BERWICK BANK WIND FARM

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Volume 1, Chapter 4: Site Selection and Consideration of Alternatives

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4. SITE SELECTION AND CONSIDERATION OF ALTERNATIVES

4.1. INTRODUCTION AND OVERVIEW

1. This chapter of the Offshore Environmental Impact Assessment (EIA) Report provides a description of the site selection process and the alternatives considered, from award of the Firth of Forth Zone (awarded as part of The Crown Estate's (TCE's) 3rd Offshore Wind Leasing Round) through to final design and definition of the offshore components of the Berwick Bank Wind Farm hereafter referred to as the 'Project' (with the offshore components seaward of Mean High Water Springs (MHWS) hereafter referred to as the 'Proposed Development').

2. This chapter has been prepared in accordance with Schedule 4(2) of the EIA Regulations (as amended) (see volume 1, chapter 2), requiring information to be provided in the Offshore EIA Report on "*the reasonable alternatives* (*for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".*

3. As outlined above there is a requirement under the EIA Regulations for all projects, as part of the consent application process, to provide information on the options considered and process used to inform selection of the application version of the proposed development.

4. The Firth of Forth Zone was awarded to SSER and Fluor in 2010 as part of TCE 3rd Offshore Wind Leasing Round (Round 3). Following zone award, SSER commenced a number of studies as part of the Zonal Appraisal and Planning (ZAP) process to identify areas within the zone to be taken forward for development. Development of the areas would be completed in three phases:

- phase 1: northern area;
- phase 2: south-eastern area; and
- phase 3: south-western area.

5. Phase 1, the northern area was subsequently taken forward for development as Seagreen Alpha Offshore Wind Farm (Project Alpha) and Project Bravo Offshore Wind Farm (Project Bravo) projects. Although consented by the Scottish Ministers in 2014, the consents were subject to legal challenge, which upheld the grant of the consents in November 2017. In 2018 these projects were combined into one project (Seagreen 1). In 2019, amendments were made to the Seagreen 1 project boundary creating the projects now referred to as Seagreen 1 and Seagreen 1A Project.

6. Having received consent for Project Alpha and Project Bravo in October 2014, a decision was taken by SSER to undertaken further studies (technical and environmental) as part of an internal Project Identification and Approval (PIA) process to determine the potential for developing the remaining two areas within the Firth of Forth Zone. At the time (2014) these areas were referred to as Seagreen Charlie (south-eastern Area) and Seagreen Delta (south-western Area). In 2018, following the creation of Seagreen 1, these remaining areas were renamed Seagreen 2 and Seagreen 3 respectively. The PIA process concluded that both remaining areas should be taken forward for development. The areas were renamed again, with accompanying boundary modification in 2020 from Seagreen 2 and 3 to Berwick Bank and Marr Bank respectively. An Offshore EIA Scoping Report was submitted for Berwick Bank in 2020 (SSER, 2020a).

7. In response to advice received from stakeholders to the 2020 Berwick Bank Wind Farm Offshore Scoping Report (SSER, 2020a), the Applicant started to explore options to combine Marr Bank and Berwick Bank into one single project (the 'Berwick Bank Wind Farm').

4.1.2. CREATING THE BERWICK BANK WIND FARM PROJECT

8. The decision to explore an option for combining the two projects was also influenced by the Scottish Government's declaration of a global climate emergency and setting targets for achieving net zero by 2045 (Scottish Government, 2019a).

9. It was determined, through ongoing stakeholder engagement following receipt of the 2020 Berwick Bank Scoping Opinion (MSLOT, 2021) and analysis of environmental data, that developing the remaining area within the Firth of Forth Zone as one single project would enable the Applicant to make a significant contribution towards accelerating decarbonisation and meeting Scotland's targets for net zero by enabling delivery of up to 4.1 GW by the early 2030s.

10. Delivery of up to 4.1 GW will enable the Project to make a meaningful and timely contribution to decarbonisation and security of energy supply in both Scotland and the United Kingdom (UK), while significantly contributing to lower bills for consumers throughout its operational life, thereby addressing all important aspects of existing and emerging Scottish Government and UK Government policy.

11. The urgent need for the Project is encompassed by six clear policy objectives:

- **Decarbonisation:** The Project is capable of delivering significant quantities of low-carbon electricity from as early as the late 2020s. Making a significant contribution to both the Scottish target of achieving Net Zero by 2045 and the UK target for achieving Net Zero by 2050. This is in line with the UK's Committee on Climate Change (CCC)'s recent identification of the need for urgent action to increase the pace of decarbonisation in the Great Britain (GB) electricity sector.
- **Wind generated electricity:** Greater energy generation from offshore wind is critical for both the reduction of electricity related emissions, as well as providing a timely contribution to a substantial increase in electricity demand due to electrification of transport, heat and industrial demand. The Project would make a significant contribution to delivering Scotland's ambitions for 11 GW of offshore wind capacity to be in operation in Scottish waters by 2030 (Scottish Government, 2020b) and UK targets of 50 GW of offshore wind by 2030 as set in the British Energy Security Strategy (HM Government 2022). This increase of 10 GW on the 40 GW by 2030 target established by the Ten Point Plan (HM Government, 2020a) and committed to in the UK Offshore Wind Sector Deal (BEIS 2019) reflects finds from National Grid Electricity Systems Operator (NGESO) Future Energy Scenarios (FES) which details that to achieve Net Zero targets, offshore wind capacities will be required at 40 – 51 GW in 2030, at 84 – 91 GW in 2040, and at 89 – 110 GW by 2050 (National Grid, 2021a). In every scenario, a pathway to Net Zero includes a significant increase of offshore wind capacity beyond that predicated in the Sector Deal. The increased target also builds on the UK Climate Change Committee (CCC)'s 2019 Report (CCC, 2019), where they advise that consistently strong deployment of low-carbon generation in the lead up to 2050 will be required to meet Net Zero, including "…*at least 75GW of offshore wind*."
- **Resilience of electricity system:** The Project will make a significant contribution to the UK's energy security from the late 2020s. By being connected at the transmission system level, Berwick Bank will play an important role in the resilience of the GB electricity system from an adequacy and system operation perspective. As part of a diverse generation mix, the Project will also contribute to the improved stability of capacity utilisations among renewable generators.
- **At scale:** The Project, with a maximum generating capacity of 4.1 GW is a substantial infrastructure asset capable of delivering significant quantities of low carbon electricity in a short period of time (by early 2030s). The Project is expected to provide enough green electricity to power more than 5 million UK homes. By maximising the capacity of generation in the wind-rich, accessible and technically deliverable proposed location, is to the benefit of all GB consumers, and the Scottish offshore wind industry generally.
- **Competitive:** The highly competitive Contract for Difference (CfD) allocation in 2022 specifically accelerated the deployment of offshore wind, with costs falling by two thirds in the last five years. The Project, one of the last remaining fixed bottom offshore wind sites in Scotland and the UK, would therefore provide competitive and non-volatile (to fuel price fluctuations) renewable electricity compared to conventional low-carbon generation, both in GB and more widely.

12. The single Berwick Bank Wind Farm project also provided the Applicant with an opportunity to mitigate and manage potential environmental risks through increased flexibility and coordination across the Project. This included a 9% reduction on the total array area of the Project which was achieved by refining the boundary that resulted when the Berwick Bank and Marr Bank projects were combined.

13. The Applicant also completed a number of engineering and technical studies to identify measures that could be incorporated into the design of the Project to further reduce potential environmental effects of the single Berwick Bank Wind Farm Project. These designed in measures include increasing the minimum blade tip clearance from 22 m Lowest Astronomical Tide (LAT) to 37 m LAT, increasing minimum and maximum wind turbine parameters included in the Project Design Envelope (PDE) such that fewer wind turbines would be required to deliver 4.1 GW capacity, and refining foundation options by removing floating wind turbines and monopile foundation structures.

4.1.3. BOUNDARY CHANGE

14. Following submission of a Scoping Report for the single project (Berwick Bank Wind Farm) in October 2021 (SSER, 2021a), the Applicant continued to explore options to further reduce potential effects on key receptors. In May 2022, the Applicant took the decision to reduce the boundary of the Berwick Bank Wind Farm to avoid areas identified as potentially relevant to ornithological receptors and to reduce the extent to which the site overlaps with the Firth of Forth Banks Complex Nature Conservation Marine Protected Area (ncMPA). The boundary change also reduces potential effects on other receptors such as shipping and navigation and commercial fisheries and increases the buffer between other projects in the area (Seagreen 1, Seagreen 1A Project, Inch Cape and Neart Na Gaoithe (NnG) Offshore Wind Farms).

15. The boundary change resulted in a further 23% reduction in the total area of the Berwick Bank Wind Farm site. The maximum capacity of the site, however, remained unchanged.

16. Further detail on the approach taken to combining the Marr Bank and Berwick Bank Projects in 2021 and the subsequent 2022 boundary change is provided in section 4.9.

4.1.4. GRID CONNECTIONS

17. The Applicant has three signed grid connection agreements with the network operator (National Grid Electricity System Operator (NGESO)). Two agreements are for connection at a point close to the existing Branxton cable sealing end compound in East Lothian, around 8 km south west of Dunbar on the East Lothian coast (hereafter referred to as the Branxton connection), with a third additional connection at Blyth, Northumberland (hereafter referred to as the Cambois connection).

18. The Branxton grid connections were first secured in 2011. Subsequently, the identification and selection of the onshore components of the Project (substation location, onshore cable routes and landfall) and the Proposed Development export cable corridor linked to the Branxton connection location have formed an integral component of the overall Project definition and refinement of the final Proposed Development boundary. The approach taken to the identification, assessment and selection of the preferred landfall and offshore export cable corridor is discussed in sections 4.10 to 4.12.

19. The third additional connection agreement (Cambois connection) was confirmed in June 2022 following NGESO's Holistic Network Review (results published July 2022). The Cambois connection provides an earlier connection date than a third connection location in the Branxton area, therefore enabling the Project to reach full generating capacity (4.1 GW) by early 2030's. As outlined in section 4.1.2, this earlier connection is critical to enabling the Project to make a significant and timely contribution towards Scottish and UK Government targets for decarbonisation, security of supply and reducing the costs of electricity.

20. The export cables and landfall infrastructure for the Cambois connection are being consented separately and have been considered cumulatively with the Proposed Development as part of this application.

21. The evolution of the Berwick Bank Wind Farm from award of the Firth of Forth Zone to the definition of the final Project (basis of this application) is illustrated in Figure 4.1 below. Further detail on this process is provided in sections 4.5 to 4.9.

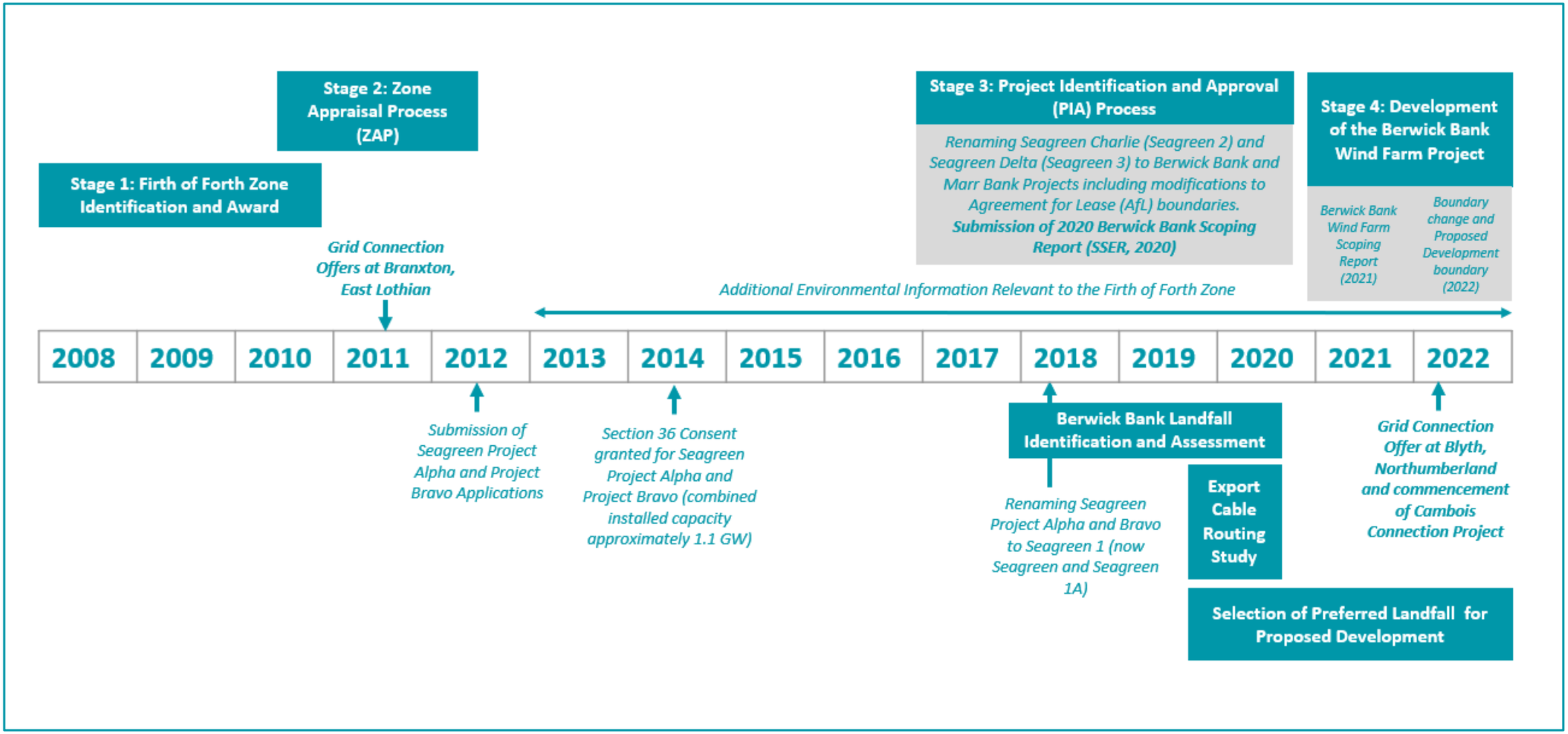

Figure 4.1: Approach to Site Selection and Project Definition

4.2. PROJECT OBJECTIVES

22. The approach taken to initial site selection and subsequent refinement of the Proposed Development boundary has been underpinned by overarching objectives for the Project. These objectives are presented in Table 4.1.

Table 4.1: Project Objectives

No.	Project Objective	Basis for the Objective
1	Develop a large-scale Offshore Wind Farm to generate low carbon electricity to support Scottish and UK decarbonisation targets	• Urgent action is needed to deliver decarbonisation and limit global warming to less than 1.5 degrees • Scottish First Minister declared a climate emergency in April 2019 and Scotland has legally binding targets to reduce greenhouse gas emissions by 75% by 2030 and to "Net Zero" by 2045 • UK Parliament declared a climate emergency in May 2019 and the UK has legally binding targets to reduce greenhouse gas emissions by 78% by 2035 and to "Net Zero" by 2050 • Delivery at scale is needed to make this change in the time available • Fixed Foundation Offshore wind is a proven technology which can deliver substantial low carbon electricity generation in the short to medium term (and beyond) and which cannot be replicated by other technologies or in other settings (e.g. onshore wind)
2	Maximise generation and export capacity within the constraints of available UK sites	• There is limited seabed available in Scotland and in the UK via the seabed leasing processes for OWFs to be located • Round 3 sites were identified through Strategic Environmental Assessment and plan level HRA and are amongst the least constrained for rapid deployment of offshore wind deployment • Generation capacity should be maximised within the available seabed to maximise benefits for Scottish and UK decarbonisation targets • Maximising capacity supports the diversity of generation portfolio within the UK and contributes towards security of supply • Regions with high-capacity factors and windspeeds should be prioritised and developed efficiently • Economies of scale of large projects result in a more efficient delivery methodology but also in decreased costs, and a more viable delivery methodology, as described in Objective 4 below • Grid connection has been secured for 4.1 GW
3	Make efficient use of very limited seabed available for fixed foundation offshore wind farms in Scottish waters	• Seabed capacity for fixed foundation OWFs is extremely limited in Scottish waters • Fixed foundations are a proven and reliable technology with a strong supply chain • Fixed foundations can be delivered at commercial scale and at lower cost than other technologies including floating wind • The Berwick Bank project will make efficient and essential use of this crucial resource to deliver low-cost low carbon electricity generation
4	Deliver low carbon electricity at the lowest possible cost to the UK consumer	• ~25% of Scottish customers are classified as living in fuel poverty, of which ~12.4% are living in extreme fuel poverty[1] • New low carbon energy generation capacity at the lowest possible cost is needed to deliver a just and fair energy transition • Lowest possible levelised cost of energy (LCoE) is required to enable the project to be competitive in CFD auctions and therefore be viable • Efficient use of limited grid resource will further reduce costs to the consumer • The project will make efficient use of available lowest cost grid capacity and has a secured grid connection into locations with existing capacity, reducing the requirement for the development of new grid infrastructure
5	Deliver a significant volume of new low carbon electricity generation as soon as possible, with a substantial contribution to the national grid before 2030	• A substantial volume of capacity is required in time to contribute to 2030 legally binding targets for both Scotland and the UK • Scottish Government has an ambition to increase offshore wind capacity to 11GW of energy installed by 2030. • UK Government has pledged to deliver 50GW of offshore wind capacity by 2030 • The delivery of low carbon electricity generation capacity is required as soon as possible to meet targets and importantly to limit the magnitude and impacts of climate change • Grid connection has been secured for 4.1 GW • Fixed foundation OWFs are a mature technology and there is high degree of certainty on deliverability at scale before 2030
6	Helping ensure UK energy supply security from the mid-2020s through increasing the proportion of electricity coming from domestic renewables and thus reducing exposure to volatile fossil fuel markets.	• Significantly increased consumer bills due to the UK being particularly exposed to high gas prices, because 85% of households use gas boilers to heat their homes and around 40% of electricity is generated in gas-fired power stations ('CarbonBrief', August 2022). • The production of low carbon domestic energy is urgently required to meet 2030 decarbonisation targets and importantly to reduce reliance on foreign energy sources and address the current UK cost of energy crisis

4.3. ASSESSING THE 'DO NOTHING' SCENARIO

23. A 'do nothing' scenario is a projection of the existing baseline to show what changes, if any, would take place if the project did not go ahead. The following section considers the 'do nothing' scenario in the context of the Project objectives set out above in particular in relation to tackling climate change, ensuring UK security of supply and the current cost-of-living crisis linked to the increasing cost of electricity.

24. In accordance with the EIA Regulations, an assessment of the future baseline under the 'do nothing' scenario has been completed for all technical topics (see volume 2, chapters 7 to 21).

25. For the Proposed Development, one of the key risks with the 'do nothing' scenario is being unable to contribute to addressing the climate change emergency and the need for rapid decarbonisation. Climate change is the defining challenge of our time. Human-induced global warming has reached approximately

[1] Scottish House Condition Survey: 2019 Key Findings (www.gov.scot). The latest available figures are from 2019 and were published by the Scottish Government in December 2020. Fuel poverty is defined by the Scottish Government as any household spending more than 10% of their income on energy - after housing costs have been deducted.

1 ºC above pre-industrial levels and without a significant and rapid decline in carbon emissions across all sectors, global warming is not likely to be contained (IPCC, 2021).

