	x
Socio-Economics, Recreation and Tourism	✓	✓
Other Issues	✓	x

2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS AND METHODOLOGY

6. This section describes the process that has been followed in undertaking the EIA and preparing the ES Addendum for the Amended Project. The EIA process and methodology outlined in the Original ES also apply to the preparation of the ES Addendum, except where changes to the methodology are identified within the ES Addendum.
7. The EIA Directive has been transposed into Scottish law through a number of different regulations. In relation to the Amended Project, the EIA Directive is applied through the following regulations:
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, as amended by The Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008 (where applicable); and
 - The Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by the Marine Works (Environmental Impact Assessment) Regulations 2011 (where applicable).
8. The EIA has been carried out in accordance with both the above regulations, collectively referred to in the Original ES and the ES Addendum as the 'EIA Regulations'.
9. Environmental effects have been assessed to identify any effects that are likely to be significant in the context of the EIA Regulations. Mitigation is proposed where possible to prevent or minimise likely significant effects.

10. In accordance with the EIA Regulations, the assessment has considered 'cumulative effects'. These are effects that result from cumulative changes caused by past, present or reasonably foreseeable actions together with the Project.

2.1 THE ROCHDALE ENVELOPE APPROACH

11. For each topic, the Original ES assessed the likely significant effects arising from the worst case scenario identified from within the Project's 'Rochdale Envelope'. The Rochdale Envelope for the project sets out a range of parameters covering construction, operational and decommissioning options within which the final design must fall. This allows for the likely significant effects arising from the worst case maximum/minimum parameters to be assessed.
12. The assessments in the ES Addendum are based on the Rochdale Envelope for the Amended Project.

2.2 THE MOST LIKELY SCENARIO

13. The ES Addendum also presents, where applicable, a discussion of the 'most likely' scenario. The most likely scenario presents a potential project design which may be realised from within the parameters of the Rochdale Envelope to assist the reader as to how the various elements of the Rochdale Envelope may combine. The most likely scenario aims to assist the consultees in putting the worst case assessment findings into context. However, this does not represent the final detailed design and hence the assessment of likely significant effects is based on, and consent is still sought for, the Rochdale Envelope parameters.

2.3 CONSULTATION

14. Following submission of the Original ES, a formal period of consultation ended on the 7th August 2012. As well as responses received during this time, comments from ongoing consultation, such as those made during meetings, have also been addressed in various different ways. Where appropriate, these are addressed within the ES Addendum, or have been responded to directly. A summary of post-submission consultation including responses to stakeholder consultation is presented within Section 3: Environmental Impact Assessment Process and Methodology of the ES Addendum, and in greater detail within the technical assessment Sections 5 to 14 of the ES Addendum.

3 CUMULATIVE EFFECTS

15. Since the submission of the Original ES, a consent application has been submitted to Marine Scotland Licensing Operations Team (MS-LOT) for the development of the Moray Firth Round 3 Zone (August 2012). The Zone is adjacent to the Wind Farm Site and due to its proximity and similar nature to the Amended Project; it is a key consideration for the assessment of cumulative effects.
16. The Moray Firth Round 3 Zone application contained further information on that project than was available at the time of preparation of the Original ES. This has allowed revised cumulative assessments to be undertaken for receptors where this

further information is considered to have the potential to affect the conclusions of the cumulative assessment in the Original ES. Where the assessments are updated, the relationship of the Original ES to the ES Addendum is clearly stated throughout.

4 AMENDED PROJECT DESCRIPTION

17. The Amended Project is unchanged from the Original Project other than the minor amendment to the Original OfTW Corridor and the construction methods identified in Section 1: Introduction. These are described in more detail below.

4.1 SITE DESCRIPTION

4.1.1 THE WIND FARM

18. The Wind Farm Site location, description and characteristics remain as described in the Original ES. To summarise, the Wind Farm Site is located approximately 25 km south south-east of Wick, Caithness and is located on the Smith Bank, a bathymetric high in the outer Moray Firth. The Wind Farm Site is, at its closest point, 13.5 km from the coastline. The Wind Farm Site is approximately 19 km in length and 9 km in width at the maximum extents of the site, covering an area of approximately 131.5 km² (see Plate 1).

4.1.2 THE OFTW

19. There has been a minor amendment to the Original OfTW Corridor since the submission of the Original ES. The amendment to the Original OfTW Corridor was identified as a requirement through ongoing consultation with oil platform stakeholders.
20. The Original OfTW Corridor has been widened in the vicinity of the Beatrice Bravo oil platform. This is to ensure that the subsea cable is a minimum of 1.5 km away from the oil platform as requested by the oil platform operator in their response to the Original ES. An additional area of 3.71 km² has been added as a result of this amendment, creating the 'Amended OfTW Corridor' (see Plate 2).
21. The Amended OfTW Corridor is approximately 65 km in length and varies between 575 m and 1.6 km in width, running between the Wind Farm Site and Mean High Water Springs at the landfall point.



4.2 DEFINITION OF THE AMENDED PROJECT

4.2.1 ROCHDALE ENVELOPE

22. The Original Project Description has been amended as follows:
- Increase in footprint of jack-up vessels used during construction of the Wind Farm; and
 - Changes to the cable installation timescales for the OfTW.
23. New information on vessels has become available since the application was submitted and hence the footprint of the jack-up vessel for the Amended Project has been increased. The worst case scenario for such vessels assumed for the Original ES was 30 m² per leg footprint and this has been increased to 200 m² per leg footprint assuming a six leg vessel as the worst case.
24. Further information has become available relating to the construction processes for the Project. As such, the Rochdale Envelope parameters with regard to the duration of cable installation for the OfTW has been further developed to give a full breakdown of activities and when, throughout the OfTW cable installation process, they will occur. This scenario presents the worst case for the OfTW cable installation based on available information at this time.
25. Otherwise the Rochdale Envelope for Amended Project remains unchanged from the Original Project and will comprise the following elements:
- Up to a maximum of 277 offshore turbines;
 - Up to a maximum of two AC and one DC Offshore Substation Platforms (OSPs);
 - Up to a maximum of three meteorological masts;
 - Up to 350 km of inter-array cabling linking turbines, OSPs and meteorological masts;
 - Measures to protect installations from scour; and
 - Ancillary elements such as metocean buoys and Closed Circuit Television (CCTV); and
 - OfTW consisting of electrical transmission cables between the OSPs and the Mean High Water Springs (MHWS) mark at landfall.

4.2.2 THE 'MOST LIKELY' SCENARIO

26. In order to assist consultees, the ES Addendum includes a 'most likely' scenario for the development of the Amended Project. This most likely scenario has been used for illustrative purposes throughout the ES Addendum to discuss the likely environmental effects of what BOWL considers may be a likely representation of the Amended Project.
27. The most likely scenario has been developed through ongoing engineering design which is working towards the concept design for the Amended Project. This does not represent the final detailed design and hence the assessment is based on, and consent is still sought for, the Rochdale Envelope parameters.
28. Key elements of the most likely scenario are as presented in the following sections.

4.2.2.1 *Wind Farm*

29. The most likely scenario is based on the construction of 140 turbines with a maximum tip height of 187.4 m.
30. The detailed design and layout of the Wind Farm Site will not be finalised until further engineering design has been undertaken. No specific layout is presented for the most likely scenario, however, a most likely spacing between the turbines is presented.

4.2.2.2 *Substructures and Foundations*

31. The Rochdale Envelope provided a range of alternative options for substructures and foundations for met masts, offshore substation platforms and turbines. The most likely scenario is based on the use of a tubular jacket substructure with pin pile foundations.

4.2.2.3 *OfTW Cable Installation Timescales*

32. The most likely scenario with regard to installation of the OfTW cable occurs over a two year period rather than three years in the worst case; however, this does not alter the spatial extent of the works.
33. Table 2 presents a high level summary of the differences for key parameters between the worst case and the most likely scenario.