26. The 6th and most recent Intergovernmental Panel on Climate Change (IPCC) Synthesis Report published in 2022 presents a narrowing window to mitigate and the reduce the probability of the most catastrophic events that could result from anthropogenic climate change and are forecast to have far-reaching negative effects on human populations globally. It also states that every ton of carbon dioxide (CO_2) emitted increases global warming and that the more rapidly decarbonisation is achieved noticeable reductions in the rate of climate change will likely be observed.

27. Any delay in reducing carbon emissions today results in greater carbon emissions to the atmosphere, higher global temperature rises and an increased level of and speed of action required to halt impacts. A rise in global temperatures above 1.5°C has potential to cause irreversible climate change, the potential for widespread loss of life and severe damage to livelihoods. Yet greenhouse gases projected at a global scale (using Nationally Determined Contributions (NDCs)) are now set to exceed 1.5°C by 2030 and look increasingly likely to exceed 2°C after 2030 (IPCC 2021). Therefore, any delays incurred now, make the challenge significantly more difficult for the years ahead.

28. As such, Scotland, and the wider UK, have declared, in common with many other countries, that we face a global "climate change emergency". By definition, an emergency is a grave situation that demands an urgent response and legal obligations have been committed to as follows:

- International: the United Nations Framework Convention on Climate Change led Paris Agreement (2015);
- UK: the Climate Change Act 2008 (as amended) and Glasgow Climate Pact (2021) (including Scotland and UK); and
- Scotland: Climate Change (Scotland) Act 2009 and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

29. These legal instruments provide the commitments to become carbon neutral (i.e. to reach "Net Zero" by the middle of the 21st century internationally, by 2045 in Scotland and 2050 in the UK) with interim targets. However, review by the Committee on Climate Change (CCC) has reported that the UK is not currently on track to meet the fourth (2023-2027) or fifth (2028-2032) carbon budgets and requires more challenging measures (CCC 2020; CCC undated).

30. The CCC has also warned that many of our plants and animals will undergo severe and catastrophic decline by the end of the century if temperatures continue to rise (CCC undated).

31. Scottish and UK waters are facing an increase in sea surface temperature. The rate of increases is varied geographically, but between 1985 and 2009, the average rate of increase in Scottish waters has been greater than 0.2 °C per decade, with the south-east of Scotland having a higher rate of 0.5°C per decade (Marine Scotland, 2011). A study completed over a longer period of time showed Scottish waters (coastal and oceanic) have warmed by between 0.05 °C and 0.07 °C per decade, calculated across the period 1870 – 2016 (Hughes *et al*., 2018).

32. Climate change is considered to be one of the primary causes of the declines in seabird populations in the UK and for the growing number of red-listed species (Daunt and Mitchell, 2013; Daunt *et al*., 2017; Eaton *et al*., 2015; McDonald *et al*., 2015; OSPAR, 2017a, b; Mitchell *et al*., 2018a, b). Previous seabird reviews (e.g. Daunt and Mitchell, 2013; Daunt *et al*., 2017) have described how climate may affect seabird populations via two main processes: indirect effects via changes in food supply, and direct effects such as mortality from extreme weather.

33. The Royal Society for the Protection of Birds (RSPB) has also widely reported evidence that wildlife in the UK, including seabirds, are already facing a more challenging time due to the climate change that has occurred to date; and that the situation will, for the most part, likely get worse (RSPB, 2017). A key finding is that climate change has been linked with an 87% decline in breeding kittiwakes on Orkney and Shetland, and by 96% at St Kilda since 2000 (RSPB, 2017).

34. Ocean acidification, which is linked to climate change, is the result of oceans absorbing atmospheric CO_2 that is released into the water cycle. This causes chemical changes and altering pH levels, making water more acidic (NOAA.gov, 2020). Research has shown that ocean acidification is already resulting in impacts on marine life and that again, this will continue to get worse (Government Office for Science, 2017). In conjunction with other environmental stresses due to climate change, ocean acidification puts at risk many valuable marine species, habitats and ecosystems. As well as this, crucial ecosystem services such as fisheries, shoreline protection and aquaculture will be at severe risk (Doney *et al*., 2020).

35. Research has shown that in the future, the shift in temperature will continue to push fish populations poleward to colder areas, reducing numbers in the UK (Pinnegar *et al*., 2017). As a result, climate change is threatening the continued success of commercial fisheries which provide food and employment within both the UK and Scottish context (Townhill *et al*., 2019).

36. The reduction in fish populations has adverse consequences for ornithological and marine mammal receptors as well. Populations of sandeel species (including lesser sandeel *Ammodytes tobianus* and Raitt's sandeel *Ammodytes marinus)* are one of many fish species that will be impacted due to a rise in sea temperature. The abundance of sandeels is sensitive to the rising sea temperatures (Van Deurs *et al*., 2011). These fish are essential prey items for a number of seabirds and marine mammals (MacDonald *et al*., 2018) in the North Sea as well as larger fish species (such as cod *Gadus morhua* and sea trout *Salmo trutta*). Current temperatures could result in a 10% decrease in large and small copepods which are a key prey species of sandeels, which is likely to reduce sandeel abundance due to lack of prey availability leading to starvation mortality (MacDonald *et al*., 2018).

37. Rapid decarbonisation is critical to tackling the climate emergency and the cost-of-living crisis by reducing Scotland and the UK's reliance on natural gas. The Project is within one of the few remaining areas in Scottish waters where fixed bottom offshore wind can be delivered at scale and crucially, connect to the grid network in timescales that are essential for not just achieving but accelerating Scotland's and the UK's path to net zero and realising Scotland's ambitions for 11 GW offshore wind connected to the grid by 2030 as set out in the Scottish Government's Sectoral Marine Plan (SMP) for Offshore Wind (Scottish Government, 2020b).

38. The urgent need that the Proposed Development addresses is encompassed by clear requirements which would not be met in a 'do nothing' scenario as summarised in Table 4.2.

Table 4.2: Consideration of the Do Nothing Scenario in the Context of the Project Objectives

No.	Project Objective	Outcome under the 'Do Nothing' Scenario'	Summary of Outcomes from Development of Berwick Bank Wind Farm
1	Develop a large-scale offshore wind farm to generate low carbon electricity to support Scottish and UK decarbonisation targets	Objective not achieved	Delivery of large scale offshore wind farm which will make significant contribution to decarbonisation – through saving of 3,640,891 t CO_2e per year. As outlined above, in the face of a global climate change emergency, rapid decarbonisation is crucial for reducing and preventing longer term significant adverse effects on society, the economy and the environment. Offshore wind farm projects including the Project have the potential to mitigate these adverse effects. Furthermore, the Project has the potential to be generating at full capacity in the next 8 to 10 years. The Project's contribution to decarbonisation would significantly accelerate Scotland's progress towards tacking and mitigating effects of climate change on the environment.
2	Maximise generation and export capacity within the	Objective not achieved	Ability to deliver a large scale offshore wind farm that maximises remaining generation capacity within the

No.	Project Objective	Outcome under the 'Do Nothing' Scenario'	Summary of Outcomes from Development of Berwick Bank Wind Farm
	constraints of available and most appropriate sites		existing Firth of Forth zone whilst taking into account (and reflecting through boundary and design changes) increased knowledge and understanding of potential effects on a range of receptors gained over more than 10 years development work and environmental data collection across the zone.
3	Make efficient use of very limited seabed available for fixed foundation offshore wind farms in Scottish waters	Objective not achieved	Maximising the development potential and associated generating and export capacity within one of the last remaining fixed bottom offshore wind farm sites in Scotland and the UK.
4	Deliver low carbon electricity at the lowest possible cost to the consumer	Objective not achieved	Ability to generate low-cost low carbon electricity for the consumer. Fixed bottom offshore wind is based on proven and reliable technology with an established strong supply chain. This enables projects to be delivered at commercial scale at lower costs than other low carbon and renewable energy technologies.
5	Deliver a significant volume of new low carbon electricity generation as soon as possible, with a substantial contribution to the national grid before 2030	Objective not achieved	The Project has grid connection agreements in place which will enable the Project to achieve full generating capacity by early 2030s. This will make a significant contribution to achieving Scottish Government targets for 11 GW offshore wind generation by 2030 and achieving Net Zero by 2045.
6	Helping ensure UK energy supply security through increasing the proportion of electricity coming from domestic renewables and thus reducing exposure to volatile fossil fuel markets.	Objective not achieved	Delivery of a large offshore wind farm in Scottish waters helping to expand and secure domestic energy sources and supply for Scotland and the UK's and for this to be a low cost source of renewable energy for customers in the UK.

4.4. APPROACH TO SITE SELECTION AND PROJECT DEFINITION AND REFINEMENT

39. The approach taken to site selection and project definition and refinement is illustrated in Figure 4.1. This involved a number of stages as summarised below.

- stage 1 – Firth of Forth Zone Identification and Award;
- stage 2 – ZAP;
- stage 3 – PIA Process; and
- stage 4 – Development of the Proposed Development.

40. These stages are discussed in sections 4.5 to 4.9 respectively.

41. The identification and selection of the preferred landfall location and Proposed Development export cable corridor formed an integral component of the overall Project definition and refinement of the final Proposed Development boundary. The approach taken to the identification, assessment and down selection of the preferred landfall and offshore export cable corridor is discussed in sections 4.10 to 4.11.

4.5. STAGE 1: FIRTH OF FORTH ZONE IDENTIFICATION AND AWARD (2008 - 2010)

42. In 2010 TCE awarded seabed rights to over 32 GW capacity across nine Round 3 offshore wind zones in UK waters beyond 12 nm (Figure 4.2). This included the Firth of Forth Zone, which is one of only two zones in Scottish waters. The other Round 3 zone is the Moray Firth.

43. The zones were identified, and refined, by TCE through a systematic process of analysis and assessment of spatial data included in their Marine Resource Geographical Information Systems (GIS) System (MaRS) (TCE, 2012).

44. In total, during 2008/2009, TCE completed three iterations of its three-stage approach to the delineation of the Round 3 Zones outlined below.

- Stage 1: Identification and removal of areas identified as being unsuitable for offshore wind due to:
  - The presence of one or more exclusions to development (e.g. activity, development or area of seabed which had either been granted future permission or is leased or licensed for another purpose or activity); or
  - Due to technical conditions or external interests such as excessive water depths or an International Maritime Organisation (IMO) shipping lane. These datasets are detailed in Table 4.3 and were mapped as areas or locations to be avoided.
- Stage 2: Evaluation of remaining areas of seabed to determine suitability based on restrictions present. Restrictions were defined as an activity, development or interest which should be considered when planning the proposed activity or development but may not preclude development. Features represented by these layers were weighted and scored to provide a representation of the potential interests and possible constraints.
- Stage 3: Outputs from the national scale mapping and modelling then reviewed against other detailed review datasets to check for consistency: Review datasets included information and data which were unsuitable for national analysis and spatial mapping but which could, however, be used to inform decisions about the zones. These layers were considered outside of the actual modelling process.

45. During each iteration, the outputs from the modelling were discussed with key stakeholders. Taking into account feedback from engagement with stakeholders and refinements applied to the mapped data, spatial analysis and review of other datasets, the number of zones identified were reduced from 11 to nine across the three iterations.

46. The MaRS GIS datasets used to inform the identification of the Round 3 zones are summarised in Table 4.3.

Table 4.3: MaRS Datasets Used to Inform Identification of Round 3 Zones (TCE, 2012)

Stage	MaRS Datasets Applied within GIS Covering all British Waters
Stage 1	**Exclusions Avoided** UK Continental Shelf • Cables (telecoms, electricity and wind farms) • Oil and Gas Wells • Pipelines • Gas Storage Areas • Seascape (8km) (lower end of range from Round 2 SEA conclusions) • Sites of Special Scientific Interest (SSSI) • Marine Nature Reserves (MNR) • Bathymetry (up to 60m) • Special Protection Areas (SPA) • Special Areas of Conservation (SACs) • Wind Farms – Round 1 • Wind Farms – Round 2 • Dumping Grounds • Shipping Routes • Oil and Gas Surface Installations – Platforms • Dredging Licences, Application and Option Areas • Distance from National Grid Connections • Military Practice and Exercise Areas (PEXA) • Six Mile Fishing Limit • International Maritime Organisation (IMO) shipping lanes • Distance from UK Ports • Shipping Density • Current Oil and Gas Licensed Blocks • OSPAR (The Convention for the Protection of the Marine Environment of the North-East Atlantic) Sites • Sandy Sediment.

Stage	MaRS Datasets Applied within GIS Covering all British Waters
Stage 2	**Exclusions Avoided (refined list)** Live Cables (telecoms and electricity) • Live Pipelines • Live Interconnectors • Outside of UK Continental Shelf • Round 1 Wind Farms • Round 2 Wind Farms • Wind Farm Cables • Round 2 SEA Regions • Wind farm Anemometers • Protected Wrecks • Deep Mining Minerals • Oil and Gas Surface Installations • Oil and Gas Subsurface Installations • Oil and Gas Safety Zones • Live Wells • Dredging Licence Areas • Dredging Option Areas • Dredging Application Areas • Dredging Prospecting Areas • Aquaculture and Foreshore Leases • Tunnels • Seascape Buffer (13 km) (upper end of range from Round 2 SEA conclusions) • Bathymetry 60 m • IMO shipping lanes. **Restrictions (weighted, not avoided)** Bathymetry (scored by depth) • Military PEXA + Munitions Dumps • Decommissioned Oil and Gas Wells • Aggregate Future Interest Areas • SSSIs • SACs • Potential Offshore SACs • SPAs • National Nature Reserve (NNR) • Local Nature Reserve (LNR) • Marine Nature Reserve (MNR) • Ramsar Sites • World Heritage Sites • Out of Service Cables • Out of Service Pipelines • Shipping Density • Port Navigation Channels • Active Dumping Grounds • Gas Storage Areas • R1 Wind Farm Exclusion Zones • Anchorage Areas and Buoys (navigation and metocean) • Recreational Craft Routes and Areas • ANOB • NSA.
Stage 3	**Review Datasets** National Grid Connections • Marine Mammals • Proposed Offshore SPA • Annex 1 Habitats • Potential Gas Storage Areas • Fish Spawning Areas • Geology • Wind Speed Model • Proposed Cables • Civil Aviation Radar Areas • Fish Nursery Areas • Potential Marine Conservation Zones • Potential CCS Areas • Oil and Gas Licence Blocks and Fields • Sensitive Bird Areas • Helicopter Platform Zones • Proposed Pipelines.

47. The approach taken by the TCE was to identify zones for offshore wind projects within the broader geographical areas identified by the Offshore Energy Strategic Environment Assessment (OESEA) (DECC, 2009b) as having potential opportunity for offshore wind. The OESEA was completed in two parts: OESEA 1 and OESEA 2 (in 2009 and 2011, respectively). OESEA 1 focussed on creating additional offshore wind and oil and gas capacity (TCE, 2012). OESEA 2 (DECC, 2011) reiterated the offshore wind development recommendations within the OESEA 1, expanding on requirements towards developers to provide project level evidence-based approaches to development with a focus on identifying potential impacts on marine mammals and fish. OESEA 2 concluded that prospective developable areas were not restricted but that offshore wind projects should be designed to reduce impacts on other users of the sea, on protected and conservation areas and on environmentally sensitive coastal locations.

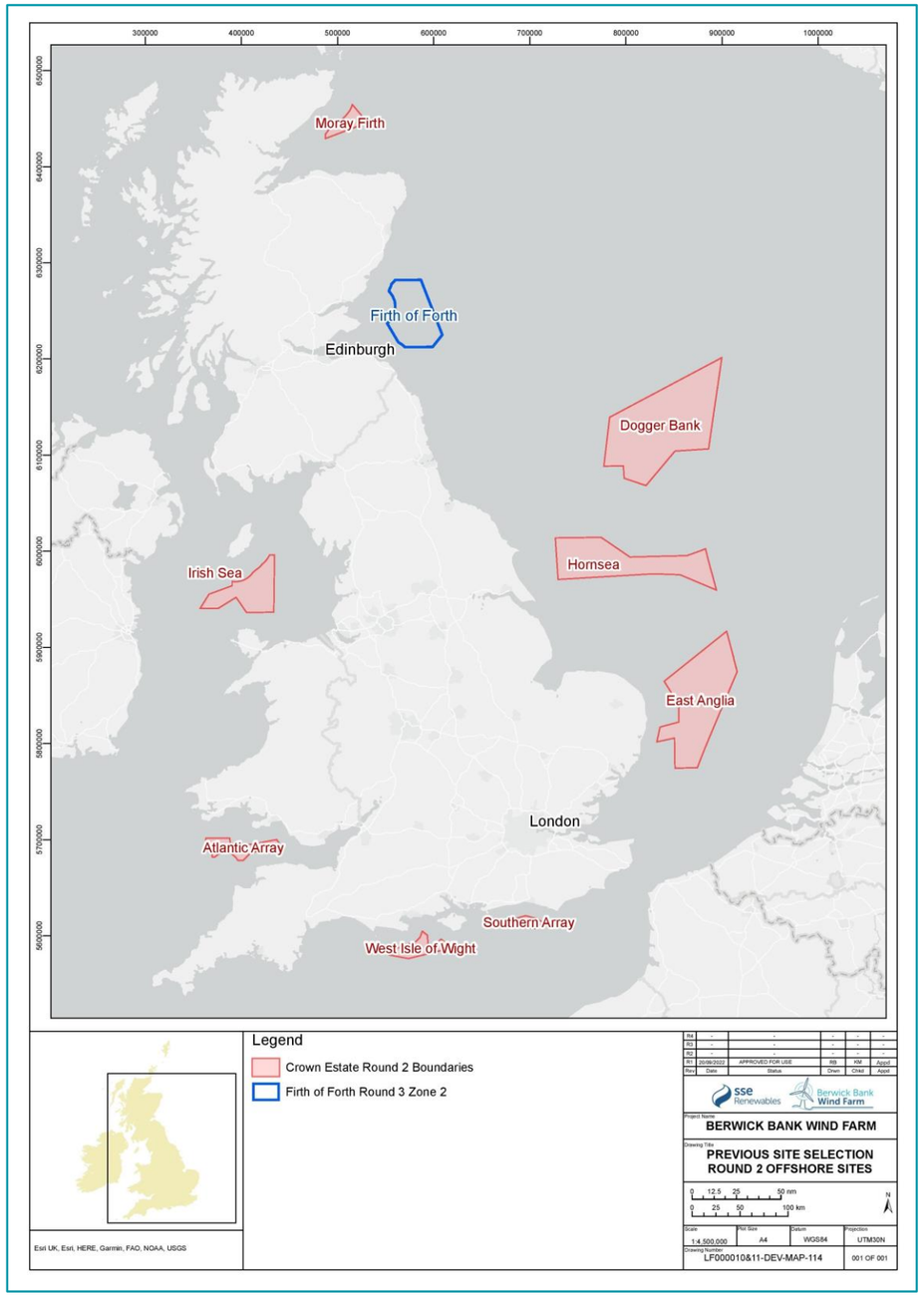

Figure 4.2: TCE Round 3 Offshore Wind Farm Zones

4.6. STAGE 2 – ZONE APPRAISAL PROCESS (2010 TO 2012)

48. The ZAP process was used to identify sites for individual projects within the Firth of Forth Zone. This was a discretionary, non-statutory process recommended by TCE (TCE, 2012), the aim of which was to:

- optimise the development opportunity by identifying the most technical and environmentally suitable development sites within the Firth of Forth Zone;
- promote stakeholder engagement at a strategic level to inform the long-term development strategy; and
- consider cumulative impacts across the former Firth of Forth Zone, particularly in relation to other offshore wind farm developments.