Table 2: Summary Comparison of Most Likely and Worst Case Parameters

Parameter	Worst Case Scenario		Most Likely Scenario
Maximum number of turbines	277	142	140
Maximum Tip Height	140.3 m	198.4 m	187.4 m
Substructure/ Foundations	Pin Piles/ Tubular Jacket Substructure Gravity Base/ Tubular Jacket Suction Piles/ Tubular Jacket Substructure Monotower Monopile/ Monotower Substructure		Pin Piles/ Tubular Jacket Substructure
OSPs	2 AC Offshore Substation Platforms	2 AC Offshore Substation Platforms and 1 DC Offshore Substation Platform	2 AC Offshore Substation Platforms
Length of Inter-Array Cabling	350 km (maximum)		260 km (likely length of cabling)
OfTW Installation Timescales	Up to three years	Up to three years	Two years

4.3 INDICATIVE CONSTRUCTION INFORMATION

34. The Original ES provided information on the likely installation techniques, vessels and construction timescales. Feedback from consultees to the Original ES requested further information on the construction programme and details of vessels movement and installation details.
35. Section 4: Amended Project Description of the ES Addendum provides such further detail. However, it is noted that the specific vessels and construction programme cannot be determined at this stage and hence the information is for illustration only.

5 ENVIRONMENTAL EFFECTS

5.1 FISH AND SHELLFISH ECOLOGY

5.1.1 INTRODUCTION AND SCOPE OF FURTHER ASSESSMENT

36. This section of the ES Addendum presents an evaluation of the likely significant effects of the Amended Project on fish and shellfish ecology, specifically the effects associated with:
- The Amended OfTW Corridor; and
 - Changes to the OfTW cable installation timescales.
37. The Amendments to the size of the jack-up vessel footprints do not affect the worst case scenario in relation to fish and shellfish ecology.
38. In addition to the assessment of likely significant effects from the amendments to the Original Project, this section of the ES Addendum presents further information in response to consultee comments received on Section 11: Wind Farm Fish and Shellfish Ecology and Section 23: OfTW Fish and Shellfish Ecology of the Original ES and further cumulative information. These have been addressed in the ES Addendum as follows:
- Further discussion in relation to increased suspended sediment concentrations (SSCs) and sediment re-deposition. A particular focus in this respect has been given to the effects of increased SSCs on salmonids, as requested in a number of responses to the Original ES;
 - Seabird distribution data referred to in order to provide further context in relation to the potential presence of sandeels within Wind Farm Site (as shown in the MORL ES 2012);
 - Consideration of further information on piling duration and further integration and clarification in relation to the temporal aspect of piling noise; and
 - Consideration of further information relating to the Moray Firth Round 3 Zone.
39. In order to update the assessments in the Original ES to take account of the above, the ES Addendum presents a revised assessment for salmon (*Salmo salar*), sea trout (*Salmo trutta*), cod (*Gadus morhua*), herring (*Clupea harengus*) and sandeels (*Ammodytidae* spp.). All the potential effects assessed in the Original ES have been taken into account. In the particular case of sandeels, however, a revised assessment has only been provided in relation to increased SSCs, sediment re-deposition,

changes to fishing activity and loss of habitat, as these are the potential effects to which the responses of stakeholders refer.

40. The conclusions of this assessment replace those of the Original ES for the receptors and effects for which a revised assessment has been undertaken. For the remaining fish and shellfish receptors, this section is supplemental and should be read alongside Section 11: Wind Farm Fish and Shellfish Ecology and Section: 23: OfTW Fish and Shellfish Ecology of the Original ES.

5.1.2 ASSESSMENT OF THE WORST CASE SCENARIO

5.1.2.1 Wind Farm

41. The further assessments of the likely significant effects on fish and shellfish receptors listed above as a result of the Wind Farm contained in the ES Addendum are detailed below.
42. The amendments to the Wind Farm in Section 4: Amended Project Description do not affect the conclusions of the Original ES in relation to fish and shellfish ecology.
43. The assessment of effects as a result of further information on piling duration does not change the effects from those presented in the Original ES, with likely significant effects predicted on cod, herring and European eel. In considering Marine Scotland Science (MSS) comments in relation to cod and herring, the probability of this effect occurring has been revised from unlikely in the Original ES to likely in the ES Addendum. Further discussion of the effects on salmon and sea trout is also provided, although the assessment of effects has not changed from the Original ES and there is still no likely significant effect.
44. Further information is included in relation to SSCs, particularly with regard to salmonids. When considering the available literature on the concentrations of SSCs, which can have an adverse effect on fish, the conclusions of the Original ES in relation to the species assessed (cod, herring salmon and sea trout, and sandeel) are reiterated, and there is no likely significant effect.
45. Further information is included in relation to electromagnetic fields (EMFs) which may occur as a result of the inter-array cables. Given the low levels of EMF likely to occur when compared to the Earth's magnetic field, the assessment of effects as a result of EMFs concludes that there is no likely significant effect on all species.
46. Reference has been made to seabird data and information presented in the ES for Moray Firth Round 3 Zone with respect to sandeel populations at the Wind Farm. The findings of surveys undertaken at the Moray Firth Round 3 Zone, coupled with the interpretation of seabird data suggest that whilst the area does support sandeels, it does not suggest that the Wind Farm Site sustains key populations. In relation to the Wind Farm alone therefore, the conclusion of no likely significant effects on sandeels remains valid.

5.1.2.2 OfTW

47. Further assessment of the likely significant effects which may arise as a result of the Amended OfTW is considered in this Section of the ES. The amendments to the

Original OfTW do not change the findings of the assessments in Section 23: OfTW Fish and Shellfish Ecology of the Original ES, and therefore no likely significant effects are predicted as a result of the OfTW.

5.1.3 CONSIDERATION OF MOST LIKELY SCENARIO

5.1.3.1 Wind Farm

48. The most likely scenario outlined in Table 2 sets out the key differences between the worst case and most likely scenarios for the Wind Farm. In relation to effects on fish and shellfish ecology, a number of these changes have the potential to result in smaller effects.
49. The reduction in turbines would result in a shorter construction period and fewer piling events, potentially causing a smaller effect on species which may be disturbed by increased noise during piling.
50. Reduced disturbance to the seabed through fewer foundations, less inter-array cabling and associated installation works, would lead to a likely reduction in the levels of SSC caused during construction of the Wind Farm, although effects are already assessed as being not likely significant effects in the worst case scenario.
51. A shorter length of inter-array cable, with a deeper burial depth may result in a reduction in EMF, although these are already assessed as not being a likely significant effect in the worst case scenario.
52. Piled foundations would result in a far smaller area of habitat loss than the worst case of gravity bases, although habitat loss is not predicted to result in a likely significant effect on fish and shellfish in the worst case scenario.

5.1.3.2 OfTW

53. The changes to the OfTW most likely scenario compared to the worst case scenario (for installation and operation) may result in a shorter duration of effects and smaller effects from increased SSC during installation, and smaller effects from EMF during operation.
54. Although these changes may result in smaller effects, all effects arising from the OfTW are assessed as not being likely significant effects in the worst case scenario.

5.1.4 CUMULATIVE EFFECTS

55. Further information available from the assessment of effects of the Moray Firth Round 3 Zone has allowed the cumulative assessment to be updated. The updated assessment identifies cumulative likely significant effects as a result of construction noise on salmon and sea trout, cod, herring and European eel. This is the same conclusions as the Original ES. The Original ES also identified likely significant effects on sandeel as a result of habitat loss, however, this has been revised in the ES Addendum, with no cumulative likely significant effect now predicted on sandeel.

5.1.5 MITIGATION AND MONITORING

56. There are a range of mitigation measures which may be implemented during the construction of the Wind Farm.

57. When piling commences a 'soft-start' procedure will be employed and the force of piling will gradually be increased to alert species in the vicinity to the commencement of the operations and thus reduce the potential for injury to these species. The soft-start is the gradual ramping up of piling power, incrementally over a set time period, until full operational power is achieved. In line with best practice guidelines, BOWL will implement a soft-start period of not less than 20 minutes.
58. Upon receiving detailed geotechnical information, BOWL will develop a piling strategy with the aim of minimising effects on agreed species throughout the construction period. The Rochdale Envelope currently allows for the use of hammer energy up to 2,300kJ, although it is possible that a lesser hammer energy will be required. Where possible, the piling programme will determine what hammer energies are most likely to be used at specific locations, which will allow the development of a piling programme that has measures embedded within it to reduce the effects on fish and shellfish when compared to the worst case scenario.
59. BOWL is engaged in ongoing consultation with MSS in relation to suitable monitoring that may be required for key receptors.
60. In addition, to further minimise effects associated with EMFs, inter-array cables will be buried or protected where feasible to increase the separation between species and the cables. Export cables will be buried or protected for their entire length.

5.2 MARINE MAMMALS

5.2.1 INTRODUCTION AND SCOPE OF FURTHER ASSESSMENT

61. This section of the ES Addendum presents an evaluation of the likely significant effects of the Amended Project on marine mammals in light of revised assessment techniques and further information that has become available since the submission of the Original ES. This includes the following:
- Population viability modelling for bottlenose dolphin (BND) (*Tursiops truncatus*) and harbour seal (*Phoca vitulina*) to assess long-term effects and improve certainty from the Original ES;
 - Consideration of both temporal and spatial worst case scenarios for piling noise for the Wind Farm alone;
 - Desktop information on harbour porpoise (*Phocoena phocoena*) sensitivity to piling noise and recoverability following piling operations to increase certainty with respect to conclusions made in the Original ES;
 - Further noise modelling undertaken in relation to the assessment of effects on minke whale (*Balaenoptera acutorostrata*); and
 - Assessment of cumulative effects based on a number of different piling scenarios and population modelling for BND and harbour seal.
62. The Amendments to the size of the jack-up vessel footprints and the increase in OfTW cable installation timescales do not affect the worst case scenario in relation to marine mammals.

63. In addition to the assessment of likely significant effects from the amendments to the Original Project, further information is also presented in response to consultee comments received on the Original ES, and further cumulative information. These have been addressed in the ES Addendum as follows:
- Comparison of effects of differing hammer energies on marine mammals and consideration of a 'most likely scenario' for piling to provide some context for the worst case scenario assessed in the Original ES;
 - Details of the integrated approach to monitoring to support conservation and development in the Moray Firth; and
 - Information to support European Protected Species (EPS) Licensing.
64. In order to update the assessments in the Original ES to take account of the above, the ES Addendum presents a revised assessment for all receptors for which likely significant effects were identified in the Original ES or for which concern has been raised in the stakeholders' responses to the Original ES. These are harbour seal, BND, minke whale and harbour porpoise.
65. Where updated assessments have been undertaken, the conclusions of these assessments replace those of the Original ES.



5.2.2 ASSESSMENT OF THE WORST CASE SCENARIO

5.2.2.1 *Wind Farm*

66. The further assessments of the likely significant effects arising from the Wind Farm contained in the ES Addendum in relation to Marine Mammals are as discussed below.
67. The amendments to the Wind Farm in Section 4: Amended Project Description do not affect the conclusions of the Original ES in relation to marine mammals.

68. For all marine mammal species considered, the primary effect was predicted to be one of behavioural disturbance rather than physical injury or damage to the animals.
69. The Original ES predicted a short-term likely significant effect as a result of piling noise on harbour seal and BND for the Wind Farm alone, and a likely significant effect on BND in the long-term based on a lack of available population modelling for this species.
70. The ES Addendum predicts short to medium-term (during the piling phase) likely significant effects on harbour seal and BND. Revised population modelling has been undertaken for harbour seal and BND, and has demonstrated that no long-term likely significant effects will occur on these species, with both showing rapid recovery to baseline conditions following the cessation of piling.
71. Marine mammals have differing ranges of hearing, and hence each species has the potential to be affected differently by the same noise levels. As the hearing ability of marine mammals to different noise levels is not known for all species, the assessment has had to use substitutes (or proxies) for some species. In the case of minke whale, the ES Addendum has used humpback whale as a proxy species. The results of the updated assessment of effects on minke whale using this revised proxy indicate that there may be a likely significant effect on minke whale over the piling phase (short to medium-term). This has changed from the no likely significant effect conclusion reached in the Original ES as humpback whale can hear over much greater distances at specific frequencies than the proxy species used in the Original ES. As minke whale have such a wide distribution within the North Sea, and are not tied to specific feeding grounds, no likely significant long-term effects are have been predicted on minke whale.
72. The Original ES concluded that there would be no likely significant effects on harbour porpoise in the short, medium or long-term as a result of the Wind Farm. Further information from the published literature has been presented within the ES Addendum in relation to potential effects of piling noise on this species. Consideration of this literature has led to the conclusions of the Original ES being re-affirmed in the ES Addendum, and no likely significant effects on harbour porpoise are predicted.

5.2.2.2 *OfTW*

73. The amendments to the Original OfTW Corridor and OfTW cable installation timescales do not affect the worst case for marine mammals, and hence this assessment is not updated in the ES Addendum.

5.2.3 CONSIDERATION OF MOST LIKELY SCENARIO

5.2.3.1 *Wind Farm*

74. The most likely scenario outlined in Table 2 sets out the key differences between the worst case and most likely scenarios for the Wind Farm. In relation to effects on marine mammals, a number of these changes have the potential to result in smaller effects.

75. The key difference would be in relation to underwater noise, with the reduction in turbine numbers from 277 to 140, and the associated reduction in piling time to one year. Whilst this would not necessarily change the significance of the effects, the effects occurring as a result of piling noise would be of a shorter duration, affecting only a single breeding season.
76. In addition, there is a reduction in the number of vessels associated with the construction of the Wind Farm in the most likely scenario. Although this is not considered to be a likely significant effect in the assessment of the worst case scenario, it is considered that the reduction in vessels would reduce the potential for disturbance and collision with vessels for marine mammals.

5.2.4 CUMULATIVE EFFECTS

77. Further information available from the assessment of effects of the Moray Firth Round 3 Zone has allowed the cumulative assessment to be updated. The new assessment methods applied to the assessment of the Wind Farm alone have also been applied to the assessment of cumulative effects, with population modelling undertaken for harbour seal and BND to provide greater certainty in relation to long-term effects.
78. As the construction timeframes for the Project and the adjacent Moray Firth Round 3 Zones are not finalised, the assessment of cumulative effects has required a range of scenarios to be considered, with the following two worst case scenarios:
- Largest spatial extent of piling noise, which arises from eight concurrent piling operations across the two developments. In this scenario, piling would occur for two years; and
 - Longest duration of piling noise, which arises from a single piling vessel working at each site, resulting in a seven year piling period with one year of overlap where the two vessels operate concurrently.
79. Likely significant effects in the short to medium-term were predicted for BND, harbour seal and minke whale in both scenarios, whilst no likely significant effects were predicted on harbour porpoise and grey seal for either scenario. For all species, there are no long-term likely significant effects predicted as a result of either scenario.

5.2.5 MITIGATION AND MONITORING

80. BOWL will adopt a piling protocol in accordance with JNCC guidelines which involves employment of dedicated marine mammal observers (MMOs) and potentially Passive Acoustic Monitoring (PAM) and Acoustic Deterrent Device (ADD) operatives. The aim of these would be to detect marine mammals within an agreed 'mitigation zone' (no less than 500 m measured from the pile location) and potentially recommending a delay in the commencement of piling activity if any marine mammals are detected. When piling commences a 'soft-start' procedure will be employed and the force of piling will gradually be increased to alert marine mammals in the vicinity to the commencement of the operations and thus reduce the potential for injury on all marine mammal species.