49. The ZAP process involved more detailed mapping and analysis of a range of environmental and technical constraints within, and surrounding, the Firth of Forth Zone.

50. Data considered in the ZAP process included:

- water depths (UK Hydrographic Office (UKHO) bathymetry dataset) and seabed conditions;
- wind speed and metocean conditions (Met office 10-year wind dataset);
- nature conservation designations SPAs, SACs, SSSIs and Important Bird Areas (IBAs);
- ornithological data (data from 24 months of boat based surveys (2009 to 2011) covering the entire Firth of Forth Zone, sightings data from TCE aerial surveys (2009/2010), SPA bird tracking studies (2010);
- benthic and intertidal ecology data;
- fisheries spawning and nursery grounds (Centre for Environment, Fisheries and Aquaculture Science (CEFAS) mapped data);
- marine mammals including cetaceans and seals (18 months boat-based survey sightings 2009 to 2011 for the entire Firth of Forth Zone and sightings data from TCE aerial surveys (2009/2010));
- fisheries activity (Marine Scotland data);
- shipping and navigation — Automated Identification System (AIS) data and radar surveys (summer and winter 2010 to 2011 completed by the Forth and Tay Offshore Wind Developers Group (FTOWDG);
- seascape and landscape – landscape designations and protected areas;
- marine archaeology and cultural heritage;
- aviation and telecommunications issues, including civil and military aspects;
- oil and gas infrastructure;
- emergency services; and
- cables and pipelines.

51. As discussed in section 4.1, the outcome from the ZAP process was the division of the Firth of Forth Zone into three areas which would be developed in phases. These areas are summarised in Table 4.4 and illustrated in Figure 4.3.

Table 4.4: Evolution of Project Boundaries and Names within the Firth of Forth Zone from 2010 to 2020

Phase	Zone Area	Project Names	Status
Phase 1	Northern area	2010 – 2017: Seagreen Project Alpha and Project Bravo 2018: Seagreen 1 (referred to as Seagreen) 2019 to date: Seagreen 1 and Seagreen 1A Project	Consent for Seagreen Alpha and Seagreen Bravo was submitted in 2012, granted in October 2014 and confirmed following legal challenge in November 2017. Seagreen 1 is due to be fully operational by 2023, followed by Seagreen 1A Project.
Phase 2	South-eastern area	2010 – 2017: Seagreen Charlie 2018: Seagreen 2 2020: Berwick Bank 2021 - 2022: Berwick Bank Wind Farm	Combined with Phase/Marr Bank into one single area in May 2021 (Berwick Bank Wind Farm).
Phase 3	South-western area	2010 – 2017: Seagreen Delta 2018: Seagreen 3. 2020: Marr Bank 2021 - 2022: Berwick Bank Wind Farm	Combined with Phase 2/Berwick Bank (and subsequent boundary change in May 2022) now comprises the Proposed Development boundary.

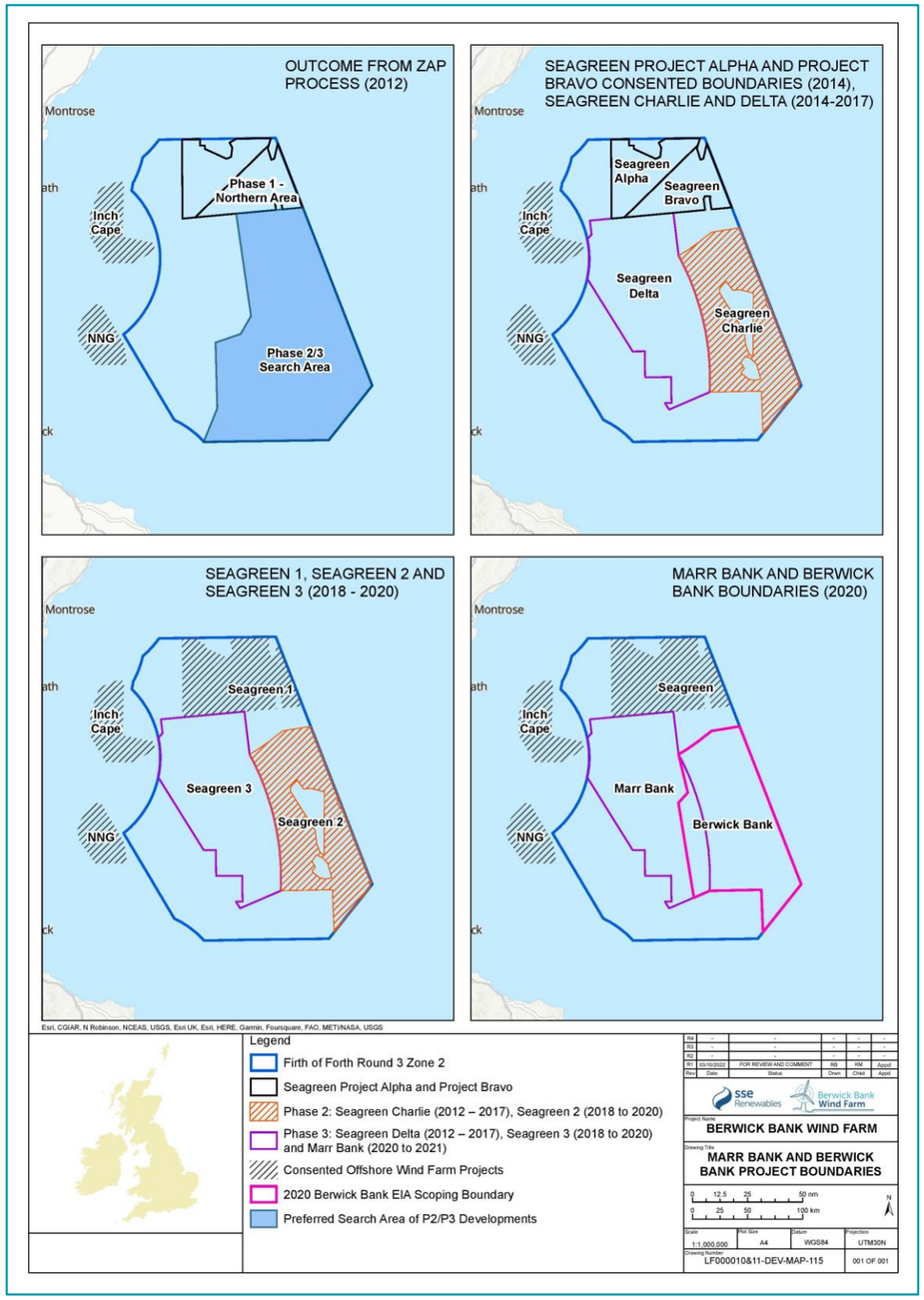

Figure 4.3: Evolution of Project Boundaries and Names in the Firth of Forth Zone from 2010 to 2020

4.7. ENVIRONMENTAL INFORMATION RELEVANT TO FURTHER DEVELOPMENT WITHIN THE FIRTH OF FORTH ZONE

4.7.1. MARINE SCOTLAND - LICENSING AND OPERATIONS TEAM APPROPRIATE ASSESSMENT OF THE FORTH AND TAY PROJECTS 2014

52. In 2014, Marine Scotland – Licensing and Operations Team (MS-LOT) (on behalf of Scottish Ministers as the Competent Authority) undertook an Appropriate Assessment of the Forth and Tay offshore wind farm development applications (Neart na Gaoithe (NnG), Inch Cape and Seagreen Project Alpha and Project Bravo (now referred to as Seagreen 1 and Seagreen 1A Project) Offshore Wind Farms) to determine whether there was potential for these developments, alone or in combination, to have an adverse effect on the integrity of any European protected site (SACs and SPAs).

53. MS-LOT concluded that the Forth and Tay developments would not adversely affect the European sites considered, either alone or in combination with other plans or projects, provided that certain planning conditions outlined in the Appropriate Assessment are complied with. The European protected sites considered in the Appropriate Assessment are shown in Figure 4.5 and listed in Table 4.5.

Table 4.5: European Protected Sites (Natura Sites) Included in the MS-LOT Appropriate Assessment

Site Name	Key Species
Buchan Nest to Collieston Coast SPA	Guillemot *Uria aalge* (breeding) Black-legged kittiwake *Rissa tridactyla* (breeding) Seabird assemblage (breeding)
Fowlsheugh SPA	Guillemot (breeding) Black-legged kittiwake (breeding) Razorbill *Alca torda* (breeding) Seabird assemblage (breeding)
Forth Islands SPA	Northern gannet *Morus bassanus* (breeding) Guillemot (breeding) Black-legged kittiwake (breeding) Atlantic puffin *Fratercula arctica* (breeding) Razorbill (breeding) Seabird assemblage (breeding)
St Abb's Head to Fast Castle SPA	Guillemot (breeding) Black-legged kittiwake (breeding) Razorbill (breeding) Seabird assemblage (breeding)
Moray Firth SAC	Bottlenose dolphin *Tursiops truncatus*
Firth of Tay and Eden Estuary SAC	Harbour seal *Phoca vitulina*
Isle of May SAC	Grey seal *Halichoerus grypus*
Berwickshire and North Northumberland Coast SAC	Grey seal
River South Esk SAC	Atlantic salmon *Salmo salar* Freshwater pearl mussel *Margaritifera margaritifera*
River Tay SAC	Atlantic salmon Sea lamprey *Petromyzon marinus*
River Teith SAC	Atlantic salmon Sea lamprey
River Dee SAC	Atlantic salmon Freshwater pearl mussel
River Tweed SAC	Atlantic salmon Sea lamprey

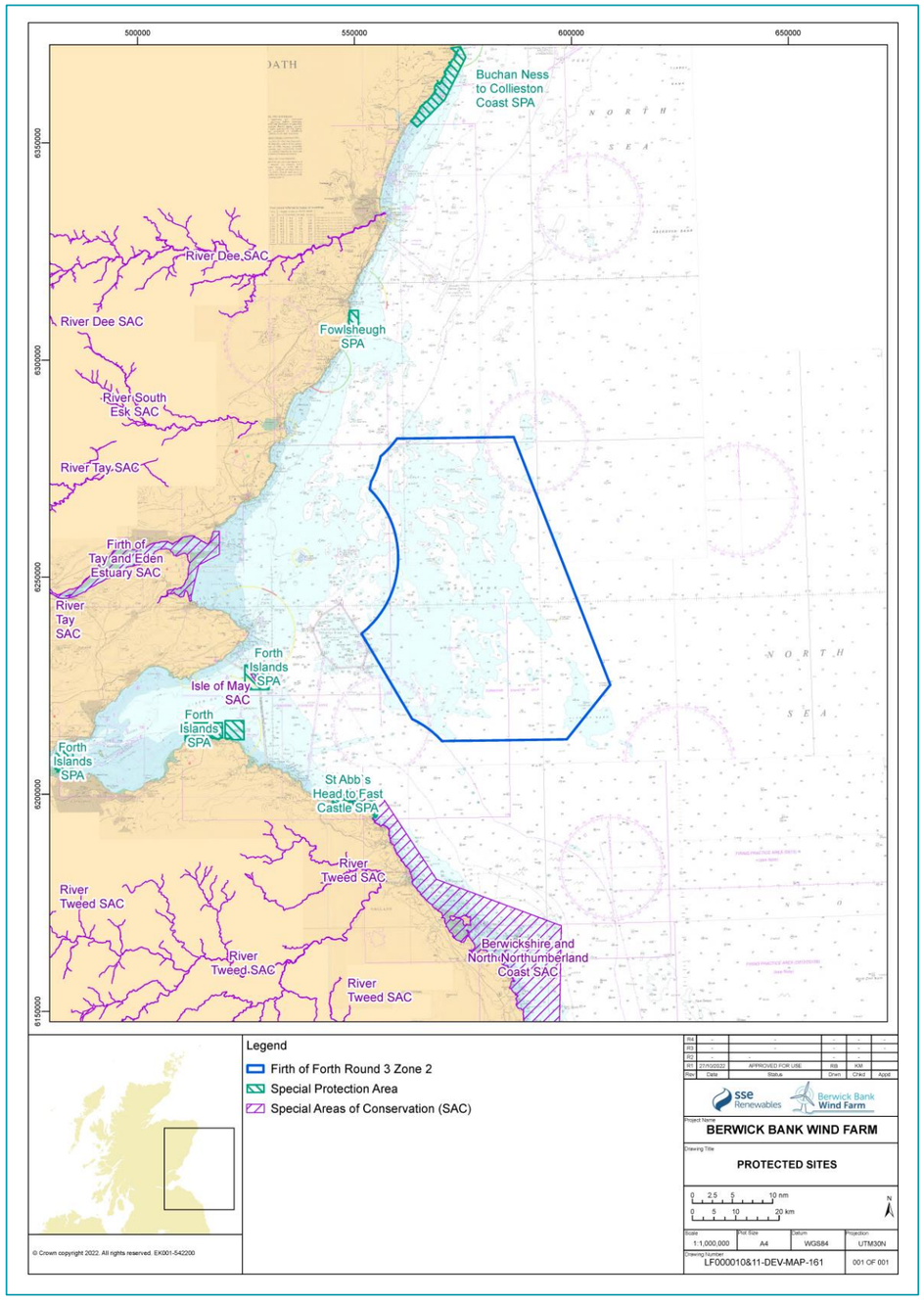

Figure 4.4 European Protected Sites (Natura Sites) Included in the MS-LOT Appropriate Assessment

4.7.2. IDENTIFICATION AND DESIGNATION OF NEW NATURE CONSERVATION SITES

54. MS-LOT's Appropriate Assessment considered European sites which were proposed or classified at the time of the assessment (2014). Following consent of the Forth and Tay developments, a suite of new potential/proposed SPAs (pSPAs) were identified by the Scottish Government, designed to protect marine foraging areas of designated seabird breeding colonies. In October 2016, following a period of review of the scientific basis of, and the conservation objectives for these sites by the Statutory Nature Conservation Bodies (SNCBs), the Scottish Government announced a public consultation on a suite of new marine SPAs, which includes the Outer Firth of Forth and St. Andrews Bay Complex SPA. The sites were classified as SPAs in December 2020 (JNCC, 2022). The Outer Firth of Forth and St. Andrews Bay Complex SPA includes part of the Wee Bankie within the Firth of Forth Zone and is classified for both wintering seabirds, and breeding seabirds foraging at sea.

55. Between 2015 and 2019, the UK and Scottish Governments, in accordance with the EU Habitats Directive, progressed with the identification and designation of SACs for harbour porpoise *Phocoena phocoena* in UK waters. A number of potential SACs for harbour porpoise were identified, including locations in the outer Moray Firth, the west coast of Scotland and the Southern North Sea. The Inner Hebrides and the Minches SAC was designated in 2016, followed by designation of the Southern North Sea (SNS) SAC in 2019 along with the Bristol Channel Approaches, North Channel, West Wales Marine and North Anglesey Marine SACs.

56. In additional to the designations of additional SPAs and SACs, the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 include provisions for the designation of Nature Conservation Marine Protected Areas (ncMPAs) in Scottish waters. These ncMPAs contribute to the wider network of marine SACs, SPAs and Ramsar sites, collective referred to as Marine Protected Areas (MPAs).

57. Since 2013, the Scottish Government has added 42 MPAs to the network, including 31 ncMPAs. The ncMPAs include the Firth of Forth Banks Complex ncMPA which is partially located within the Firth of Forth Zone. The site was designated in 2014 and includes the Berwick, Scalp and Montrose Banks and the Wee Bankie shelf banks and mounds.

4.8. STAGE 3 – PROJECT IDENTIFICATION AND APPROVAL PROCESS (2017 TO 2020)

58. In 2017, SSER commenced its PIA Process, the aim of which was to build upon information gathered during the ZAP to identify potential future sites for development within the remaining Firth of Forth Zone (areas identified initially as Phases 2 and 3). The PIA process involved the following:

- identification of areas largely beyond the foraging range of key seabird species;
- review and analysis of available boat based ornithology survey results;
- review and analysis of 2010 and 2011 metocean survey data acquired across the entire Firth of Forth Zone by Seagreen;
- review and analysis of 2012 nearshore measurements and wavebuoy data;
- consideration of other conservation interests (including new nature conservation designations - Firth of Forth and St. Andrews Bay Complex SPA, Firth of Forth Banks Complex NCMPA and SNS SAC) to determine extent and nature of potential interactions with these designations);
- analysis of water depths; and
- consideration of separation distance from Seagreen 1, Seagreen 1A Project and adjacent Scottish territorial waters projects.

59. The outcome from the 2017 PIA process was the identification of two separate 1 GW projects within Phases 2 and 3 (Seagreen Charlie and Seagreen Delta respectively). The 1 GW capacity for each project was based on a project design that minimised environmental effects whist still enabling zero carbon energy production. Each project comprised up to 100 wind turbines, with a nominal generating capacity of 8 MW

to 10 MW. At this time this was considered realistic in terms of technological development (offshore fixed wind).

60. Having established that there is potential for further development of the Firth of Forth Zone and that this development would make a significant contribution to the renewable energy targets set by the Scottish and UK Governments, the PIA process was progressed further to better understand key environmental sensitivities in the two areas and explore options for further reducing any potential adverse effects.

61. In 2018, SSER carried out analysis on the boat based ornithological survey data obtained for the Firth of Forth Zone, and ornithological data from the other Forth and Tay projects. From this analysis it emerged that there is potential for areas of ornithologically sensitivity to overlap the Phase 3 part of the Firth of Forth Zone (referred to as Seagreen Delta at the time, prior to becoming Seagreen 3 in 2018 and then Marr Bank in 2020).

62. A review of the available biological ornithological 'headroom'[2] for key seabird species at the designated breeding colonies identified in the 2014 Appropriate Assessment was then undertaken to determine the potential capacity for development in this part of the Firth of Forth Zone, taking into account these ornithological sensitivities. It was concluded that, on the basis of the published review of collision avoidance rates (BTO, 2014), sufficient 'headroom' was potentially available for further offshore wind farm development in the Forth and Tay region.

63. Having identified the potential for ornithological headroom, the PIA was further progressed to take into account advances in wind turbine technology which had started to be identified as being effective in reducing potential impacts on key seabird species. These advances include the deployment of fewer, larger wind turbines (e.g. wind turbines with capacity of more than 10 MW) to deliver the same project capacity and the ability to increase the minimum sea level to blade tip clearance (air gap) from the standard 22 m towards 30 m or more.

64. Whilst progressing the PIA, all three of the Forth and Tay projects applied to vary their Section 36 consents to use fewer, larger wind turbines capable of generating the same capacity as the consented designs, reducing potential impacts on ornithology. These variations are summarised below.