81. BOWL and the wider offshore wind industry are investigating a number of mitigation measures to minimise the effects of construction noise on marine mammals, and there are techniques under development that may help to minimise construction noise levels at-source. However, none of these techniques are currently sufficiently developed to enable developers to commit to their use in construction.
82. Upon receiving detailed geotechnical information, BOWL will develop a piling strategy with the aim of minimising effects on agreed species throughout the construction period. The Rochdale Envelope currently allows for the use of hammer energy up to 2,300kJ, although it is possible that a lesser hammer energy will be required. Where possible, the piling programme will determine what hammer energies are most likely to be used at specific locations, which will allow the development of a piling programme that has measures embedded within it to reduce the effects on marine mammals when compared to the worst case scenario presented in the Original ES. BOWL is committed to continued discussions with Marine Scotland in order to devise a piling strategy with the aim to, where possible, minimise certain effects.
83. A detailed Marine Mammal Monitoring Programme (MMMP) is currently being developed in consultation with Moray Offshore Renewables Ltd (MORL) (the developers of the Moray Firth Round 3 Zone), Marine Scotland, Scottish Natural Heritage and the University of Aberdeen to allow the unique existing baseline information of the Moray Firth to be built on, and to provide the opportunity to better understand the interactions between marine mammals and offshore wind farms.

5.3 *ORNITHOLOGY*

5.3.1 INTRODUCTION AND SCOPE OF FURTHER ASSESSMENT

84. This section of the ES Addendum presents information to address consultation responses, and consider additional cumulative information in relation to ornithology. In addition, this section presents a discussion of the effects that may occur as a result of the most likely scenario.
85. The ornithology section of the ES Addendum presents:
- Revised reference population estimates for some seabird species. These estimates replace those provided in the Original ES;
 - Presentation of outputs from stochastic (probabilistic) population modelling used to estimate potential effects on the populations of fulmar, gannet, kittiwake, herring gull, great black-backed gull, guillemot, razorbill and puffin. This includes discussion of how effect significance has been derived from probabilistic population model predictions. This is additional to the assessment presented in the Original ES;
 - Revised methods for estimating displacement effects for fulmar, gannet, kittiwake, guillemot, razorbill and puffin. These replace the assessment of displacement effects presented in the Original ES;

- Assessment of collision effects using the stochastic population models. This includes the collision mortality estimates presented in the Original ES (for information) and also updated collision estimates produced using the most up to date offshore collision model (Band 2012, offshore collision modelling tool, Option 3). The collision assessment for the following species: fulmar, gannet, kittiwake, herring gull and great black-backed gull replaces the assessment of collision effects presented in the Original ES. For all other species at risk of potential collisions the assessment in the Original ES remains valid;
- Consideration of non-breeding season collision effects for gannet, kittiwake, herring gull and great black-backed gull which is additional to the assessment in the Original ES;
- Assessment of potential cumulative effects on the basis of updated information now available for other wind farms which replaces the cumulative assessment presented in the Original ES.



5.3.2 ASSESSMENT OF THE WORST CASE SCENARIO

5.3.2.1 Wind Farm

86. Population models have been used in the ES Addendum to generate probabilistic predictions for effects of displacement of breeding seabirds and collision risk during both the breeding and non-breeding periods. The results of the modelling have been used to determine if effects are either significant or non-significant in terms of the EIA Regulations, according to the predicted increases in the probability of population decline in relation to specific thresholds.
87. The further assessments of the likely significant effects arising from the Wind Farm contained in the ES Addendum in relation to ornithology are as follows:
- Displacement during the breeding season of breeding adult seabirds (fulmar, gannet, kittiwake, guillemot, razorbill and puffin), modelled as breeding failure for each breeding pair affected, was not found to cause any likely significant

effects on the seabird populations which have been recorded on the Wind Farm Site;

- Collision risk during the breeding season (fulmar, gannet, kittiwake, great black-backed gull, herring gull) was not found to cause any likely significant effects on the seabird populations which have been recorded on the Wind Farm Site;
- Collision risk during the non-breeding (gannet, kittiwake, great black-backed gull and herring gull) season was not found to cause any likely significant effects on the seabird populations which have been recorded on the Wind Farm; and
- Potential combined effects of displacement and collision during the breeding season (fulmar, gannet and kittiwake) were not found to cause any likely significant effects on the seabird populations which have been recorded on the Wind Farm.

88. All other effects remain unchanged from the Original ES.

5.3.2.2 *OfTW*

89. The change to the OfTW Corridor and the increased OfTW cable installation time included in the Amended Project, do not affect the worst case scenario in relation to the assessment of effects on ornithology as presented in the Original ES. Therefore the results of the original assessment remain valid.

5.3.3 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.3.3.1 *Wind Farm*

90. This section of the ES Addendum includes consideration of the most likely scenario. The key differences between the worst case scenario and most likely scenario with respect to potential ornithology effects, relates to the size and number of turbines. The greater separation between the sea and the lower edge of the rotor tips, when used in the most up to date offshore collision risk model, reduces the estimated probability of collision for all species of seabirds. Comparison of estimated collision rates for gannet, kittiwake, great black-backed gull and herring gull show reductions in predicted collisions of between 20% and 50%. Therefore, it is judged that the most likely scenario would reduce collision risk for all species. Since displacement effects due to the worst case scenario were not predicted to have significant effects no modelling was considered necessary for displacement due to the most likely scenario. However, the lower number of turbines and the greater distances between turbines are expected to reduce the magnitude of effects. Overall, the most likely scenario is considered to result in lower magnitudes for all effects.

5.3.3.2 *OfTW*

91. As no additional consideration was required for the worst case scenario for OfTW effects upon ornithology the same applied for the most likely scenario.

5.3.4 CUMULATIVE EFFECTS

92. The ES Addendum presents an assessment of cumulative effects based on the revision to the ornithology assessment and consultee responses presented in the

section above, plus additional and updated information on Moray Firth Round 3 Zone.

93. This assessment of cumulative effects considers the effects of the Wind Farm and the Moray Firth Round 3 Zone.
94. The same species assessed for the Wind Farm are considered in the cumulative assessment; displacement during the breeding season (fulmar, gannet, kittiwake, guillemot, razorbill and puffin); collision risk during the breeding season (kittiwake, gannet, great black-backed gull, herring gull) and collision risk during the non-breeding season (kittiwake, gannet, great black-backed gull and herring gull). (Note that fulmar was not assessed for cumulative collision risk as no estimates for this species were presented in the Moray Firth Round 3 Zone ES.)
95. The same assessment methods used for the Wind Farm (displacement, collision risk modelling and population modelling) were used for the cumulative assessment. Effect significance was determined using the outputs from the population models in relation to the same thresholds of increase in risk of population decline.
96. The cumulative assessment on ornithology established that they will not create any significant cumulative effects for displacement, collision risk during the breeding season or collision risk during the non-breeding season.

5.3.5 MITIGATION AND MONITORING

97. The only mitigation measures appropriate with regards to effects on birds are those already performed as best practice within industry standards.
98. No specific applied mitigation above and beyond best practice has been identified for ornithological effects in relation to the construction, operational or decommissioning phases of the Wind Farm.