Table 4.6: Forth and Tay Offshore Wind Projects – Section 36 Consent Variations 2018/2019

Project	2014 Section 36 Consented Capacity and Wind Turbines	Varied Section 36 Consented Capacity and Wind Turbines	Date Variation Granted
Inch Cape Offshore Wind Farm	110 wind turbines Maximum blade tip height 215 m from LAT Maximum rotor diameter 172 m 784 MW capacity	72 wind turbines Maximum blade tip height 291 m from LAT Maximum rotor diameter 250 m	17 June 2019
NnG Offshore Wind Farm	75 wind turbines Maximum blade tip height 197 m Maximum rotor diameter (not stated) 450 MW capacity	54 wind turbines Maximum blade tip height 208 m Maximum rotor diameter 167 m Around 450 MW capacity	3 December 2018
Seagreen Project Alpha and Project Bravo Offshore Wind Farms	For each project: 75 wind turbines Maximum blade tip height 209.7 m from LAT Maximum rotor diameter 122 m to 167 m 525 MW capacity	Removal of 525 MW capacity	28 August 2018

65. MS-LOT undertook an Appropriate Assessment for each of the three developments in late 2018. For each project it was concluded in the Appropriate Assessment that there would be a reduction in the predicted collision impacts due to the use of fewer larger wind turbines. MS-LOT also acknowledge that the Appropriate Assessments are considered to be highly precautionary. This is on the basis that the 2018 worst case scenario (WCS) for the Appropriate Assessment was based on the 2018 Seagreen design in-combination with the 2014 consented designs for Inch Cape and NnG Offshore Wind Farms, neither of which (based on the varied consents for these projects) will be constructed. It is therefore deduced that if all 2018 designs had been considered in the in-combination assessment, effects would be substantially reduced.

66. Furthermore, the seabird collision avoidance study undertaken at Thanet offshore wind farm lends support to the view that the avoidance rates used in the 2018 applications are also likely to be highly precautionary (Skov *et al*, 2018). The research at Thanet also provided valuable information on bird flight speeds. Skov *et al.* (2018) offers species-specific empirical data on flight speeds from a large number of individual birds. The EIA Report for the Optimised Seagreen Project (Seagreen, 2018) estimated that using the flight speeds recorded at Thanet would reduce gannet collisions by 6%.

67. As such, considerable headroom in the region has already been released through the revised Forth and Tay consents, with further potential headroom available from current and ongoing empirical research designed to reduce uncertainty in ornithology assessments, and from as-built versus consented designs outside of the Forth and Tay region (OWEC, 2021).

4.8.1. IDENTIFICATION OF MARR BANK AND BERWICK BANK PROJECTS (2020)

68. Having confirmed that there is ornithological headroom available within the Firth of Forth Zone, SSER took the decision to progress development of the Phase 2 and 3 areas. Following a number of internal boundary

[2] Headroom is the difference between predicted levels of mortality based on worst case parameters used at the application stage and mortality rates based on 'as built' project designs (built v assessed or consented wind farm designs) (Trinder, 2017).

reviews and project iterations it was determined that the two projects identified within these Phase 2 and 3 areas (Seagreen 2 and 3) would be renamed Berwick Bank and Marr Bank respectively.

69. In August 2020, an Offshore EIA Scoping Report (SSER, 2020a) was submitted to MS-LOT for an offshore wind farm project within the Phase 2 area (2020 Berwick Bank). Although the Phase 3 area (Marr Bank) was also being progressed it was at an earlier stage of development.

4.9. STAGE 4 – DEVELOPING THE BERWICK BANK WIND FARM (2021 TO 2022)

70. The stages in the development of the Project and refinement of the Proposed Development from submission of the 2020 Berwick Bank Wind Farm Offshore EIA Scoping Report in August 2020 to finalisation of the Proposed Development boundary included in this application (May 2022) are summarised in Table 4.7. Note this does not include information on the grid connections, which are discussed in sections 4.10 to 4.12.

Table 4.7: Stages in the Development of the Proposed Development Boundary (not Including Grid Connections – See Sections 4.10 to 4.12 Below)

Date	Boundary Refinements	Basis of Project Design Iteration
August 2020	Submission of 2020 Berwick Bank Wind Farm Scoping Report (based on project within Phase 3 area) (SSER, 2020a)	• maximum generating capacity 2.3 GW; • 775 km^2 array area; • up to 242 wind turbines (fixed or floating); • blade tip clearance 22 m; • maximum rotor diameter 270 m; and • maximum blade tip height 310 m above LAT.
November 2020	Virtual public exhibition	• feedback from consultees with a preference towards one rather than two Offshore EIA Reports, thus reducing the number of consents that would require assessment by authorities; • streamlining of offshore development consent and licensing applications; • a reduction in regulatory review and assessment; and • potential to achieve the generation of greater amount of renewable energy more quickly through the development of the Project rather than two separate projects.
March 2021	MS-LOT Berwick Bank Scoping Opinion	
March to October 2021	Detailed review of environmental constraints associated with both Berwick Bank and Marr Bank project areas	
October 2021	Submission of Berwick Bank Wind Farm Offshore Scoping Report (2021a) and Berwick Bank Wind Farm Offshore HRA Screening Report (SSER, 2021b) (based on single boundary combining 2020 Berwick Bank and Marr Bank)	• maximum generating capacity 4.1 GW; • 1,314 km^2 array area; • up to 307 wind turbines (fixed only); • blade tip clearance 37 m; • maximum rotor diameter 310 m; • maximum blade tip height 355 m above LAT; and • refinement of substructure options (suction caissons and jacket foundations) – monopile and floating foundations discounted.
February 2022	MS-LOT Scoping Opinion for the Berwick Bank Wind Farm	• Feedback from consultees in relation to potential effects associated with the Berwick Bank Wind Farm Boundary
May 2022	Berwick Bank Wind Farm Boundary Change (Proposed Development Boundary)	• 1,041 km^2 array area; • up to 307 wind turbines (fixed only); • blade tip clearance 37 m; • maximum rotor diameter 310 m; and • maximum blade tip height 355 m above LAT.

4.9.1. DEVELOPMENT OF THE BERWICK BANK WIND FARM PROJECT BOUNDARY - 2021

71. In response to feedback received from stakeholders on the 2020 Berwick Bank Scoping Report (August 2020) (SSER, 2020a) advising that it would be preferable to combine the boundaries of the 2020 Berwick Bank and Marr Bank projects into one single project, the Applicant commenced a detailed site assessment and refinement study. This study (March 2021 to October 2021) focused specifically on the exploration of options for maximising capacity within the Berwick Bank Wind Farm boundary whist reducing potential effects on ornithology and other key receptors including the Firth of Forth Banks Complex NCMPA, shipping and navigation and commercial fisheries.

72. With regards to reducing effects on ornithology detailed analysis of a subset of the ornithological aerial survey data was undertaken to identify potential 'hotspots' for key species within the Berwick Bank Wind Farm boundary. Where possible, overlaps with these higher usage areas 'hotspots' were avoided or minimised. Consideration was also given to options to minimise potential barrier effects (including cumulatively with other Forth and Tay projects) for key species such as gannet.

73. Combining the 2020 Berwick Bank and Marr Bank boundaries to create the Berwick Bank Wind Farm boundary also provided the Applicant with an opportunity to:

- Reduce the overall footprint of the array area. The 2020 Berwick Bank array area was 775 km^2 and the array area for Marr Bank was 666 km^2 resulting in a combined the total area of 1,441 km^2. Through refinements to avoid/reduce overlap with sensitive areas and features the resulting Berwick Bank Wind Farm array area was 1,314 km^2 which is a reduction of 9%.
- Once combined, further boundary refinements were focused on the northern and north-eastern boundaries which overlap areas of higher ornithological activity including those which may be associated with feeding grounds.
- Refinements to northern and north-eastern boundaries also resulted in an increase in the buffer between the Berwick Bank Wind Farm and the other Forth and Tay projects in particular Inch Cape Offshore Wind Farm, Seagreen 1 and Seagreen 1A Project. This helped increase the area of open sea available for birds to pass through the area, therefore reducing potential barrier effects. The increase in buffer also helped reduced potential effects on shipping and navigation by increasing the area of sea available for vessels transiting between Berwick Bank and the adjacent wind farms.

74. The 9% reduction in the resulting single Berwick Bank Wind Farm boundary also resulted in the avoidance of key nursery and spawning grounds for important prey species and commercial fisheries species including sandeel, mackerel *Scomber scombrus*, herring *Clupea harengus* and sprat *Sprattus sprattus*.

75. Development of the Berwick Bank Wind Farm boundary was also informed by detailed engineering site suitability studies, including preliminary assessment of ground conditions for the installation of preferred foundation options (suction caissons and jackets). This was necessary to ensure suitability of ground conditions within the combined boundary including the associated consideration of the effects on the LCoE. The combined Project boundary was also sufficiently larger to allow for constraint sensitive design options to be built into the final Project Design.

76. The site assessment and refinement study culminated in the submission of the Berwick Bank Wind Farm Offshore EIA Scoping Report (SSER, 2021a) to MS-LOT in October 2021.

4.9.2. BERWICK BANK WIND FARM BOUNDARY CHANGE (PROPOSED DEVELOPMENT BOUNDARY MAY 2022)

77. Following receipt of the Berwick Bank Wind Farm Scoping Opinion from MS-LOT on 04 February 2022 (MS-LOT, 2022), work progressed on the full EIA assessment, using assessment parameters as advised in the Scoping Opinion. During this work, an opportunity was identified which could potentially further reduce predicted impacts from the proposed development. In March 2022 a boundary review process was initiated by the Applicant to explore options for further reducing impacts, whilst meeting the Project's overarching aims and objectives. This process concluded in late May 2022, resulting in a further 23% reduction of the array area (from 1,314 km^2 to 1,010.2 km^2). A comparison with the previous site boundary is shown in Figure 4.5.

78. Furthermore, when compared to the size of the 2020 Berwick Bank boundary (775 km^2) the final Proposed Development array area (post-boundary change) is only 34% larger, whereas the maximum generating capacity of the site has increased by 78.3% (4.1 GW compared to 2.3 GW in the 2020 Berwick Bank Offshore EIA Scoping Report (SSER, 2020a)).

79. Key environmental considerations influencing the boundary change are summarised in Table 4.8.

80. Table 4.10 presents an evaluation of the environmental benefits linked to the boundary change and the associated PDE refinements.

Table 4.8: Environmental Considerations Influencing Key Boundary Changes

Receptor	Effects of the Boundary Change (May 2022)
Ornithology	Initial work on the EIA for the Proposed Development commenced in 2021 following submission of the Berwick Bank Wind Farm Offshore EIA Scoping Report (SSER, 2021a). This focused specifically on reviewing the following key sources of baseline data: • two years of site-specific baseline survey data (HiDef 2019-2021); • Marine Ecosystems Research Program Ornithology Data Trends; and • tagging data from SPA populations. Further detail on data sources used in the ornithological assessment are given in volume 2, chapter 11 of this Offshore EIA Report. The analysis of the full two years of baseline survey data using MRSea identified areas of high utilisation of seabirds (potential foraging hotspots) the north of the Berwick Bank Wind Farm array area (around the 'notch' area) and also in western and south-western part of the array area. These results align with other studies including empirical tracking data which also show higher levels of seabird utilisation associated with these areas, in particular for guillemot and kittiwake. As such, it was determined that, an option for reducing potential effects on seabirds would be to realign the boundary of the Berwick Bank Wind Farm to avoid these potential foraging hotspots. Further detail on the MRSea outputs (density estimates) and the identification of potential foraging hotspots is provided in volume 2, chapter 11 of this Offshore EIA Report. The boundary change, which resulted in a deepening of the northern notch by moving the north-western and northern boundary further south, and removal of the south-western corner was calculated to result in a >20% reduction in ornithological displacement impacts. Changes to the north-western boundary also reduced the extent to which the array area overlapped the Firth of Forth Complex ncMPA. Features associated with the ncMPA were identified in the data sources above as typically being more frequently used by seabirds compared to areas further offshore (as a function of being closer to breeding SPA populations). The ornithological benefit of removing this area from the site boundary include a reduction in displacement impacts and slight reduction in modelled collision mortality, through an overall reduction in seabird densities figures. The 'stepped' south-eastern boundary of the array area was originally delineated by the Outer Firth of Forth and St Andrew's Bay SPA. The assessment parameters defined in Table 6.13 of the Offshore EIA Scoping Report (SSER, 2021a) (Proposed Parameters to be Used in the Assessment of Displacement Impacts) and confirmed in the Scoping Opinion (MS-LOT, 2022) include a 2 km displacement buffer. As part of the boundary change, a 2 km buffer between the Outer Firth of Forth and St Andrew's Bay SPA and the Proposed Development was added to ensure that there is no direct overlap relating to this site.
Benthic Ecology and the Firth of Forth Banks Complex NCMPA	The change to the north-western boundary of the array area also resulted in a reduction in the extent to which the Proposed Development boundary overlaps with the Firth of Forth Complex ncMPA. Although reducing potential effects on ornithology was the main driver influencing the boundary change there was also good alignment between ornithology and the Firth of Forth Banks Complex MPA feature. Therefore, the boundary change also provided an opportunity to reduce potential effects on the Firth of Forth Complex ncMPA. From a mitigation perspective the main action available with regards reducing effects of the Proposed Development on the Firth of Forth Banks Complex ncMPA features is to minimise overlap. In designing the new boundary, the Applicant was able to reduce the extent to which the Proposed Development array area overlaps with the Firth of Forth Banks Complex MPA by 37% (in relation to the scoped boundary) through an overall site reduction of 23%. This reduction has seen the extent to which the Proposed Development array area overlaps the Firth of Forth Banks Complex MPA reduce from 503.9 km^2 to 316.5 km^2. The benefits of this reduction regarding the potential impacts of the proposed development are outlined in the Firth of Forth Banks Complex MPA Assessment.

Receptor	Effects of the Boundary Change (May 2022)
Shipping and Navigation Commercial Fisheries	Despite the previous boundary iteration increasing the navigable corridor between the Proposed Development and Inch Cape Offshore Wind Ltd. (ICOL) to 2.4 nm, there was deemed to be the potential for a residual risk related to this north-south corridor. Therefore, although ecological effects were a key driver for the boundary change, there was the opportunity to align this with shipping and navigation and remove any residual risk with the navigable corridor between the proposed development and ICOL alongside the other benefits that the boundary change provided. The boundary change has allowed the minimum gap between the proposed development and ICOL to increase from 2.4 nm to 4.2 nm at the closet point. There has also been a straightening (in a north to south direction) of the corridor, thus further benefiting vessels navigating in the area. With regards to commercial fisheries, the change to the western and south-western boundary has the additional benefit of reducing potential interactions between fishing vessels operating in the area and the increased access to fishing grounds located to the west of the array area, which are also the grounds closest to shore. Therefore, the overlap between the proposed development and the fishing grounds in the area has been reduced wherever possible to do so. The benefits of this alteration of the navigable corridor is outlined in the Navigational Risk Assessment (NRA) (volume 3, appendix 13.1).

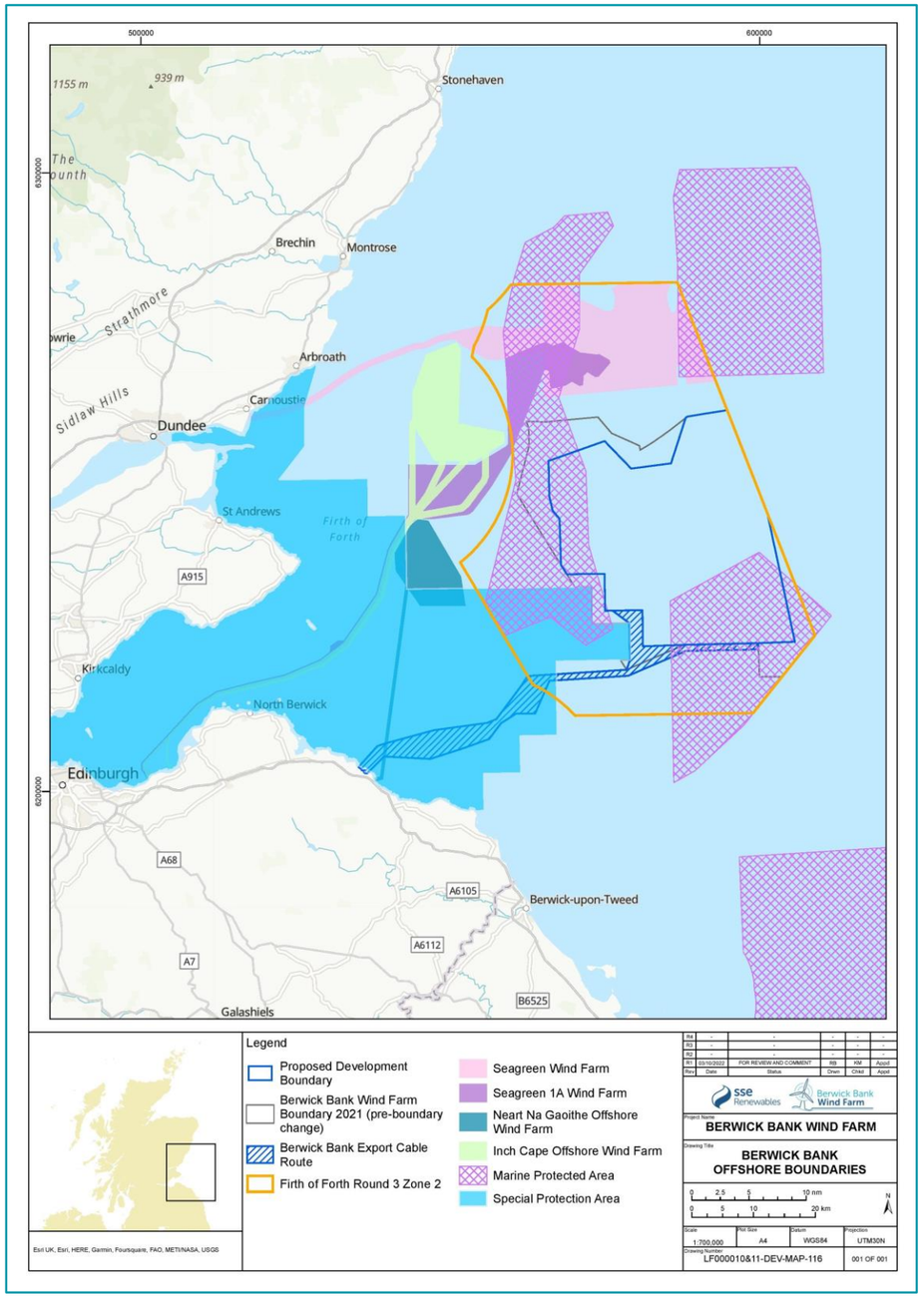

Figure 4.5: Influence of the Firth of Forth Banks Complex ncMPA and the Outer Firth of Forth and St Andrew's Bay SPA on the Boundary Change

Table 4.9: Overview of Berwick Bank Wind Farm Boundary Changes and Project Design Refinements