5.4 SEASCAPE, LANDSCAPE AND VISUAL

99. This section of the ES Addendum presents information to address consultation responses, and consider further cumulative information in relation to the seascape, landscape and visual environment. In addition, this section presents a discussion of the effects that may occur as a result of the most likely scenario. For the purposes of the seascape, landscape and visual impact assessment (SLVIA), the worst case scenario is based on 142 turbines with a height to blade tip of 198.4 m as opposed to 277 smaller turbines. This was discussed fully with consultees and further information is provided within the Original ES.
100. The seascape, landscape and visual section of the ES Addendum presents:
- An assessment of coastal character areas (CCAs). This is supplemental to the assessment of effects in the Original ES;
 - An assessment of a further viewpoint at Lybster Harbour which is further to the assessment of viewpoints presented in Section 14.5.5 of the Original ES;
 - A discussion of the most likely scenario in addition to the Original ES Section 14: Wind Farm Seascape, Landscape and Visual; and

- An updated cumulative assessment utilising the new information on the Moray Firth Round 3 Zone. This replaces the cumulative assessment presented in the Original ES with the exception of the assessment of Regional Seascape Units (RSUs) which remains as presented in the Original ES.

5.4.1 ASSESSMENT OF THE WORST CASE SCENARIO

5.4.1.1 Wind Farm

101. The further assessments of the likely significant effects arising from the Wind Farm contained in the ES Addendum in relation to seascape, landscape and visual are as discussed below.
102. The ES Addendum presents an assessment of the effects of the Wind Farm on nine CCAs. The assessment concludes that likely significant effects are limited to the Sarclet Head CCA. This is due to the fact that the orientation of the open coastline to the south east and corresponding field patterns which create a strong maritime connection is likely to increase the potential effects of the Wind Farm. Whilst the turbines would not directly effect upon the physical attributes of this CCA, they will become a key focal point within the characteristic sea views. The scale and extent of the Wind Farm across the horizon will relate well to expansiveness of the open sea, where views of the existing Beatrice Demonstrator Turbines and oil platforms are also seen.
103. The further viewpoint at Lybster Harbour is just under 20 km from the closest turbine. The viewpoint will largely retain open sea views and the turbines will not be a new type of feature in the view. The receptor groups of visitors and fishermen have different levels of sensitivity, therefore the effect on visitors is considered to be a likely significant effect and the effect on fishermen is not a likely significant effect. This reflects the fact that visitors are more likely to be drawn to the area for its amenity value, whereas this would be a secondary consideration for fishermen, who are within a working environment.
104. All other effects remain unchanged from the Original ES.

5.4.1.2 OfTW

105. Effects upon seascape, landscape and visual in relation to the OfTW were scoped out of the Original ES and hence also the ES Addendum.

5.4.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.4.2.1 Wind Farm

106. This section of the ES Addendum includes consideration of the potential effects of the most likely scenario based on 140 turbines of up to 187.4 m to blade tip. It is judged that the marginal difference in height and number of turbines will not make a meaningful (if any) difference to the Zone of Theoretical Visibility (ZTV). The ZTVs, wireframe and fieldwork all indicate that the most likely scenario would not change the magnitude of effect to trigger an adjustment of any of the assessment conclusions. Therefore, it is judged that the most likely scenario would not

meaningfully alter the assessment conclusions presented in the Original ES and this ES Addendum for the worst case.

5.4.2.2 *OfTW*

107. Effects upon seascape, landscape and visual in relation to the OfTW were scoped out of the Original ES and hence also the ES Addendum.

5.4.3 CUMULATIVE EFFECTS

108. This section of the ES Addendum replaces the assessment of cumulative effects with the exception of the assessment of RSUs which remains as presented in the Original ES. It takes into account consultee responses and presents the cumulative assessment of the Wind Farm with the Moray Firth Round 3 Zone.

109. The following receptors are considered:

- CCAs;
- Regional Seascape Character Types (RSCTs);
- Landscape Character Types
- Landscape Designations; and
- Visual Amenity (incorporating visual receptor groups and viewpoints).

110. The cumulative assessment on coastal character established that the addition of the Moray Firth Round 3 Zone will not create any likely significant cumulative effects greater than the effects of the Wind Farm. Likely significant cumulative effects will therefore be limited to the Sarclet Head CCA, where the Wind Farm constitutes the greater effect, with the addition of the Moray Firth Round 3 Zone creating no more than a minor alteration.

111. The cumulative assessment with the Moray Firth Round 3 Zone on RSCTs established that there will be a likely significant cumulative effect on the Coastal Waters RSCT. The combined wind farms would be prominent features adjacent to the RSCT so that they will create a major change to the visual characteristics.

112. Likely significant cumulative visual effects were assessed for recreational sailors in close proximity to the wind farms where the combination of the Moray Firth Round 3 Zone with the Wind Farm will noticeably alter the open expansive sea views further than the Wind Farm alone. Likely significant cumulative visual effects were also assessed for workers on ships for the same reasons.

113. The cumulative assessment established that there would be likely significant effects on the travelling public using the A99. However, views of the combined wind farms will not occur for the whole length of the road and, due to distance, the addition of the Moray Firth Round 3 Zone will not considerably add to the effects of the Wind Farm alone.

114. Likely significant cumulative effects on residents and visitors at the viewpoints between Lybster and Wick Bay were assessed. At these viewpoints, except Wick Bay, the cumulative effects were not considered to be greater than the effects of the Wind Farm alone. The distance that the Moray Firth Round 3 Zone lies from the coastline and its position largely behind the Wind Farm moderates the potential

cumulative effects on the viewpoints. However, at Wick Bay, the northern part of the Moray Firth Round 3 Zone will increase the horizontal extent of turbines to the north and the density of turbines visible, thus increasing the prominence of turbines within the view further than the Wind Farm alone.

5.4.4 MITIGATION AND MONITORING

115. Mitigation and monitoring was discussed in the Original ES, however, SNH requested further consideration on design mitigation of the Wind Farm. Exact layouts and positioning of turbines cannot be determined at this stage until appropriate detailed site surveys are undertaken post-consent. However, following the September 2012 meeting with MS-LOT and SNH, a commitment was given by BOWL to ensure that seascape, landscape and visual sensitivities will continue to be taken into account at detailed design stage where technically feasible. At this time it is not possible to provide any further information on the positioning of the turbines and layout as mitigation.

5.5 PHYSICAL PROCESSES AND GEOMORPHOLOGY

116. This section of the ES Addendum presents an evaluation of the likely significant effects of the Amended Project on the physical processes and geomorphology (wave, tidal and sedimentary environments), specifically the effects associated with:

- The Amended OfTW Corridor; and
- Changes to the jack-up vessel footprints associated with the Wind Farm.

117. The changes to the OfTW construction timings bear no relevance to the assessment of physical processes and geomorphology and hence do not fall within the scope of this section of the ES Addendum.



The photograph above shows a typical jack-up vessel

5.5.1 ASSESSMENT OF THE WORST CASE SCENARIO

5.5.1.1 *Wind Farm*

118. The worst case scenario for total footprint is a jack-up vessel with six legs, each leg having a footprint of 200 m² (approximately 14 m square or 16 m diameter), leading to a total footprint per jack-up operation of 1,200 m². Two separate jack-up operations are required at each of the 283 foundation locations during the construction phase. The total area of seabed affected represents only a small proportion (0.517%) of the Wind Farm Site and a much smaller proportion of the wider Moray Firth.
119. Anchors individually present a much smaller footprint of impact (order of 2 to 5 m²). This is one to two orders of magnitude smaller than that of a single jack-up leg as described above. Given the same number of vessels, anchors per vessel, operations and turbines, anchors present a proportionally smaller total footprint than jack-ups.
120. The result is that a small magnitude of change to the surficial sediments of Smith Bank is assessed to arise from the total footprint of jack-up vessels in an area of low sensitivity. This results in a negative effect which is of negligible significance and is therefore not a likely significant effect.

5.5.1.2 *OfTW*

121. The amendment to the Original OfTW Corridor does not alter the conclusions of the Original ES as the worst case scenario for the OfTW is dependent only on the local dimensions of the trench and not the OfTW Corridor. The potential effects resulting from the OfTW remain unchanged from those presented in the Original ES.