Site Selection and Project Refinements	Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER, 2021a)	Proposed Development (May 2022 Boundary Change)
Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and corresponding increase in maximum blade tip height from 310 m to 355 m above LAT.	The Applicant made a commitment to increasing the minimum blade tip to sea clearance from 22 m LAT to 37 m LAT in the Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER, 2021a). This decision was based on outputs from additional ornithological collision risk modelling (CRM) work which examined collision rates for a range of minimum blade tip clearance heights. The decision was also informed by internal engineering studies looking at water depths, foundation designs and vessel requirements for wind turbine installation (to manage increased wind turbine heights combined with deep water). To accommodate the increase in the minimum blade tip to sea clearance it was necessary to also increase the maximum blade tip height. This was increased from 310 m to 355 m LAT which also takes into account the increase in the minimum and maximum wind turbine sizes from 10 MW and 20 MW up to 14 MW to 24 MW (see below).	No further change. 37 m minimum blade clearance included in PDE for the Proposed Development. Maximum blade tip height remains at 355 m.
Maximum wind turbine numbers and increase in minimum and maximum wind turbine sizes from between 10 MW and 20 MW up to 14 MW to 24 MW	The 2020 Berwick Bank Wind Farm Scoping Report (SSER, 2020a) included the following: • 242 wind turbines (maximum); • maximum rotor blade diameter 270 m; • maximum blade tip 310 m above LAT; • 10 MW to 20 MW per wind turbine; • maximum capacity 2.3 GW; and • closest distance to shore = 43 km. The Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER, 2021a) included: • 307 wind turbines (maximum); • maximum rotor blade diameter 310 m; • maximum blade tip 355 m LAT • 14 MW to 24 MW capacity per wind turbine; • maximum capacity 4.1 GW; and • closest distance to shore = 33 km. Although there was an increase in the total maximum number of wind turbines, the number of additional wind turbines required to achieve an increase of 78.3% in the maximum generating capacity for the site (4.1 GW compared to 2.3 GW) is only 65 wind turbines (26.9% increase). This is due to the increase in minimum and maximum wind turbine sizes. Therefore, proportionally less wind turbines are required to deliver more generating capacity.	The wind turbine parameters included in the PDE for the Proposed Development remain the same as those included in the 2021 Berwick Bank Wind Farm Offshore Scoping Report (SSER, 2021a). The maximum capacity of the project also remains unchanged (4.1 GW) despite the 23% reduction in the total area of the Berwick Bank site. Increase in the minimum distance of the Proposed Development array area from shore from 33 km to 37.8 km (Scottish Border Coastline at St Abbs Head).
Changes to project areas (km^2)	Increase in the Berwick Bank Wind Farm array area from 775 km^2 to 1,314 km^2. The combined total of the single Berwick Bank Wind Farm array area would have been 1,441 km^2 (2020 Berwick Bank was 775 km^2 and Marr Bank was 666 km^2). However, with refinements to avoid/reduce overlap with sensitive areas and features the Berwick Bank Wind Farm array area was reduced by 9% to 1,314 km^2.	Additional studies completed in 2022 as part of the Boundary Change achieved a further 23% reduction in the Proposed Development array area. Total area of the Proposed Development array area is now 1,010.2 km^2. It is also important to note that, the size of the Proposed Development array area is only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2) whereas the maximum generating capacity of the site is 78.3% greater (4.1 GW compared to 2.3 GW).
Wind Turbine foundation options refined to two options, namely jacket foundation with pin piles or suction caisson. Floating, monopile and gravity base foundations were removed from the design envelope.	The Applicant made a commitment remove monopile, gravity base and more novel floating foundations. This was based on internal engineering studies considering water depths and ground conditions across the Berwick Bank Wind Farm array area. This enabled the Applicant to refine the PDE to provide increased certainty around the types of foundations that would be used for the Project. No changes were made to any other design parameters included in the PDE (e.g. in relation to Offshore substation platforms (OSPs)/Offshore convertor station platforms), number and lengths of cables.	As part of the boundary change a number of engineering studies were completed as part of the boundary refinement to ensure options for the installation of either suction caissons or jacket foundations were optimised where possible, whilst taking into account other environmental constraints and sensitivities. This involved the use of heat maps to identify preferred areas where seabed conditions were most favourable. These were then combined with heatmaps prepared for environmental receptors (see Table 4.10 below) to ensure the boundary change reduced potential effects on these sensitive receptors while optimising future project design options.
Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	The Applicant made a commitment to mitigate possible impacts to key receptors by reducing underwater noise generated should UXO clearance be required.	No further change.
Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	The maximum hammer energy included in the 2020 Berwick Bank Scoping Report was 6,000 kJ (SSER, 2020a). This was the hammer energy identified as being required for 15 m diameter monopile foundations. With removal of the monopile foundations, the Applicant was also able to reduce the maximum hammer energy to 4,000 kJ (for pin piles required for jacket foundations), with a maximum realistic hammer energy of 3,000 kJ.	No further change. The maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000kJ has been maintained in the PDE for the Proposed Development.

Table 4.10: Comparison of Environmental Effects Associated with the Berwick Bank Wind Farm Boundary Changes and Project Design Refinements

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
Physical Processes (volume 2, chapter 7)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	Due to the increase in maximum wind turbine numbers (307 compared to 242) there is potential for an increase in effects on physical processes due to a corresponding increase in the maximum number of foundation structures in particular in relation to the following impacts: increased suspended sediment concentrations (SSC) and sediment deposition resulting from seabed disturbance during foundation and cable installation; changes to wave climate, tidal currents and sediment transport due to the presence of infrastructure (including scouring, effects on bank features (e.g. Marr Bank and Berwick Bank features and effects on coastal morphology)). There is also potential for these effects to occur over a larger area due to the increase in the overall size of the Berwick Bank Wind Farm array area. Given that maximum number of wind turbines has only increased by 26.9% compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) the extent to which potential effects will increase is expected to be limited. Furthermore, taking into account the corresponding increase in maximum rated capacity of the wind turbines (from 20 MW to 24 MW) the maximum number of wind turbines required to deliver 4.1 GW generating capacity is 179 wind turbines.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	Although the maximum number of wind turbines remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) (307 compared to 242) the boundary change has resulted in a 23% reduction (1,314 km^2 to 1,010.2 km^2) in the total extent to which the Proposed Development array area boundary overlaps with sensitive geological and geomorphological features (e.g. the Berwick and Marr bank features of the Firth of Forth Banks Complex ncMPA). The resulting Proposed Development array area is also now only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). Therefore, although there is potential for a slight increase in potential magnitude of effects on physical processes due to the increase in the maximum number of wind turbines (and associated foundation numbers) compared to the 2020 Berwick Bank project the overall conclusions of effect significance are not expected to increase on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process. Conclusions of effect significance are presented in volume 2, chapter 7.
	Change in the total size of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caissons.	In both the 2020 Berwick Bank Scoping Report (SSER, 2020a) and the Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER, 2021a) the jacket foundations with suction caissons had the largest total footprint (m^2) on the seabed. This was calculated as 31,416 m^2 per foundation including scour protection in the Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER, 2021a) (a comparable parameter was not included in the 2020 Berwick Bank Scoping Report (SSER, 2020a)). Removal of the monopile, gravity base and floating wind turbines therefore were not considered to have a significant effect in terms of reducing the total footprint (m^2) of the foundations on the seabed. Potential increases in effects on physical processes associated with an increase in the maximum number of wind turbine foundations is as discussed above.	No change from the Berwick Bank Wind Farm PDE	Removing monopile, gravity base and floating foundations enabled the Applicant to refine the design for the preferred foundation options (jacket foundations with pin piles or suction caissons). The refinement of the options also enables the Applicant to complete more detailed engineering analysis and modelling to create heat maps to identify preferred areas where seabed conditions were most favourable for the foundation options being considered. This information was then reviewed against environmental sensitivity heat maps including sensitive seabed features such as the Marr and Berwick bank features of the Firth of Forth Banks Complex ncMPA to ensure the boundary change reduced potential effects on these sensitive receptors while optimising future Project design options. Although the maximum number of wind turbines and therefore associated foundation structures remains unchanged (307) and is higher than the 2020 Berwick Bank Scoping Report (SSER, 2020a), the potential significance of any resulting increased effect on physical process is expected to be similar on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	N/A	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	N/A	N/A
Benthic Subtidal and Intertidal Ecology	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
(volume 2, chapter 8)	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	Due to the increase in maximum wind turbine numbers (307 compared to 242) there is potential for an increase in effects on benthic ecology receptors (e.g. temporary habitat disturbance/loss, increased SSC and sediment deposition, EMF, long term habitat loss, colonisation of hard structures and risk of introduction and spread of invasive non-native species due to a corresponding increase in the maximum number of foundation structures). There is also potential for these effects to occur over a larger area due to the increase in the overall size of the Berwick Bank Wind Farm array area and to affect sensitive receptors located within, or interacting with, the Berwick Bank Wind Farm array area. However, given that maximum number of wind turbines has only increased by 26.9% compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) the extent to which potential effects will increase is expected to be limited. Furthermore, taking into account the corresponding increase in maximum rated capacity of the wind turbines (from 20 MW to 24 MW) the maximum number of wind turbines required to deliver 4.1 GW generating capacity is 179 wind turbines.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	Although the maximum number of wind turbines remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) (307 compared to 242) the boundary change has resulted in a 23% reduction (1,314 km^2 to 1,010.2 km^2) in the total extent to which the Proposed Development array area boundary overlaps with sensitive benthic features. This included reducing the extent to which the Proposed Development array area overlaps with the Firth of Forth Banks Complex ncMPA by 37% (in relation to the Berwick Bank Wind Farm array area boundary October 2021). The resulting Proposed Development array area is also now only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). Therefore, although there is potential for a slight increase in potential magnitude of effects on benthic receptors due to the increase in wind turbine numbers (and associated foundation numbers) compared to the 2020 Berwick Bank project, the overall significance of these effects is expected to remain unchanged (see volume 2, chapter 8 for conclusions on effect significance) on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Change in the total size of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	In both the 2020 Berwick Bank Scoping Report (SSER, 2020a) and the Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER, 2021a) the jacket foundations with suction caissons had the largest total footprint (m^2) on the seabed. This was calculated as 31,416 m^2 per foundation including scour protection in the Berwick Bank Wind Farm Offshore Scoping Report (October 2021) (SSER,2021a) (a comparable parameter was not included in the 2020 Berwick Bank Wind Farm Scoping Report (SSER, 2020a)). Removal of the monopile, gravity base and floating wind turbines therefore were not considered to have a significant effect in terms of reducing the total footprint (m^2) of the foundations on the seabed. Potential increases in effects on physical processes associated with an increase in the maximum number of wind turbine foundations is as discussed above.	No change from the Berwick Bank Wind Farm PDE	Removing monopile, gravity base and floating foundations enabled the Applicant to refine the design for the preferred foundation options (jacket foundations with pin piles or suction caissons). The refinement of the options also enables the Applicant to complete more detailed engineering analysis and modelling to create heat maps to identify preferred areas where seabed conditions were most favourable for the foundation options being considered. This information was then reviewed against environmental sensitivity heat maps including protected features within the Firth of Forth Banks Complex ncMPA to ensure the boundary change reduced potential effects on these sensitive receptors while optimising future project design options. Although the maximum number of wind turbines and therefore associated foundation structures remains unchanged (307) and is higher than the 2020 Berwick Bank Wind Farm Scoping Report (SSER, 2020a), the potential significance of any resulting increased effect on benthic ecology is not expected to change on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	N/A	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	N/A	N/A
Fish and Shellfish Ecology (volume 2, chapter 9)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	Due to the increase in maximum wind turbine numbers (307 compared to 242) there is potential for an increase in effects on fish and shellfish ecology receptors (e.g. temporary habitat disturbance/loss, increased SSC and sediment deposition, EMF, long term habitat loss, underwater noise from piling due to a corresponding increase in the maximum number of foundation structures). There is also potential for these effects to occur over a larger area due to the increase in the overall size of the Berwick Bank Wind Farm array area and to affect sensitive receptors located within, or interacting with, the Berwick Bank Wind Farm array area. In terms of underwater noise impacts there is potential that	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	Although the maximum number of wind turbines remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) (307 compared to 242), the Proposed Development array area has been reduced by 23% (1,314 km^2 to 1,010.2 km^2). The resulting Proposed Development array area is also now only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). As part of the boundary change, the Applicant reduced the extent to which the Proposed Development array area boundary overlapped with potential habitat for key fish and shellfish species including sandeel, herring, elasmobranchs, *Nephrops*, lobster, edible crab, scallop and swimming velvet crab, Atlantic salmon and sea lamprey.
	Change in the total size of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area	

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
		there will be a requirement for longer piling campaigns leading to potential increases in the durations over which fish and shellfish are exposed to underwater noise and particle motion. However, given that maximum number of wind turbines has only increased by 26.9% compared to the 2020 Berwick Bank project, the extent to which potential effects will increase is expected to be limited. Furthermore, taking into account the corresponding increase in maximum rated capacity of the wind turbines (from 20 MW to 24 MW) the maximum number of larger wind turbines required to deliver 4.1 GW generating capacity is 179 wind turbines.	from 1,314 km^2 to 1,010.2 km^2.	Therefore, although there is potential for an slight increase in potential magnitude of effects on fish and shellfish in terms of temporary habitat disturbance/loss, increased SSC and sediment deposition, EMF, long term habitat loss, underwater noise (piling and UXO detonation) due to the increase in the maximum number of wind turbines (and associated foundation numbers) compared to the 2020 Berwick Bank project the overall significance of these effects is expected to remain unchanged (see volume 2, chapter 9 for conclusions on effect significance). This is on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	Removal of monopiles from the PDE has a significant benefit on fish and shellfish as it has enabled the Applicant to reduce the maximum hammer energy from 6,000 kJ to 4,000 kJ. This is significant in terms of reducing potential impact zones for both injury and disturbance resulting from piling activities (underwater noise and particle motion). There is potential that, as outlined above the increase in the maximum number of wind turbines (and therefore foundations) requiring installation could lead to an increase in the duration over which piling campaigns are completed and fish and shellfish are exposed to underwater noise and particle motion from these activities. However, given that the increase in wind turbine (and foundation) numbers of only 26.9% compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) it is expected that the increase in potential magnitude of this effect will be limited.	No change from the Berwick Bank Wind Farm PDE	In addition to removing monopile foundations and reducing the maximum hammer energy to 4,000 kJ, the Applicant also reduce the extent to which the Proposed Development array area boundary overlapped with potential habitat for key fish and shellfish species including sandeel, herring, elasmobranchs, *Nephrops*, lobster, edible crab, scallop and swimming velvet crab, Atlantic salmon and sea lamprey. Therefore, although there is potential for an slight increase in potential magnitude of effects on fish and shellfish in terms of the duration over which piling campaigns are completed due to the increase in the maximum number of wind turbines (and associated foundation numbers) compared to the 2020 Berwick Bank project, the overall significance of these effects is expected to remain unchanged (see volume 2, chapter 9 for conclusions on effect significance) on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.		No change from the Berwick Bank Wind Farm PDE	
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	The use of low order techniques for clearance of UXO has been adopted as a mitigation measure to reduce potential effects of underwater noise and particle motion from UXO detonation on fish and shellfish. This approach enables noise levels to be slowly increased to encourage fish that are sensitive to noise and/or particle motion to move out of the area prior to using larger detonation charges, therefore reducing the potential for these receptors to be injured by a detonation and to reduce to the extent to which the fish will be disturbed. The total number of UXO within the Berwick Bank Wind Farm array area is not influenced by total wind turbine numbers, although there may a requirement to remove a higher number of UXO if these correspond with increased wind turbine locations. By increasing the size of the Berwick Bank Wind Farm array area, there is also potential for a higher number of UXO to be present in the wider area. However, the risk of UXO presence and requirement for detonation generally remains unchanged due to these uncertainties.	No change from the Berwick Bank Wind Farm PDE	By reducing the size of the Proposed Development array area by 23%, the risk of potential UXO within the site requiring detonation is also reduced. The Proposed Development array area is only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). Through the use of low order techniques for the clearance of UXO as introduced for the Berwick Bank Wind Farm the risk of significant effects on fish from UXO detonation is also reduced.
Marine mammals (volume 2, chapter 10)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	Due to the increase in maximum wind turbine numbers (307 compared to 242) there is potential for an increase in effects on marine mammal receptors in particular in relation to underwater noise from piling and effects on prey species due to a corresponding increase in the maximum number of foundation structures. There is also potential for these effects to occur over a larger area due to the increase in the overall size of the Berwick Bank Wind Farm array area. In terms of underwater noise impacts there is potential that there will be a requirement for longer piling campaigns leading to potential increases in the durations over which marine mammals are exposed to underwater noise.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307) Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	Although the maximum number of wind turbines remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) (307 compared to 242), the Proposed Development array area has been reduced by 23% (1,314 km^2 to 1,010.2 km^2). The resulting Proposed Development array area is also now only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). Site specific surveys have identified a number of key species including harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, harbour seal and grey seal to be present within the assessment study area (based on the 2020 Berwick Bank and Marr Bank sites plus survey buffer of 16 km). As part of the boundary change, the Applicant reduced the extent to which the Proposed Development array area boundary overlapped
	Change in the total size of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2			

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
		However, given that maximum number of wind turbines has only increased by 26.9% compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) the extent to which potential effects will increase is expected to be limited. Furthermore, taking into account the corresponding increase in maximum rated capacity of the wind turbines (from 20 MW to 24 MW) the maximum number of larger wind turbines (24 MW) required to deliver 4.1 GW generating capacity is 179 wind turbines.		with potential habitat used by these species. The boundary change also enabled the Applicant to increase the distance between the Proposed Development array area and other offshore wind farm projects in the Forth and Tay in particular Seagreen 1, Inch Cape and NnG Offshore Wind Farms, creating larger corridors for the passage of marine mammals through the area. The Proposed Development array area also does not overlap any SACs or MPAs designated for marine mammals. Therefore, although there is potential for an slight increase in potential magnitude of effects of underwater noise from piling on marine mammals due to the increase in the maximum number of wind turbines (and associated foundation numbers) the overall significance of these effects is expected to remain unchanged (see volume 2, chapter 10 for conclusions on effect significance) on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	Removal of monopiles from the PDE has a significant benefit on marine mammals as it has enabled the Applicant to reduce the maximum hammer energy from 6,000 kJ to 4,000 kJ. This is significant in terms of reducing potential underwater noise impact zones for both injury and disturbance resulting from piling activities. There is potential that, as outlined above, the increase in the maximum number of wind turbines (and therefore foundations) requiring installation could lead to an increase in the duration over which piling campaigns are completed and marine mammals are exposed to underwater noise from these activities. However, given that the increase in maximum wind turbine (and foundation) numbers of only 26.9% compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) it is expected that the increase in potential magnitude of this effect will be limited.	No change from the Berwick Bank Wind Farm PDE	In addition to removing monopile foundations and reducing the maximum hammer energy to 4,000 kJ, the Applicant also reduce the extent to which the Proposed Development array area boundary overlapped with potential habitat for key marine mammal species including harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, harbour seal and grey seal. Therefore, although there is potential for an slight increase in potential magnitude of effects on marine mammals in terms of the duration over which piling campaigns are completed due to the increase in the maximum number of wind turbines (and associated foundation numbers) compared to the 2020 Berwick Bank project, the overall significance of these effects is expected to remain unchanged (see volume 2, chapter 10 for conclusions on effect significance) on the basis that potential interactions with sensitivities features have been reduced where possible through the boundary change process.
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.		No change from the Berwick Bank Wind Farm PDE	
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	The use of low order techniques for clearance of UXO has been adopted as a mitigation measure to reduce potential effects of underwater noise and particle motion from UXO detonation on marine mammals. This approach enables noise levels to be slowly increased to encourage marine mammals that are sensitive to underwater noise to move out of the area prior to using larger detonation charges, therefore reducing the potential for these receptors to be injured by a detonation and to reduce to the extent to which the marine mammals will be disturbed. The total number of UXO within the Berwick Bank Wind Farm array area is not influenced by total wind turbine numbers, although there may a requirement to remove a higher number of UXO if these correspond with increased wind turbine locations. By increasing the size of the Berwick Bank Wind Farm array area, there is also potential for a higher number of UXO to be present in the wider area. However, the risk of UXO presence and requirement for detonation generally remains unchanged due to these uncertainties.	No change from the Berwick Bank Wind Farm PDE	By reducing the size of the Proposed Development array area by 23%, the risk of potential UXO within the site requiring detonation is also reduced. The Proposed Development array area is only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). Through the use of low order techniques for the clearance of UXO as introduced for the Berwick Bank Wind Farm the risk of significant effects on marine mammals from UXO detonation is also reduced.
Ornithology (volume 2, chapter 11)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	The decision to increase the minimum blade tip to sea clearance from 22 m to 37 m LAT was driven by work completed by the Applicant and ornithological consultants to identify options for reducing potential effects on ornithology. This decision was based on outputs from additional ornithological collision risk modelling (CRM) work which examined collision rates for a range of minimum blade tip clearance heights. The decision was also informed by internal engineering studies looking at water depths, foundation designs and vessel requirements for wind turbine installation (to manage increased wind turbine heights combined with deep water). As a result of the increase in minimum blade tip to sea clearance from 22 m to 37 m LAT it was also necessary to increase the maximum blade tip height from 310 m to 355 m LAT. However, this parameter has	No change from the Berwick Bank Wind Farm PDE	The minimum blade tip to sea clearance of 37 m LAT is a key feature of the Proposed Development PDE. By raising the air gap to a minimum of 37 m above LAT as a designed in measure the risk of collision impacts is significantly reduced as an increasing proportion of birds fly below rotor height. Results from the assessment of collision impacts on key species (kittiwake, gannet, herring gull, lesser black-backed gull, little gull, common tern, Arctic tern and great skua are presented in volume 2, chapter 11).