5.5.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.5.2.1 *Wind Farm*

122. The most likely scenario would mean a smaller footprint of the Wind Farm and construction activities. This would mean effects would be even lower magnitude although these are already assessed as not being likely significant effects.

5.5.2.2 *OfTW*

123. In comparison to the potential effects for the worst case scenario assessment presented in the Original ES, the most likely scenario will result in a reduction of approximately 32% in the sediment volume released during installation works. As with the worst case assessment, the increases in suspended sediment concentrations will remain local and temporary in nature and may be of smaller magnitude. The extent of deposition effects will likely remain unchanged but the thickness of any resulting sediment deposits would also be reduced by approximately 32%.

5.5.3 CUMULATIVE EFFECTS

124. The cumulative assessment for physical processes and geomorphology was not within the scope of the ES Addendum and therefore effects remain unchanged from those presented within the Original ES.

5.5.4 MITIGATION AND MONITORING

125. No mitigation or monitoring further than that presented in the Original ES was presented in the ES Addendum.

5.6 BENTHIC ECOLOGY

126. This section of the ES Addendum presents an evaluation of the effects of the Amended Project on benthic ecology, specifically the effects associated with:

- The Amended OfTW Corridor;
- Changes to the OfTW cable installation timescales; and
- Changes to the jack-up vessel footprints associated with the Wind Farm.

5.6.1 ASSESSMENT OF THE WORST CASE SCENARIO

5.6.1.1 *Wind Farm*

127. As a result of new information on the size of jack-up legs, their anticipated disturbance has been revised from 0.101 km² to 0.679 km². Time taken for pits created by jack-up legs to recover from disturbance can be expected to be between 18 months and 12 years (not accounting for storm activity). This is increased from estimates in the Original ES of six months to four years. Disturbance is also expected to arise from anchor dredge, however pits caused by anchors are anticipated to be far smaller than those caused by jack-up legs. As a result of the increase in area of seabed affected, a likely significant effect is predicted on the MoeVen biotope during construction as a result of its elevated importance. However, this biotope is able to recover rapidly from this type of effect.

5.6.1.2 *OfTW*

128. Effects associated with the OfTW will occur from ploughing, trenching or jetting activities used to lay cable and from anchors used by installation vessels.
129. The additional area associated with the amendment to the Original OfTW Corridor has decreased the percentage of the habitat 'sand and shell fragments' affected by the installation of cables from 3.67% to 3.27%. This is due to the fact that the area of habitat within the OfTW Corridor has increased but the area affected by installation has remained the same. This does not decrease the overall conclusion on effects, with no likely significant effects predicted.
130. The effect of noise generated by installation of the cable remains unchanged from the original ES, and does not result in a likely significant effect.

5.6.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.6.2.1 *Wind Farm*

131. The main differences between the worst case and most likely scenario result from the reduction of the area of footprints on the seabed resulting from the smaller number of foundations, the smaller area of pin pile foundations compared with gravity bases, a reduction from three to two OSPs and smaller jack-up vessel legs. Most, if not all of the effects on benthos that have been assessed are theoretically likely to be reduced in the most likely scenario compared to the worst case, but only

in the case of permanent habitat loss and seabed disturbance are the differences considered to be sufficient to warrant discussion within the ES Addendum.

132. Permanent loss of habitat is considerably reduced with the most likely scenario from 2.52% to 0.34% for turbine foundations and scour protection and from 0.371% to 0.31% for inter-array cables and protection. Whilst these anticipated losses are considerably reduced under the most likely scenario, the assessment is unchanged.
133. The most likely scenario also entails a number of reductions in likely sediment disturbance compared to the worst case scenario. These would be:
- A greatly reduced temporary zone of influence around each structure during construction through the change in foundation type and number, from circa 0.562 km², (0.428% of the seabed in the Wind Farm Site) for the worst case to circa 0.174 km² (0.132%);
 - Reduced disturbance due to jack-up vessel legs and anchors due to the need for deployments at only 140 turbine locations instead of 277, and the use of smaller vessels; from circa 0.665 km² (0.506% of the seabed in the Wind Farm Site) for the worst case as assessed in the ES Addendum, to circa 0.252 km² (0.192%); and
 - A reduced amount of disturbance due to cabling activities, due to the shorter total length of inter-array cables to be buried or protected (260 km cf 325 km), from circa 0.975 km² (0.74% of the seabed in the Wind Farm Site) for the worst case to circa 0.78 km² (0.60%).
134. The overall effect, however, is considered to be very small (as for the worst case scenario), and so the significance of the effects is unchanged.

5.6.2.2 *OfTW*

135. Section 9: Physical Processes and Geomorphology of the ES Addendum demonstrates a significant decrease in sediment volume released under the most likely scenario (approximately 32%). However, this was not considered to change the conclusions on significance of effects.
136. The change to cable installation timescales does not alter the conclusions of the effects presented in the Original ES, with no likely significant effects predicted as a result of the OfTW.

5.6.3 CUMULATIVE EFFECTS

137. Cumulative effects remain unchanged from those presented in the Original ES with the exception of the increased disturbance to the MoeVen biotope during Wind Farm construction. As this is identified as a likely significant effect as a result of the increased jack-up vessel footprints, it is considered that a likely significant effect could therefore occur with the addition of this to the effects of the Moray Firth Round 3 Zone. However, given the limited extent of MoeVen within the Moray Firth Round 3 Zone, this represents a precautionary approach to this assessment, and this biotope is able to recover rapidly from this type of effect.

5.6.4 MITIGATION AND MONITORING

138. No mitigation is proposed for benthic ecology and no monitoring further than that presented in the Original ES was presented in the ES Addendum.

5.7 MARINE ARCHAEOLOGY AND CULTURAL HERITAGE

139. This section of the ES Addendum presents and evaluation of the effects of the Amended Project on marine archaeology and cultural heritage, specifically the effects associated with:

- The Amended OfTW Corridor; and
- Changes to the OfTW cable installation timescales.

5.7.1 ASSESSMENT OF THE WORST CASE SCENARIO*5.7.1.1 Wind Farm*

140. Jack-up vessel footprints do not affect the worst case parameters for marine archaeology and cultural heritage. Effects remain unchanged from those presented in the Original ES.

5.7.1.2 OfTW

141. No further sites or features of archaeological or cultural heritage interest were identified in the additional area associated with the amendment to the Original OfTW Corridor, therefore, effects remain unchanged from those presented in the Original ES.
142. The changes to the cable installation timescales would result in a temporal increase in construction vessels, however, as the construction area does not change, the effects remain unchanged from those presented in the Original ES.

5.7.2 CONSIDERATION OF THE MOST LIKELY SCENARIO*5.7.2.1 Wind Farm*

143. The most likely scenario differs from the worst in that it reduces the number of turbines and utilises pin piles as opposed to gravity bases for the turbines, OSPs and meteorological masts. Furthermore, the length of inter-array cable which will be buried is also reduced in the most likely scenario.
144. All of these factors result in a reduction in the area of the sea bed which may be subject to direct effects from the construction of these structures and thus the effects of the most likely scenario for the Wind Farm would be less than those of the worst case. The most likely scenario is not considered to change the conclusions from the worst case even though the most likely scenario may result in a reduced effect.
145. Operational effects of the Wind Farm are limited to those for which there may be a visual effect on cultural heritage assets. In considering the most likely scenario in terms of visual effects, it was concluded that the most likely scenario would not alter the magnitude of effect on visual receptors and hence there would be no change to the level of effects as a result of the most likely scenario.