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
		less influence on ornithology as is well above the flight height for most seabird species.		
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	There is potential that, with the increase in the size of the Project (maximum number of wind turbines and total area of the Berwick Bank Wind Farm array area) that there is an increased risk to ornithological receptors. However, proportionally the scale of infrastructure required to deliver the 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) resulting from the increase in the size of Berwick Bank Wind Farm array area only increased by 26.9%. The commitment to increase the minimum blade tip to sea clearance from 22 m to 37 m LAT also helps mitigate the increase in maximum wind turbine numbers associated with the increase in size of the Berwick Bank Wind Farm array area. In addition to increasing the minimum blade tip to sea clearance from 22 m to 37 m LAT the Applicant also took the decision to increase the minimum and maximum wind turbine sizes from between 10 MW and 20 MW up to 14 MW to 24 MW with a view to further reducing potential effect on key seabird species. It has been demonstrated by a number of offshore wind farm projects, including Seagreen, ICOL and NnG that, as the size of wind turbines increases, the number of wind turbines required to achieve maximum generating capacity for a project decreases. Wind turbine numbers have a significant influence on both displacement and collision risk impacts, with impacts increasing as wind turbine numbers increase. Potential impacts are therefore reduced with a corresponding decrease in wind turbine numbers. By increasing the minimum and maximum size of the wind turbines, maximum wind turbine numbers required to achieve the increase in maximum installed capacity can be reduced. This is demonstrated by that fact that, although the maximum number of wind turbines has increased from 242 to 307 this is only a 26.9% increase compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW). Furthermore, taking into account the corresponding increase in maximum rated capacity of the wind turbines (from 20 MW to 24 MW) the maximum number of larger wind turbines (24 MW) required to deliver 4.1 GW generating capacity is 179 wind turbines.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	No change as wind turbine parameters and maximum wind turbine numbers remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report October 2021 (SSER, 2021a).
	Change in the total size of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2	By increasing the size of the Berwick Bank Wind Farm array area, there is increased potential for effects on seabirds as a result of development extending into areas used by seabirds for foraging, both during the breeding and non-breeding seasons. When combining the Marr Bank and 2020 Berwick Bank array areas, the Applicant reduced the total combined area by 9% (1,314 km^2 compared to 1,441 km^2). However, it was acknowledged that the resulting Berwick Bank Wind Farm array area was 69.5% larger than the 2020 Berwick Bank array area. As discussed in section 4.1.2 the decision to increase the size of the Berwick Bank Wind Farm array area has been driven by the urgent need for global decarbonisation as well as tackling rising electricity bills and cost of living crisis. By increasing the size of the Berwick Bank Wind Farm array area, the Project has the potential to nearly double its contribution towards achieving Scotland and UK targets for Net Zero and, with the increased scale, to achieve this quickly and at a competitive price, reducing the cost of electricity for the consumer. With respect to ornithology, decarbonisation is critical to mitigating impacts of climate change on the environment and seabird populations. However, the Applicant acknowledged that, with the increase in the size of the Berwick Bank Wind Farm array area, there was an increased risk of potential adverse effects on ornithology due to the extent to which the array area overlapped with important foraging habitat for key seabird species. This risk of increased adverse effects on seabirds was the	Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	As work progressed on the EIA, it emerged that creation of the single site (Berwick Bank Wind Farm array area) meant that there was more space available within the site to accommodate the additional 65 wind turbines required to deliver the increase in maximum generating capacity of 4.1 GW. As discussed in Table 4.8 additional work was also completed on the analysis of the ornithological data collected during the site-specific Digital Aerial Surveys (DAS) and analysis of other ornithological datasets. This identified a number of potential areas within the Berwick Bank Wind Farm array area that are potentially important foraging areas for seabirds, a number of which also corresponded to areas where the Berwick Bank Wind Farm array area overlapped the Marr and Berwick bank features of the Firth of Forth Banks Complex ncMPA. A number of internal studies were undertaken to explore options for reducing the extent to the Berwick Bank Wind Farm array area overlapped the potential seabird foraging hotspot and the Firth of Forth Banks Complex ncMPA, whilst maintaining the maximum generating capacity of 4.1 GW. This resulted in the boundary change and creation of the Proposed Development array area. The boundary change also resulted in the addition of a 2 km buffer between the Proposed Development array area and the Outer Firth of Forth and St Andrew's Bay SPA. This helps to reduce potential effects on species associated with this site in terms of displacement. figure

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
		primary driver for the 2021 boundary change as it was acknowledged by the Applicant that additional mitigation pre-application was essentially to ensuring that potential effects on seabirds resulting from the larger Project were reduced where possible.		As a result of the boundary change the distances between the Proposed Development array area and the Seagreen 1, Seagreen 1A Project, Inch Cape and NnG Offshore Wind Farm projects have also increased. This change also helps to reduce the risk of the projects creating a barrier to the passage of birds through and within the Firths of Forth and Tay.
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
Commercial Fisheries (volume 2, chapter 12)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	There is potential that, with the increase in the size of the Project (maximum number of wind turbines and total area of the Berwick Bank Wind Farm array area) that there is potential for an increase in effects on commercial fisheries in terms of temporary loss or restricted access to fishing grounds, displacement of fishing activity into other areas, increased steaming times, snagging risk, interference with fishing activities (due to presence of other vessels on the site) and potential effects on commercially exploited species. These impacts are most likely to effect fisheries within the Berwick Bank Wind Farm array area which include *Nephrops* and squid fisheries and scallop dredgers. It is also noted that some creel fisheries (crab and lobster) also occur within the Berwick Bank Wind Farm array area. Potential effects are likely to be most notable during construction due to requirement for safety zones preventing access to fishing grounds and presence of other construction vessels occurring over a larger area and potentially for a longer duration due to the increase in the number of wind turbines requiring installation.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	Although the maximum number of wind turbines remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) (307 compared to 242) the boundary change has resulted in a 23% reduction (1,314 km^2 to 1,010.2 km^2) in the total extent to which the Proposed Development array area overlaps key fishing grounds for *Nephrops,* squid, scallop, crab and lobster. The resulting Proposed Development array area is also now only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). Therefore, although there is potential for an increase in potential magnitude of effects of commercial fisheries due to the increase in the maximum number of wind turbines compared to the 2020 Berwick Bank project the overall significance of these effects is expected to remain unchanged (see volume 2, chapter 11 for conclusions on effect significance) on the basis that the extent to which the Proposed Development overlaps key fishing grounds has been reduced where possible through the boundary change process.
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	Removal of floating foundations from the PDE potentially has a positive effect on commercial fisheries where there is uncertainty around the nature of potential interactions between fishing gear and dynamic cables (suspended in the water column from floating structures and the requirement for anchor/mooring lines to attach the floating foundations to the seabed. The removal of the floating foundations doesn't reduce the maximum number of wind turbines included in the PDE (307) or the increase in the size of the Berwick Bank Wind Farm array area and potential increase in effects associated with these changes. However, given the uncertainty with regards to the potential effects of floating foundations on fisheries, removal of these foundations from the PDE for the Berwick Bank Wind Farm provides increased certainty to the commercial fishing community in terms of the specific options that are being considered for the Project.	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	Removal of monopiles from the PDE has a significant benefit on commercial exploited fish and shellfish as it has enabled the Applicant to reduce the maximum hammer energy from 6,000 kJ to 4,000 kJ. This is significant in terms of reducing potential impact zones for both injury and disturbance resulting from piling activities (underwater noise and particle motion).	No change from the Berwick Bank Wind Farm PDE	N/A

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
		There is potential that, as outlined above the increase in the maximum number of wind turbines (and therefore foundations) requiring installation could lead to an increase in the duration over which piling campaigns are completed and commercial exploited fish and shellfish are exposed to underwater noise and particle motion from these activities. However, given that the increase in wind turbine (and foundation) numbers of only 26.9% compared to a 78.3% in the maximum generating capacity for the Project (4.1 GW compared to 2.3 GW) it is expected that the increase in potential magnitude of this effect will be limited.		
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	The use of low order techniques for clearance of UXO has been adopted as a mitigation measure to reduce potential effects of underwater noise and particle motion from UXO detonation on fish and shellfish (including commercially exploited species). This approach enables noise levels to be slowly increased to encourage fish that are sensitive to noise and/or particle motion to move out of the area prior to using larger detonation charges, therefore reducing the potential for these receptors to be injured by a detonation and to reduce to the extent to which the fish will be disturbed. The total number of UXO within the Berwick Bank Wind Farm array area is not influenced by total wind turbine numbers, although there may a requirement to remove a higher number of UXO if these correspond with increased wind turbine locations. By increasing the size of the Berwick Bank Wind Farm array area, there is also potential for a higher number of UXO to be present in the wider area. However, the risk of UXO presence and requirement for detonation generally remains unchanged due to these uncertainties.	No change from the Berwick Bank Wind Farm PDE	N/A
Shipping and Navigation (volume 2, chapter 13)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	No change. Minimum blade to sea clearance in 2020 Berwick Bank Scoping Report (SSER, 2020a) was set at 22 m which is the minimum height advised by the Maritime and Coastguard Agency (MCA) with respect to navigational safety. The increase to 37 m will not have any effect on compliance with this requirement or make any material difference to the effects on shipping and navigation.	No change from the Berwick Bank Wind Farm PDE	N/A
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	Due to the increase in maximum wind turbine numbers (307 compared to 242) there is potential for an increase in effects on shipping and navigation in terms of increased risk of vessel displacement, increased risk of vessel to vessel collision (affecting third party vessels and project vessels), vessel to structure allision, reduced access to local ports (due to disruptions to vessels approaches to and from the Firth of Forth), reduction in emergency response capability (search and rescue) and interference with magnetic fixing equipment. Vessel densities are generally higher to the west of the Berwick Bank Wind Farm array area, where vessels were observed from AIS tracking data and radar vessel traffic surveys to route northwest to south east across the Firth of Forth or east west into the Firth of Forth, with vessels from the south, turning west on approach to the south west corner of the array area. Although the maximum number of wind turbines has only increased by 26.9% compared to the 2020 Berwick Bank project, due to the increase in the size of the Berwick Bank Wind Farm array area there is potential for the effects listed above to occur over a much larger area of sea. The increase in the size of the Berwick Bank Wind Farm array area also leads to a reduction in the area of sea space available for vessels to transit between the Project and other projects in the area (Seagreen 1, Seagreen 1A Project, Inch Cape and NnG Offshore Wind Farms). This reduction in open water for vessels to transit around the Berwick Bank Wind Farm array area potentially leads to further increased risk of adverse effects on shipping and navigation.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	Although the maximum number of wind turbines remains unchanged from the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) (307 compared to 242) the boundary change has resulted in a 23% reduction (1,314 km^2 to 1,010.2 km^2) in the total extent of the Proposed Development array area. The resulting Proposed Development array area is also now only 30.8% larger than the 2020 Berwick Bank project (1,010.2 km^2 compared to 775 km^2). In addition to mitigating potential effects on ornithology, it was identified by the Applicant that by reducing the boundary to the north and northwest of the site, it would be possible to increase the buffer between the Proposed Development and the other projects in the area (Seagreen 1, Seagreen 1A Project, Inch Cape and NnG Offshore Wind Farms), helping to reduce potential effects of reduced sea space on navigational safety of vessels transiting along shipping routes that pass between these projects. Changes made to the southeast corner of the Proposed Development boundary (effectively smoothing out the boundary) was also identified as having beneficial effects in term of navigational safety by reducing the potential for outlier wind turbines to be positioned in this location. Although the maximum number of wind turbines has increased (compared to the 2020 Berwick Bank project) and the Proposed Development boundary has reduced by 23% compared to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a), the minimum spacing between wind turbines remains unchanged (1,000 m). The Applicant has also committed to complying with MCA guidance relating to array layouts and emergency response requirements. Therefore, although there remains the potential for an increased risk to navigational safety and shipping routes due to the increase in the
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
				maximum number of wind turbines compared to the 2020 Berwick Bank project the overall significance (acceptability/tolerance) of these effects is expected to remain unchanged (see volume 2, chapter 13 for conclusions on shipping and navigation) due to amendments made to the Proposed Development boundary outlined above.
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	Due to uncertainty relating to the potential interactions between vessels and dynamic cables, anchors and mooring lines associated with floating foundations, removal of these from the PDE for the Berwick Bank Wind Farm was considered to be positive in terms of potential effects on shipping and navigation. This was mainly due to increased certainty as to the nature and magnitude/level of risk associated with the refined foundation options (jacket foundations with pin piles or suction caissons).	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
Aviation, Military and Communications (volume 2, chapter 14)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	The key aviation and military receptors identified for assessment include civilian and military radar systems, Air Traffic Control (ATC) and Air Defence (AD) capabilities. The key consideration with regards to potential effects on these receptors is in relation to the height of wind turbines during construction and presence of wind turbines during operation. During construction, the installation of wind turbines (or objects more than 91.4 m in height such as vessels with cranes) present risks (obstacles) to low flying aircraft (including SAR helicopter operations). During operation, the presence of radar interference (or "clutter") generated by the spinning blades of the wind turbines during operation could desensitize radar in the area of the wind farm. This radar interference can hinder the detection of legitimate targets and therefore, operational aircraft safety. The maximum blade tip height in the 2020 Berwick Bank Scoping Report was 310 m (SSER, 2020a). Therefore, given this already exceeded the 91.4 m threshold for low flying craft, the increase in maximum blade tip height to 355 m required to accommodate the increase in blade tip to sea clearance of 37 m the potential effect on low flying aircraft remains unchanged. There is potential than an increase in the maximum blade tip height and minimum and maximum wind turbine sizes could increase the extent to which the wind turbines create radar clutter, in particular when combined with an increase in the array area. National Air Traffic Services En-Route PLC (NERL) confirmed in their response to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a) that the effects of cluttering on the Perwinnes ATC radar would be unacceptable (due to wind turbine sizes and size and location of the Berwick Bank Wind Farm array area).	No change from the Berwick Bank Wind Farm PDE	Given that there is no change to the wind turbine parameters in terms of maximum tip heights and therefore heights of cranes required to install the wind turbines, potential effects on clearance for low flying aircraft remains unchanged. Potential effects will be managed through agreement of a Lighting and Marking Plan (LMP) which will enable aviation operators to set an appropriate Minimum Safe Altitude (MSA) across the Proposed Development. Further detail on the assessment of effect significance relating to this impact and designed mitigation measures is provided in volume 2, chapter 14. With regard to radar interference, although the boundary change resulted in a reduction in the size of the Proposed Development array area, there is still potential for an adverse effect on the Perwinnes ATC radar due to cluttering. Consequently, additional secondary mitigation (in additional to designed in measures and the boundary change) will be required to reduce these potential effects. These include the use of Multi-Radar Tracking (MRT) blanking which removes wind turbine returns from the ATC radar display reducing the potential for cluttering, and potentially the introduction of a Transponder Mandatory Zone (TMZ) across the Proposed Development array area. These secondary mitigation options have been discussed with NERL and are discussed in detail in volume 2, chapter 14.
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)		No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
Seascape, Landscape and Visual Resources (volume 2, chapter 15)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	With an increase in the maximum blade tip height from 310 m to 355 m LAT and an increase in maximum number of wind turbines (242 to 307) there is potential for an increase in effects on seascape, landscape and visual resources. Furthermore, creation of the Berwick Bank Wind Farm site resulted in a reduction in the distance of the Berwick Bank Wind Farm array area from the coast (reducing from 43 km to 33 km at the closest distance to shore). By reducing the distance of the wind turbines (and associated above sea infrastructure including OSPs/Offshore convertor station platforms) there is further potential for an increase in effects on seascape, landscape and visual resources. As a result of these changes the 60 km radius study area for the Zone of Visual Influence (ZTV) was redefined with additional viewpoints requiring consideration in the Seascape, Landscape and Visual Assessment (SLVIA) agreed with NatureScot.	No change from the Berwick Bank Wind Farm PDE	Although the maximum tip height (355 m LAT) and maximum number of wind turbines (307 compared to 424 remains unchanged), the boundary change has resulted in an increase in the minimum distance between the Proposed Development array area and the coast (at the closest point – St Abbs Head in the Scottish Borders) of 4.8 km (from 33 km to 37.8 km). Although this is 5.2 km closer than the 2020 Berwick Bank, the increase in distance compared to the Berwick Bank Wind Farm array area will have a positive effect in terms of reducing the extent to which potential adverse effects on seascape, landscape and visual resources could occur. The boundary change also reduced the spatial extent of the northern part of the Proposed Development array area and increased its distance offshore from the coast of Aberdeenshire, Angus and Fife, contributing to minimising the effects on receptors in these parts of the study area. Due to its scale and location, potential viewpoint (locations from which the Proposed Development may be visible) have been identified within a 60 km radius of the Proposed Development array area. The 60 km radius study area (which remains unchanged from the Berwick Bank Wind Farm 2021) extends from the Aberdeenshire coastline in the north (between Stonehaven and St Cyrus) to the Northumberland coast in the south (between Berwick-upon-Tweed, Holy Island and Seahouses). No significant effects will occur beyond the 60 km study area. In total 22 representative and five illustrative viewpoints were identified in consultation with key stakeholders including NatureScot, Angus Council, Fife Council, East Lothian Council, Scottish Borders Council and Northumberland County Council. These viewpoints took into account feedback from consultees in both the 2020 Berwick Bank Scoping Opinion (MSLOT, 2021) and the Berwick Bank Wind Farm Scoping Opinion (MSLOT, 2022). Conclusions from the assessment of effect significance a presented in volume 2, chapter 15.
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW).		No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
Cultural heritage (volume 2, chapter 16)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	It was agreed during scoping on the 2020 Berwick Bank scoping process that the Cultural Heritage assessment would focus on assessing impacts on the setting of cultural heritage assets only. Impacts on marine archaeology and deposits of palaeoenvironmental interest were scoped out of the EIA. However, these potential effects are addressed in a Marine Archaeology Technical Report and Written Scheme of Investigation included in the Outline Environmental Management Plan (EMP) (volume 4, appendix 22). As with seascape, landscape and visual resources, with the increase in the maximum blade tip height from 310 m to 355 m LAT, increase in maximum	No change from the Berwick Bank Wind Farm PDE	Although the maximum tip height (355 m LAT) and maximum number of wind turbines (307 compared to 424 remains unchanged), the boundary change has resulted in an increase in the minimum distance between the Proposed Development array area and the coast (at the closest point – St Abbs Head in the Scottish Borders) of 4.8 km (from 33 km to 37.8 km). Although this is 5.2 km closer than the 2020 Berwick Bank, the increase in distance compared to the Berwick Bank Wind Farm array area will have a positive effect in terms of reducing the extent to which potential adverse effects on the setting of culture heritage assets could occur. The boundary change also reduced the spatial extent of the northern part of the Proposed Development array area and increased its
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)		No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2	number of wind turbines (242 to 307) and reduced distance from shore (33 km compared to 44 km with the 2020 Berwick Bank) there is potential for an increase in effects on the setting of cultural heritage assets. Potential effects were assessed within the same 60 km radius ZTV study area defined for the SLVIA. This was agreed with Historic Environmental Scotland (HES) and other key stakeholders include affected local authorities.	Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	distance offshore from the coast of Aberdeenshire, Angus and Fife, contributing to minimising the effects on receptors in these parts of the study area. In total 13 cultural heritage assets were identified within the 60 km radius ZTV study area agreed for the SLVIA. These assets include Dunnottar Castle (Scheduled Monument) on the Aberdeenshire Coast to the north of the study area to Bamburgh Castle and Lindisfarne Priory on the Northumberland coast at the southern extent of the study area. Conclusions from the assessment of effect significance a presented in volume 2, chapter 16.
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
Infrastructure and other users (volume 2, chapter 17)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	A number of receptors are considered with respect to infrastructure and other sea users (recreational boating, recreational fishing, other recreational activities (diving, watersports, beach users and bathing waters), marinas and harbours, dredging and disposal sites, offshore energy projects, offshore cables, pipelines and subsea communications). With regard to minimum blade tip clearance and maximum blade tip height, this parameter is only relevant recreational boating and sailing. Minimum blade to sea clearance in 2020 Berwick Bank Scoping Report (SSER, 2020a) was set at 22 m which is the minimum height advised by the Maritime and Coastguard Agency (MCA) with respect to navigational safety which also applies to recreational safety. The increase to 37 m will not have any effect on compliance with this requirement.	No change from the Berwick Bank Wind Farm PDE	N/A
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW)	Due to the increase in maximum wind turbine numbers (307 compared to 242) and increase in the size of the Berwick Bank Wind Farm array area there is potential for an increase in potential effects on a number of infrastructure and other user receptors due to the increase in the amount of infrastructure present in the area (wind turbines, OSPs/Offshore convertor station platforms) and increased number of vessels within the Berwick Bank Wind Farm array area and increased number and frequency of vessel movement within the site and transiting to and from the site from surrounding port/harbour facilities. This has to the potential to lead to an increase in interactions with, or displacement of other users or lead to restrictions in access to existing infrastructure (e.g. cables). Most of the infrastructure and other user receptors occur in the inshore area, and therefore have greater potential to interact with the Proposed Development export cable corridor rather than the site.	No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	The maximum number and size of wind turbines remains unchanged. However, as a result of the 23% reduction in the size of the Proposed Development array area (1,314 km^2 to 1,010.2 km^2) there will be a reduction in the extent to which the Proposed Development array area overlaps with areas used by other users (e.g. recreational sailing and recreational fishing). This will have a positive effect by reducing the potential for interactions with these other users, therefore reducing the extent to which these other users would be adversely affected by the Proposed Development.
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Use of low order techniques for clearance of Unexploded	In addition to reducing potential adverse effects on marine mammals, fish and shellfish, the use of will also prevent the uncontrolled detonation of UXO, in particular during the construction phase and the potential effects of this in terms of	No change from the Berwick Bank Wind Farm PDE	No change to approach to UXO detonation. With a reduction in the size of the Proposed Development area there is potential for a reduction in the number of UXO that might be

Receptor	Key Changes from 2020 Berwick Bank Scoping Report (SSER, 2020a) to the Berwick Bank Wind Farm Offshore Scoping Report 2021 (SSER, 2021a)	Potential Environmental Effects Associated with Creation of the Single Project (Berwick Bank Wind Farm 2021) and Project Design Refinements	Key Changes from the 2022 Proposed Development (Post Boundary Change)	Potential Environmental Effects Associated with the Proposed Development (Post Boundary Change)
	Ordnance (UXO) that cannot be removed or avoided.	disruption to other users in the area at the time of detonation. Prior to any UXO detonation a risk assessment will be completed in accordance with relevant guidance to identify any risks to other users and measures to manage these risks.		present in the Proposed Development area and subsequent reduced requirements for UXO detonations.
Offshore socioeconomics and tourism (volume 2, chapter 18)	Increasing minimum blade tip to sea clearance from 22 m LAT to 37 m LAT and maximum blade tip height from 310 m to 355 m LAT.	With the increase in the maximum blade tip height from 310 m to 355 m LAT, increase in maximum number of wind turbines (242 to 307) and reduced distance from shore (33 km compared to 44 km with the 2020 Berwick Bank) there is potential for an increase in effects tourism where presence of the wind turbines (and associated above sea infrastructure including OSPs/Offshore convertor stations) has the potential to effect visitor experiences at key tourist attractions. This is most notable for coastal trips and activities including swimming, sailing, water sports and adventure sports, walking and golf as well as visiting coastal attractions, including for example castles and other historic sites. With regard to potential effects on socioeconomics, the overall increase in maximum capacity (2.3 GW to 4.1 GW) resulting from the increase in the size of the wind turbines (from 10 MW and 20 MW up to 14 MW to 24 MW) and the size of the Berwick Bank Wind Farm array area has the potential to have positive effects in terms of employment creation, gross value added (GVA), access to employment and demand for housing, accommodation and services at a local and national (Scotland) level due to increased investment potential in local port and harbour facilities required to support construction, operation and maintenance (O&M) and decommissioning activities as well as supporting employment through existing and future supply chain contracts.	No change from the Berwick Bank Wind Farm PDE	Although the maximum tip height (355 m LAT) and maximum number of wind turbines (307 compared to 424 remains unchanged), the boundary change has resulted in an increase in the minimum distance between the Proposed Development array area and the coast (at the closest point – St Abbs Head in the Scottish Borders) of 4.8 km (from 33 km to 37.8 km). Although this is 5.2 km closer than the 2020 Berwick Bank, the increase in distance compared to the Berwick Bank Wind Farm array area will have a positive effect in terms of reducing the extent to which potential adverse effects on recreation and tourism could occur. With regard to socioeconomics, although the Proposed Development array area has reduced by 23% the maximum generating capacity of the site (4.1 GW) remains unchanged. The maximum number of wind turbines also remains unchanged. The positive effects in terms of employment creation, gross value added (GVA), access to employment and demand for housing, accommodation and services at a local and national (Scotland) level due to increased investment potential in local port and harbour facilities to support construction, O&M and decommissioning will remain unchanged. Investment through existing and future supply chain contracts also remains unchanged.
	Increase maximum number of wind turbines and minimum and maximum sizes (from 10 MW and 20 MW up to 14 MW to 24 MW).		No change to maximum wind turbine numbers (maximum number of wind turbines maintained at 307)	
	Change in the total area of the Berwick Bank Wind farm array area from 775 km^2 to 1,314 km^2		Reduction in the total area of the Proposed Development array area from 1,314 km^2 to 1,010.2 km^2.	
	Refinement of foundation options to only consider jacket foundations with pin piles and suction caisson jackets.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Maximum hammer energy of 4,000 kJ and maximum realistic hammer energy of 3,000 kJ.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A
	Use of low order techniques for clearance of Unexploded Ordnance (UXO) that cannot be removed or avoided.	N/A	No change from the Berwick Bank Wind Farm PDE	N/A

4.10. GRID CONNECTION AND STRATEGIC LANDFALL ASSESSMENT

4.10.1. GRID CONNECTIONS

81. The Applicant has three signed grid connection agreements with the network operator. Two agreements are for connection at the Branxton substation, with a third additional connection (the Cambois connection) at Blyth, Northumberland. The Cambois connection was confirmed in June 2022 following National Grid's Electricity System Operator (ESO) Holistic Network Review (HNR)[3]. This third additional connection will enable the Project to reach full generating capacity (4.1 GW) by early 2030's. The Cambois connection (offshore export cables and landfall) is being consented separately and has been considered cumulatively with the Proposed Development as part of this application (see volume 2, chapters 7 to 21).

82. The onshore works required as part of the Branxton Connection for the Proposed Development have been assessed as part of the Berwick Bank Wind Farm Onshore EIA Report for the Project (SSER, 2022a).

4.10.2. STRATEGIC LANDFALL ASSESSMENT

83. In parallel to the development of the Berwick Bank Wind Farm, subsequent boundary change and resulting Proposed Development, as described above, the Applicant progressed a strategic landfall assessment to identify a preferred landfall in the vicinity of the Branxton grid connection. As part of this assessment, a number of landfall options within the vicinity of Branxton (landfall sites 1, 2, 3, 4, 5, 6 and 7A, 7B) (see Figure 4.6) were evaluated from an engineering, consents (planning and environment) and land perspective.

84. Potential landfall options were identified based on their ability to connect to the various onshore substation options which were also being considered at the time. Key consideration for the locations of the onshore substation options were:

- proximity to the Branxton grid connection;
- environmental constraints;
- land constraints; and
- engineering feasibility.

85. For more information on the onshore infrastructure site selection process, refer to volume 1, chapter 4 - Site Selection and Analysis of Alternatives, in the Berwick Bank Wind Farm Onshore EIA Report (SSER, 2022a).

86. Nine onshore substation options were considered in parallel with the landfall sites. Later on in the process two further substation sites were considered within the vicinity, one at Oxwellmains, Dunbar and the other west of Torness Nuclear Power Station, also Dunbar. Refer to volume 1, chapter 4 of the Onshore EIA Report (SSER, 2022a) for detail on the onshore infrastructure site selection process including justification for the preferred Branxton Substation site.

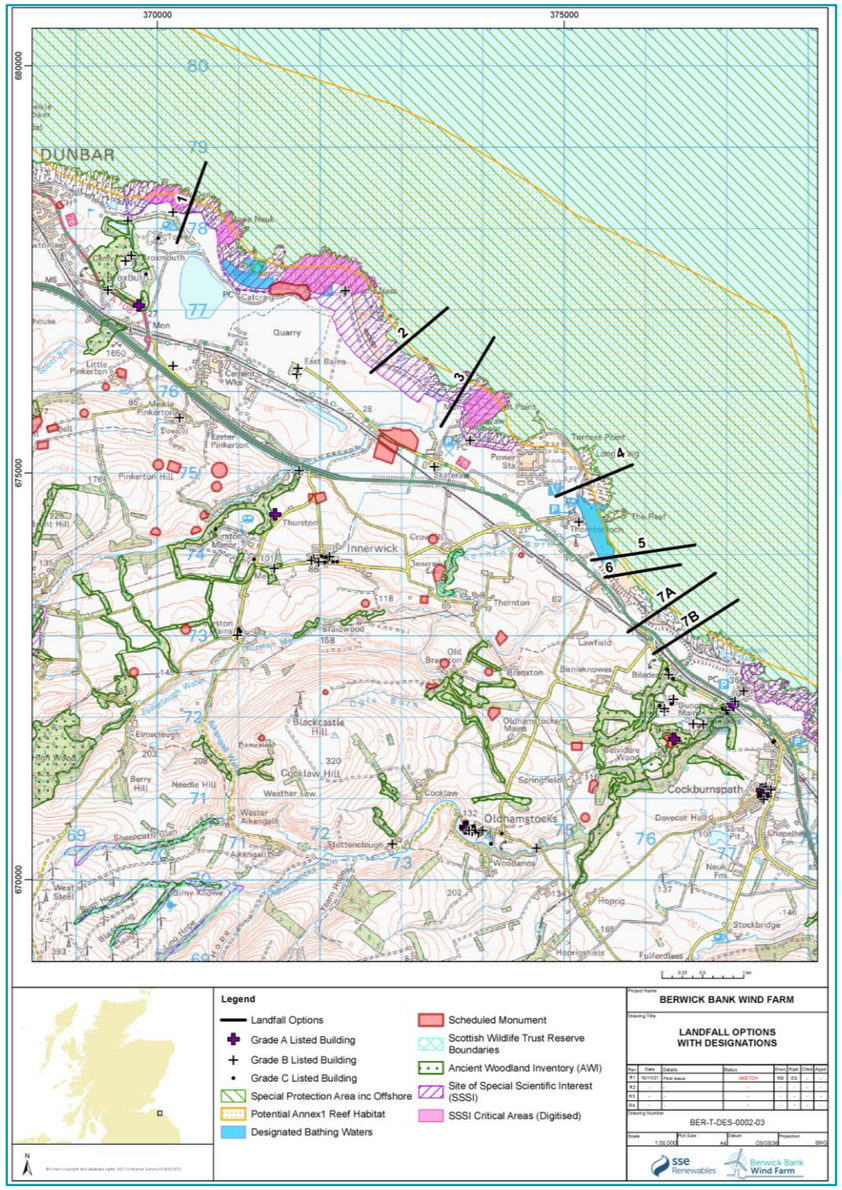

Figure 4.6: Offshore Export Cables Landfall Options and Designations

[3] Results from the NGESO Holistic Network Review were published in July 2022 (NGESO, 2022)

4.10.3. IDENTIFICATION OF THE PREFERRED LANDFALL LOCATION

87. Various studies and surveys were undertaken between 2018 and 2021 to inform the landfall site selection process. The studies considered a range of factors such as intertidal and onshore infrastructure requirements, engineering and environmental constraints, including (but not limited to), geology, thermal, land use, nature designations (e.g. Barns Ness SSSI) and Scheduled Monuments, ancient woodland, battlefield sites, former coal working areas, as well as human receptors such as visual impacts, air quality and proximity to dwellings, recreational areas and greenspace.

88. The key outcomes of these studies and the Applicant's site selection process allowed for decisions to be made on which landfalls could be deemed unfeasible and therefore discounted from the site selection process. The main reasons for discounting landfall locations from the site selection process are set out below.

- Landfall 1 – this option was discounted due to the long onshore cable route and challenging landform, which made it unfeasible from an engineering perspective;
- Landfall 2 – this option was considered to be unfeasible due being sited on part of Tarmac's operational quarry. This area of land would be required to enable trenchless techniques (e.g. Horizontal Directional Drilling (HDD)) underneath the Barns Ness SSSI. In addition, access to the site would require the construction of a new road;
- Landfall 4 – This option was discounted due to the landfall being within the boundary of the Torness Nuclear Power Station licenced area;
- Landfall 6 – This option was discounted due to the presence of a cliff which would require extensive engineering earthworks, and constraints presented by the road and rail infrastructure; and
- Landfall 7 (7a and 7b) – This option was discounted based on engineering feasibility. The depth of cable under the cliff (approximately 30 m) would have led to potential thermal issues such as overheating.

89. The remaining preferred options (Landfall 3 - Skateraw and Landfall 5 - Thorntonloch) were both included in the Berwick Bank Wind Farm Offshore EIA Scoping Report (October 2021) (SSER, 2021a). The locations of these preferred landfall sites and key environmental constraints are shown in Figure 4.6.

90. A summary of the key opportunities and constraints for both Skateraw (Landfall 3) and Thorntonloch (Landfall 5). Landfalls are presented in Table 4.11.

Table 4.11: Skateraw and Thorntonloch Landfalls - Key Opportunities and Constraints

Landfall	Key Opportunities	Key Constraints
Skateraw (Landfall 3)	**Technical** • Technically feasible with trenchless technique below the Barns Ness SSSI, and this SSSI having more limited inland extent. **Consents** • A trenchless technique for cable installation would be underneath the Barns Ness Coast SSSI and UK Biodiversity Action Plan (UKBAP) sand dune habitat, which is present along the coast; and • this landfall location would require a shorter and less challenging route than other landfall options within the vicinity to the onshore Substation 8.	**Technical** • The cable route would need to account for the westward extent of the Torness Nuclear Licensed Site, the East Coast Mainline (railway line), A1 trunk road, Thorntonloch Burn and potentially the buried 400 kV cables leading southward from Torness Power Station. **Consents** • Potential issues around access and disruption to the nearby Skateraw village during construction. However, this would be temporary and limited in extent; • if installation of cables has the potential to impact Skateraw Burn, potential issues around future erosion and course alterations of the burn would require consideration; • potential area of archaeological significance as there are several known Historic Environment Records (HERs) in the surrounding area, a scheduled monument (SM4040) and two Grade B Listed Buildings, Skateraw Limekiln and Skateraw House within the vicinity; • located within 100 m of a residential property; and intersects with the John Muir Link coastal path.
Thorntonloch (Landfall 5)	**Technical** • This is a compact site at Thorntonloch Beach; however, it has the potential to offer a technically good landing point. **Consents** • This landfall location would require a short route to Substation 3.	**Technical** • Limited availability of space at Thorntonloch Beach due to NnG Offshore Wind Farm's cable route reaching landfall in the same area; and • a viable engineering solution could not be established for either trench or trenchless solutions due to the nature of the superficial and bedrock geology. **Consents** • Located within 50 m of a watercourse; • UKBAP sand dune habitat present along the coast; • located within 100 m of residential property and sensitive receptors including users of Thorntonloch beach and caravan park; • intersects with the John Muir Link coastal path; and • in proximity to a designated bathing water.

91. The landfall site selection study concluded in November 2021 with selection of Landfall 3 – Skateraw as the preferred option on the basis that, compared to Landfall 5 – Thorntonloch, the Skateraw landfall is a more technically viable option from an engineering perspective and allows for a shorter and less challenging and environmentally constrained onshore cable route to connect to the preferred Branxton Substation location.

4.11. STAGE 5 – REFINEMENT OF OFFSHORE EXPORT CABLE ROUTE OPTIONS

4.11.1. OFFSHORE EXPORT CABLE ROUTE OPTIONS

92. The Proposed Development export cable corridor included in the Berwick Bank Wind Farm Offshore EIA Scoping Report (October 2021) (SSER, 2021a) allowed for connection from the array area to either Landfall Option 3 – Skateraw or Landfall Option 5 – Thorntonloch. The Proposed Development export cable corridor is based upon the full metocean surveys of the former Firth of Forth Zone undertaken in 2010 and 2011, as well as data from a further study carried out by the Applicant in 2020 - the Indicative Export Cable Corridor Design (SSER, 2020b).