5.7.2.2 *OfTW*

146. The most likely scenario presents a decrease in the depth of cable burial from 2.5 m to 1.7 m. The potential to disturb unknown cultural heritage assets was assessed as being low and this reduction in trenching volume further alleviates the potential risk. The decrease in the anticipated timescale for installation of cabling would also slightly minimise the effect. It is judged that the most likely scenario would not alter the assessment conclusions presented for the worst case.

5.7.3 **CUMULATIVE EFFECTS**

147. The cumulative assessment for marine archaeology and cultural heritage was not within the scope of the ES Addendum and therefore effects remain unchanged from those presented within the Original ES.

5.7.4 **MITIGATION AND MONITORING**

148. No mitigation or monitoring further than that presented in the Original ES was presented in the ES Addendum.

5.8 **COMMERCIAL FISHERIES**

149. This section of the ES Addendum presents an evaluation of the likely significant effects of the Amended Project on commercial fisheries, specifically those associated with:

- The Amended OfTW corridor; and
- Changes to the cable installation timescales.



5.8.1 **ASSESSMENT OF THE WORST CASE SCENARIO**

5.8.1.1 *Wind Farm*

150. The amended jack-up vessel footprints bear no relevance to the assessment of effects on commercial fisheries as the larger area of the footprints still falls within

the 500 m safety exclusion zone to be implemented during construction. Hence, the amended jack-up vessel footprints do not fall within the scope of this section of the ES Addendum. Effects remain unchanged from those presented in the Original ES.

5.8.1.2 *OfTW*

151. The Study Area remains unchanged from that presented in the Original ES as it already encompassed the additional area created by the amendment to the Original OfTW Corridor. An ICES rectangle is the smallest spatial unit available for the collation of fisheries statistics. It is noted that the ICES rectangles which make up the Study Area are much larger than the area covered by the Amended OfTW Corridor. Given the relatively minor amendment to the Original OfTW Corridor, relative to the scale and description of fishing grounds, the baseline conditions for the Study Area are as per the baseline conditions described in the Original ES.
152. The assessment of effects in the Original ES therefore remains valid, with likely significant effects predicted to arise from temporary loss or restricted access to fishing grounds and associated displacement during construction.

5.8.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.8.2.1 *Wind Farm*

153. During construction, the worst case would be to assume that the entirety of the Wind Farm Site is subject to an exclusion zone, preventing the entry and passage of commercial fishing vessels. The most likely scenario considers a 500 m rolling safety exclusion zone. However, the area of the Wind Farm Site remains unchanged in the most likely scenario and hence the effects during construction remain as described in the assessment of the worst case scenario.
154. During the operational phase, the effects on commercial fisheries are associated with the footprint of the Wind Farm, but also the exclusions zones around the structures. It has been assumed there will be a 50 m exclusion zone around each structure as was assumed in the Original ES. As the number of turbines is reduced in the most likely scenario to 140, from 277 in the worst case, this in turn reduces the area lost to exclusion zones. Furthermore in the most likely scenario the spacing between structures is increased from the minimum worst case of 642 m to 985.6 m, allowing for more space between turbines. This increased space may enable vessels through the Wind Farm more easily, although would be unlikely to alter the assessment of effects presented in the Original ES.
155. In the worst case scenario there is 350 km of inter-array cables, this is reduced to 260 km in the most likely, again reducing the potential effects on commercial fishing activities.

5.8.2.2 *OfTW*

156. In terms of OfTW the two main differences for the most likely scenario are the shorter installation timescales and the reduced maximum length of cable protection. With regard to cable installation timescales, this will lessen the extent that access to fishing grounds along the Amended OfTW Corridor are temporarily restricted, but does not alter the level of effect.

157. The most likely scenario for the maximum length of cable which will require protection (i.e. maximum length of surface laid cable), is 10.7 km instead of 45% (29 km) of the total cable length. This is a reduction in the length that was assessed previously, but does not change the level of effect identified in the assessment of the worst case scenario. The remainder of the export cable would be buried.

5.8.3 CUMULATIVE IMPACT ASSESSMENT

158. The cumulative assessment for commercial fisheries was not within the scope of the ES Addendum and therefore effects remain unchanged from those presented within the Original ES.

5.8.4 MITIGATION AND MONITORING

159. No mitigation or monitoring further than that presented in the Original ES was presented in the ES Addendum.

5.9 SHIPPING AND NAVIGATION

160. This Section of the ES Addendum presents an evaluation of the likely significant effects of the Amended Project on shipping and navigation, specifically, this section assesses the effects associated with:

- The Amended OfTW Corridor; and
- Changes to the OfTW cable installation timescales.

5.9.1 ASSESSMENT OF THE WORST CASE SCENARIO

5.9.1.1 Wind Farm

161. The amended jack-up vessel footprints bear not relevance to the assessment of effects on shipping and navigation as the larger area of the footprints still falls within the 500 m safety exclusion zone to be implemented during construction. Hence, the jack-up vessel footprints do not fall within the scope of this section of the ES Addendum. Effects remain unchanged from those presented in the Original ES.

5.9.1.2 OfTW

162. The Study Area for the assessment of effects on Shipping and Navigation was defined as a 10 nautical mile radius of the Original OfTW Corridor. Due to the limited extent of the amendment to the Original OfTW Corridor, the original Study Area remains appropriate.
163. Consideration has been given to the Amended OfTW Corridor and cable installation timescales in terms of the potential effects on shipping and navigation. However, the amendments have not resulted in any changes to the assessment of the effects of the OfTW on shipping and navigation. The temporary nature of the works, combined with the available sea room in the area for passing commercial, recreational and fishing vessels, will result in limited further effects from the extended timeframe of cable installation operations. The potential effects therefore remain unchanged from those presented in the Original ES.

5.9.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.9.2.1 Wind Farm

164. The most likely scenario would have 137 fewer turbines than the worst case as assessed in the Original ES. This would result in a smaller loss of navigable sea room and therefore reduce the effect on shipping and navigation.

5.9.2.2 OfTW

165. With regard to the OfTW, it is recognised that the most likely scenario includes a greater duration of cable installation and cable protection during year 1 of cable installation works. However, given the nature of the impacts on shipping and navigation, such as effects on vessel routing and increased collision risk due to cable installation vessels, the total duration of works (as opposed to the number of days per year) is considered to be of most relevance. In the most likely scenario this has been reduced from 690 days to 479 days. Therefore the effects would be reduced.

5.9.3 CUMULATIVE EFFECTS

166. The cumulative assessment for shipping and navigation was not within the scope of the ES Addendum and therefore effects remain unchanged from those presented within the Original ES.

5.9.4 MITIGATION AND MONITORING

167. No mitigation or monitoring further than that presented in the Original ES was presented in the ES Addendum.

5.10 SOCIO-ECONOMICS, RECREATION AND TOURISM

168. This section of the ES Addendum presents an evaluation of the likely significant effects of the Amended Project on socio-economics, recreation and tourism, specifically the effects associated with:

- The Amended OfTW Corridor; and
- Changes to the OfTW cable installation timescales.

5.10.1 ASSESSMENT OF THE WORST CASE SCENARIO

5.10.1.1 Wind Farm

169. The amended jack-up vessel footprints bear no relevance to the assessment of effects on socio-economics, recreation and tourism as the size of the footprint of a construction vessel does not affect the worst scenario for the assessment. Hence, the jack-up vessel footprints do not fall within the scope of this section of the ES Addendum. Effects remain unchanged from those presented in the Original ES.

5.10.1.2 OfTW

170. The assessment of effects on gross added value (GVA) is based on expenditure over the construction period. The amendment to the Original OfTW Corridor and the amendment to the cable installation timescales will not affect Amended Project expenditure. As employment effects for the OfTW are also based on project

expenditure, these will also not be affected. Whilst some elements of the construction process will change as a result of the extended timeframe of cable laying operations, e.g. duration of employment and ship hire, the temporary nature of the works will result in limited further effects to those originally assessed. Therefore, the assessment of GVA and employment remains unchanged.

171. The effect of the OfTW on recreation relates to surfing and sea kayaking. Effects would occur if the Amended OfTW Corridor directly affected access or changed the nature of these sites. This is not the case. As such, the amendment to the Original OfTW Corridor does not affect the conclusions of the assessment in the Original ES.
172. Although any visual effects of the OfTW are scoped out, the OfTW could have an effect on marine wildlife tourism if it affects either the behaviour of the marine mammals that attract visitors or access to them.
173. As detailed in the Original ES, effects on the Whale and Dolphin Conservation Society's Scottish Dolphin Centre will only occur while the cabling vessel is working close to the shore. The amendment to the Original OfTW Corridor is approximately 45 km from the Moray coast. As such no effects on tourism (marine wildlife) further to those presented in the Original ES are anticipated.

5.10.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

5.10.2.1 Wind Farm

174. A decrease in the installed capacity of the Project would lead to a decrease in the expected capital expenditure. The 1 GW scheme assessed in the Original ES would require an estimated £3bn of investment. The most likely scenario would, based on the £3m per MW estimate, require an investment of £2.52bn. This still represents a substantial investment which is of the same magnitude of that of the worst case scenario. As such, the most likely scenario does not sufficiently differ from the worst case so as to result in any changes to the outcome of the assessment. Whilst industry standard figures have been used as described above, it is currently anticipated the capital expenditure costs of developing and constructing an offshore wind farm are greater than £3m per MW.
175. The most likely scenario does not present any parameters which would potentially alter the assessment of tourism and recreation.

5.10.2.2 OfTW

176. The most likely parameters for the OfTW do not result in any changes to the parameters upon which the OfTW assessment was based.

5.10.3 CUMULATIVE EFFECTS

177. The cumulative assessment for socio-economics, recreation and tourism was not within the scope of the ES Addendum and therefore effects remain unchanged from those presented within the Original ES.

5.10.4 MITIGATION AND MONITORING

178. No mitigation or monitoring further than that presented in the Original ES was presented in the ES Addendum.

5.11 SUMMARY OF ENVIRONMENTAL EFFECTS

179. Table 3 presents a summary of all likely significant effects of the Wind Farm and the OfTW identified in the Original ES and ES Addendum, both alone and cumulatively with other projects.

Table 3: Summary of Likely Significant Effects Identified in the Original ES and ES Addendum

	Conclusions from Original ES			Final Conclusions following ES Addendum (including effects unchanged from Original ES)		
	Wind Farm	OfTW	Cumulative	Wind Farm	OfTW	Cumulative
Physical Processes and Geomorphology	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.
Benthic Ecology	Likely significant effects predicted for MoeVen biotope during the operational phase resulting from loss of habitat.	No likely significant effects.	Likely significant effects predicted for MoeVen biotope resulting from loss of habitat due to placement of foundations and scour protection including over cables.	Likely significant effects predicted for MoeVen biotope during the operational phase resulting from loss of habitat. Likely significant effects predicted for MoeVen biotope during the construction phase due to sea bed disturbance.	No likely significant effects.	Likely significant effects predicted for MoeVen biotope during the operational phase resulting from loss of habitat. Likely significant effects predicted for MoeVen biotope during the construction phase due to sea bed disturbance.
Fish and Shellfish Ecology	Likely significant effects resulting from construction noise on cod, herring and European eel. ¹	No likely significant effects.	Likely significant effects resulting from construction noise on herring, cod, European eel and salmon and sea trout. ¹ Likely significant effects were predicted on sandeels resulting from loss of habitat.	Likely significant effects resulting from construction noise on cod, herring and European eel. ¹	No likely significant effects.	Likely significant effects resulting from construction noise on herring, cod, European eel and salmon and sea trout. ¹ Effects on sandeels have been revised based on further baseline information across the Moray Firth and are considered to be not likely significant effects.
Marine Mammals	Likely significant short and medium term effects on harbour seal and bottlenose dolphin as a result of pile driving noise. Long-term significant effects on bottlenose dolphins.	No likely significant effects.	Likely significant short and medium term effects on harbour seal and bottlenose dolphin as a result of pile driving noise. Long-term significant effects on bottlenose dolphins.	Likely significant short and medium term effects on harbour seal, minke whale and bottlenose dolphin as a result of pile driving noise.	No likely significant effects.	Likely significant short and medium term effects on harbour seal, minke whale and bottlenose dolphin as a result of pile driving noise.

¹In addition to the species, species groups and life stages listed, the potential effect of construction noise was assessed for a number of fish species not modelled and without defined surrogates, including sandeels, elasmobranchs, river and sea lamprey, anglerfish, haddock, European eel and sprat. The effect of construction noise on these was assessed to be negligible or negative minor, depending on the species under consideration. An exception to this was the European eel, for which a negative moderate effect was predicted. Given the limitations and qualitative nature of the noise assessment carried out for these species, probabilities were not assigned to the predicted significance of the effect, and they are not included in the table.

	Conclusions from Original ES			Final Conclusions following ES Addendum (including effects unchanged from Original ES)		
	Wind Farm	OfTW	Cumulative	Wind Farm	OfTW	Cumulative
Seascape, Landscape and Visual	Likely significant effects identified for the RSU Noss Head to Berridale and the RSCT Coastal Waters; on visual receptor groups, residents, footpath users, motorists and offshore recreational sailors; and on the representative viewpoints of Wick Bay, Sarclet, Hill O'Many Stanes, Dunbeath and Whaligoe Steps.		Likely significant effects identified for the RSU Noss Head to Berridale and the RSCT Coastal Waters; on visual receptor groups, residents, footpath users, motorists and offshore recreational sailors; on the representative viewpoints of Lybster, Wick Bay, Sarclet, Hill O'Many Stanes, Dunbeath and Whaligoe Steps; and temporarily for travellers on the Aberdeen to Orkney / Shetland ferry route.	Likely significant effects identified for the RSU Noss Head to Berridale, the Sarclet Head CCA and the RSCT Coastal Waters; on visual receptor groups, residents, footpath users, motorists and offshore recreational sailors; and on the representative viewpoints of Wick Bay, Sarclet, Hill O'Many Stanes, Dunbeath and Whaligoe Steps.		Likely significant effects identified for the Sarclet Head CCA and the RSCT Coastal Waters; on visual receptor groups, residents, footpath users, motorists and offshore recreational sailors; on the representative viewpoints of Lybster, Wick Bay, Sarclet, Hill O'Many Stanes, Dunbeath and Whaligoe Steps; and temporarily for travellers on the Aberdeen to Orkney / Shetland ferry route.
Marine Archaeology and Cultural Heritage	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.
Commercial Fisheries	No likely significant effects.	Likely significant effects during the construction phase due to loss or restricted access to traditional fishing grounds and displacement of fishing vessels into other areas.	Likely significant effects during the construction and operational phase due to loss or restricted access to traditional fishing grounds and displacement of fishing vessels into other areas.	No likely significant effects.	Likely significant effects during the construction phase due to loss or restricted access to traditional fishing grounds and displacement of fishing vessels into other areas.	Likely significant effects during the construction and operational phase due to loss or restricted access to traditional fishing grounds and displacement of fishing vessels into other areas.
Airborne Noise	No likely significant effects.		No likely significant effects.	No likely significant effects.		No likely significant effects.
Shipping and Navigation	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.
Aviation	No likely significant effects.		No likely significant effects.	No likely significant effects.		No likely significant effects.
Socio-Economics, Recreation and Tourism	Likely significant positive effects for GVA and employment.	Likely significant positive effects for GVA and employment.	Likely significant positive effects for GVA and employment.	Likely significant positive effects for GVA and employment.	Likely significant positive effects for GVA and employment.	Likely significant positive effects for GVA and employment.
Other Issues	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.	No likely significant effects.