93. In addition to this, the Applicant in 2020 completed geotechnical surveys of both the Berwick Bank Wind Farm and Landfall 5 – Thorntonloch. Data from this survey identified potential technical challenges associated with Landfall 5. As such, the Applicant completed the Indicative Export Cable Corridor Design (SSER, 2020b). The objective of this study was to provide more precise offshore export cable route options for connections to Landfall 3 within the wider Proposed Development export cable corridor.

94. The Indicative Export Cable Corridor Design study involved a preliminary assessment of potential constraints to the development of offshore export cable route options using various open-source data layers (e.g. EMODnet and Joint Nature Conservation Committee (JNCC)). Information considered during the offshore export cables selection included bathymetry, seabed slope, seabed infrastructure and known shipwrecks together with seabed geology data. A list of the data sources considered in this study is included in Table 4.12.

95. The data sources and associated constraints are listed in Table 4.12. These were categorised as hard and soft constraints. Hard constraints were to be avoided, and soft constraints were to be avoided unless no other option was available.

96. Other technical considerations included;

- cable lengths to be minimised; and
- to ensure appropriate project scope and suitable micro-siting was achieved, a 1 km cable corridor width was maintained for all proposed routes within the offshore cable route boundary.

97. A key consideration during the offshore export cables selection was the presence of the Firth of Forth Banks Complex Marine Protection Area (MPA). MPA's and SSSI's were avoided by the offshore export cable route optioneering GIS assessment (SSER, 2020b). SAC's, SCI's and spawning and breeding grounds were avoided where possible. As part of this analysis a rock ridge was identified which the cable route has been widened southwards to a width of 3 km in the centre of the cable route to ensure availability of engineering solutions to minimise the challenges presented by it (Figure 4.7).

4.11.2. DEEP WATER OPTIONS

98. As part of the Proposed Development export cable corridor selection, two indicative deep water (DW) options were identified, namely DW1 and DW2 (Figure 4.7).

99. The two deep water options connect the Proposed Development array area to landfall at Branxton, taking the most efficient routes whilst also taking into account identified hard constraints. Furthermore, the Proposed Development export cable corridor options sought to avoid the Firth of Forth Banks Complex MPA, where reasonably practicable, to minimise potential impact on this designated site. However, as illustrated in Figure 4.7, it was not possible to avoid the MPA for DW1, as this deep water option overlaps with the MPA at the south-east part of the Proposed Development array area.

100. Although the Firth of Forth Banks Complex MPA is considered the most significant constraint at this stage of development, consideration was also given to bathymetry, slope and socio-economic influences when selecting the final deep water option of Proposed Development export cable corridor.

4.11.3. NEAR SHORE OPTIONS

101. Four indicative near shore options for the Proposed Development export cable corridor were identified, namely Nearshore A, Nearshore B, Nearshore C and Nearshore D (Figure 4.8).

102. A study was then completed to assess the near shore options. It should be noted that at the time of this study, Landfalls 7A and 7B had not yet been eliminated from the possible landfall options so were included within the study. Please refer to sections 4.10.2 and 4.10.3 on the Strategic Landfall Assessment and Landfall Options for further detail on landfall selection. The near shore options identified connect the modified cable route originally provided to Landfalls 3, 5, 7A and 7B, taking the most efficient route whilst also respecting hard constraints.

103. The NnG cable corridor, Barns Ness SSSI, hard substrate areas and the Torness Power Station intake and outfall pipes are considered the most significant constraints at this stage of development, consideration was also given to bathymetry, slope, and socio-economic influences when selecting the final near shore option Proposed Development export cable corridor.

104. Following selection of Landfall 3 (Skateraw) the Proposed Development export cable corridor option Nearshore A to the Thorntonloch Landfall was removed from the site boundary. The Proposed Development export cable corridor has been defined as shown in Figure 4.8.

Table 4.12: Constraints and Parameters Considered within Offshore Export Cables Option Site Selection

Hard/Soft Constraint	Constraints
Hard constraints (all to be avoided by cable route)	• Phase 2 and 3 AfL areas; • 3rd party wind farm boundaries (Seagreen Alpha/Bravo, NnG and Inch Cape Offshore Wind Farms); • planned and consented cables; • cable crossings; • approach length (2 km); • approach orientation (perpendicular to the landing); • slope (maximum) (2 degrees maximum); • hard substrate; • wrecks (hazardous); and • anchorages.
Soft constraints (to be avoided unless no suitable alternative route is possible)	• Out of service cables; • minimum bend radius; • maximum alter course radius; • distance between turns/consecutive bends; • water depth (maximum) (-70 m LAT); • Depth (minimum) (0 m LAT); • commercial fisheries; • spawning/breeding grounds; • harder rock types (igneous dykes); • hard sediments; • geohazards; • boulders; • sand waves; • magnetic targets; • areas of limited sediment thickness; • mineral extraction areas; • seabed mobility; • oil and gas platform (unmanned); • other infrastructure (wells, freespans, etc.); • oil and gas platform (manned); • yachting/sailing routes; • shipping density; • pilotage areas; • shipping routes; • archaeological features; • wrecks; • SSSIs; • SACs; • SCIs; • SPAs; • MPAs; • Annex I habitat; • planned aquaculture; • existing dumping ground; and • unexploded Ordnance (UXO) targets.

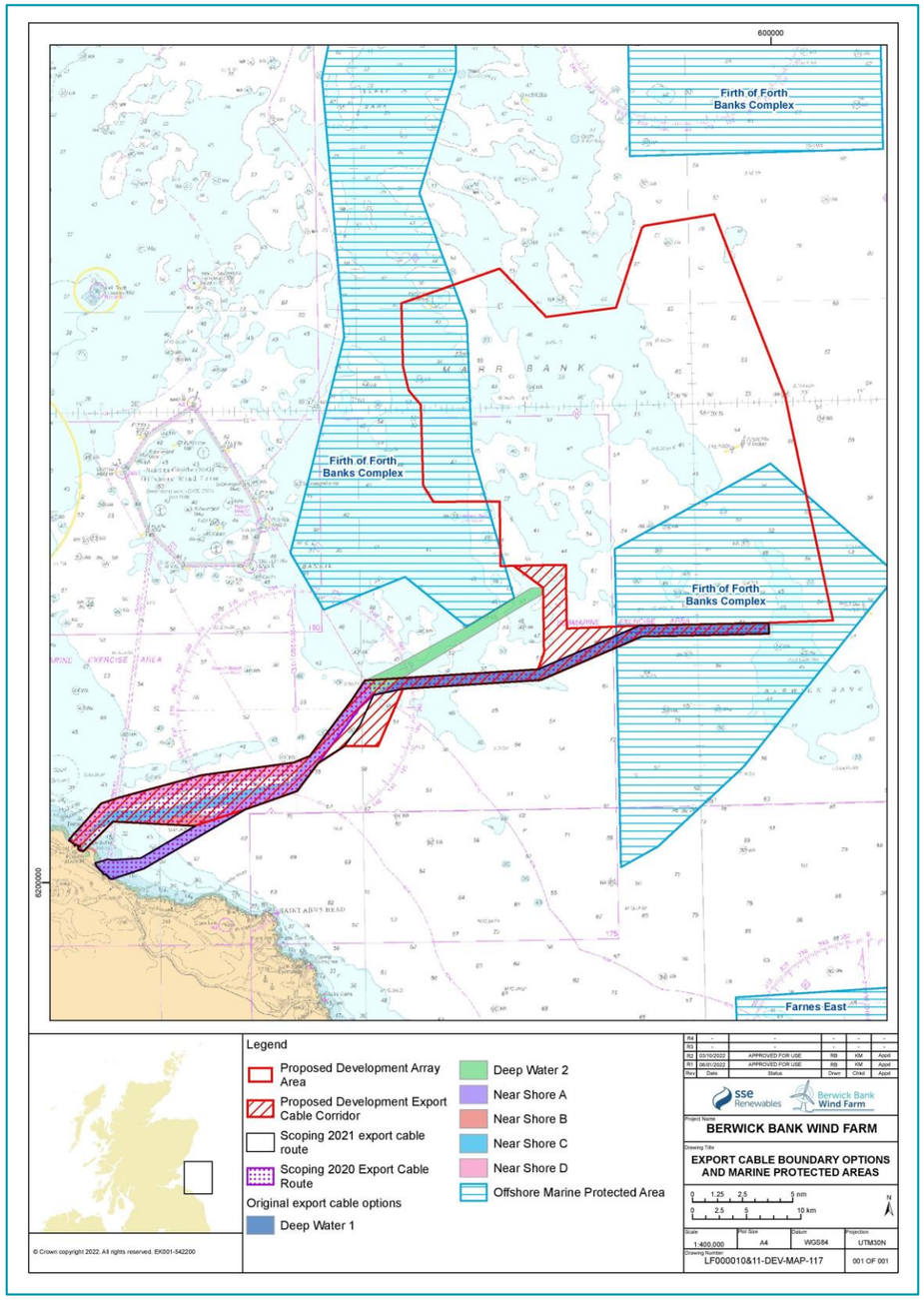

Figure 4.7: Offshore Export Cable Route Options

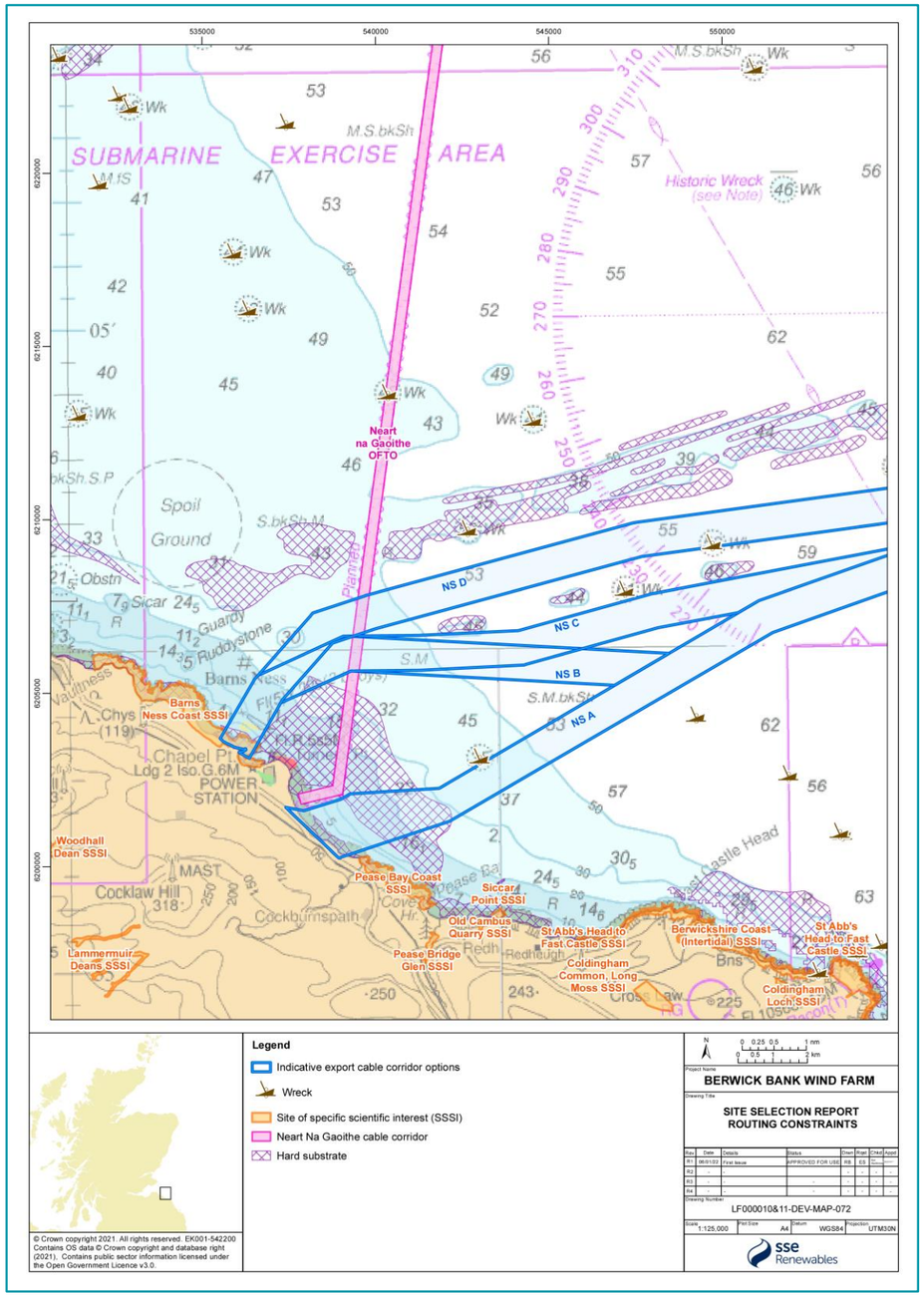

Figure 4.8: Nearshore Export Cable Route Options and Constraints

4.12. OVERVIEW OF PROJECT DESIGN ENVELOPE (PDE) REFINEMENTS

105. In addition to the boundary change and selection of the preferred landfall location and offshore export cable route, there have also been a number of refinements made to the PDE since October 2021 (upon the completion of the Berwick Bank Wind Farm Offshore Scoping Report (SSER, 2021a) and the Offshore HRA Screening Report (SSER, 2021b)). These refinements are summarised below:

- selection of the Skateraw Landfall option in December 2021 (and abandonment of the Thorntonloch Landfall option) resulting in the modification of the Proposed Development export cable corridor (Figure 4.7);
- trenchless techniques are the only PDE option for the Skateraw Landfall to avoid open trenching through Barns Ness SSSI;
- reduction in the extent of boulder clearance along the offshore export cables (High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC options) has been reduced from 5,360,000 m^2 to 4,360,000 m^2;
- increase in the offshore export cables voltage from 320 kV to 525 kV;
- the option of suction caissons for the Offshore Substation Platforms (OSP)/Offshore convertor station platform foundations was added to the PDE, alongside the option of piled jackets;
- reduction in the number of offshore export cables from 12 to eight (HVAC/HVDC);
- reduction in the extent of sand wave clearance (along Proposed Development export cable corridor) from 9,360,000 m^2 to 4,360,000 m^2; and,
- reduction in the number of vessels and return trips.

4.13. CONSULTATION AND STAKEHOLDER ENGAGEMENT

4.13.1. SCOPING AND SCREENING DOCUMENTS SUBMITTED

106. Table 4.13nbelow provides a summary of the key EIA screening and scoping documents submitted to date as part of the development and refinement of the Proposed Development.

Table 4.13: Documents Submitted for the Initial Berwick Bank Wind Farm and the Berwick Bank Wind Farm

Document	Submission Date	Available From
2020 Berwick Bank Wind Farm		
Offshore EIA Scoping Report	August 2020	https://www.sserenewables.com/media/0t5n05b4/berwick-bank-wind-farm-offshore-scoping-report.pdf
Offshore EIA Scoping Opinion	March 2021	Scoping Opinion – Berwick Bank Offshore Wind Farm | Marine Scotland Information
Offshore HRA Screening Report	October 2020	https://www.berwickbank.com/planning-and-consent
Offshore HRA Screening Report Response	May 2021	HRA Screening Report Response - Berwick Bank Offshore Wind Farm | Marine Scotland Information
Berwick Bank Wind Farm		
Offshore EIA Scoping Report	October 2021	https://www.berwickbank.com/planning-and-consent
Offshore HRA Screening Report	November 2021	https://www.berwickbank.com/planning-and-consent

4.13.2. COMMUNITY ROADSHOW

107. The community roadshow took place 25 - 29 October 2021. Members of the project team were available to answer questions at 17 locations throughout East Lothian, as detailed below:

- 25 October 2021:
  - North Berwick High Street; and
  - North Berwick Community Centre, 8 Law Road, EH39 4PN.
- 26 October 2021:
  - Tesco, Tantallon Rd, North Berwick EH39 5NF;
  - Dirleton, Main Road, EH39 5EP;
  - Gullane, Main Street; and
  - North Berwick Sports Centre, Grange Rd, Eh39 4QS.
- 27 October 2021:
  - Dunbar High Street;
  - Skateraw;
  - Thorntonloch; and
  - Innerwick, Village Hall.
- 28 October 2021:
  - Melbourne Rd, outside Scottish Seabird Centre;
  - Aldi, Dunbar Rd, North Berwick EH39 4DQ;
  - Whitekirk; and
  - East Linton, Community Hall.
- 29 October 2021:
  - Hallhill Sports Centre, Kellie Road, Dunbar, EH42 1RF;
  - Broxburn, Main Street; and
  - West Barns, Edinburgh Road.

108. During the roadshow members of the Project team presented project maps including distances to shore, indicative 3D models of the Proposed Development array area, Proposed Development export cable corridor, potential landfall locations, onshore cable corridors and onshore substation infrastructure. On each day the Project team were also on hand to answer any queries or concerns members of the public had regarding our proposals.

4.13.3. CONSULTATION EVENTS

109. The change from 2020 Berwick Bank Project to the 2021 Berwick Bank Wind Farm and the subsequent boundary change (Proposed Development) was notified to key consultees, stakeholders, and the public through various communication streams, including the Project website.

110. An early informal in-person and virtual public exhibition was held in October 2021. For this, the combined Proposed Development array areas were presented. At this exhibition, the Project had progressed the site selection phase and provided information on:

- the selected Skateraw Landfall and the associated Proposed Development export cable corridor from the Proposed Development array area; and
- the selected onshore Skateraw Substation site and selected onshore cable route from landfall to the onshore substation and then onwards to SP Energy Networks (SPEN)'s Branxton 400 kV Substation (proposed substation).

111. The formal public exhibition for the Project took place in March 2022. This exhibition was both in-person and virtual as detailed in volume 1, chapter 5. At this exhibition, details of the final stage of the site selection process, as assessed as part of the Onshore and Offshore EIA Reports were presented.

112. In July 2022, an extensive leaflet drop was undertaken notifying key consultees, stakeholders, and the public of the boundary change and providing additional information on other measures being introduced by the project to address climate change and nature emergencies.

4.14. CONCLUSION

113. The site selection process explained within this chapter of the Offshore EIA Report has culminated in the Application for the Proposed Development. The Applicant has endeavoured to take on board points raised by stakeholders during the offshore EIA scoping phase for the Proposed Development, in relation to the site selection and/or design.

114. As discussed in volume 2, chapter 6, a maximum design scenario approach has been implemented when assessing any impacts arising from the Proposed Development as part of this Offshore EIA Report. The final design will fall within the maximum PDE parameters to ensure that it is compliant with the Proposed Development as assessed in the Offshore EIA Report.

4.15. REFERENCES

CCC (undated). *Advice on reducing the UK's emissions*. Available at:https://www.theccc.org.uk/about/our-expertise/advice-on-reducing-the-uks-emissions/. Accessed on 14 April 2022

Department for Energy and Climate Change (DECC) (2009a). *Offshore Energy – Strategic Environmental Assessment – Post Public Consultation Report*. Available at: Microsoft Word - OE SEA Post Consultation Report.doc (publishing.service.gov.uk). Accessed on: 06/01/2022.

Department for Energy and Climate Change (DECC) (2009b). *Future Leasing for Offshore Wind Farms and Licensing for Offshore Oil and Gas and Gas Storage. Non-Technical Summary.* Available at: Microsoft Word - Non Technical Summary Final 260109.doc (publishing.service.gov.uk). Accessed on: 20 September 2021.

Department for Energy and Climate Change (DECC) (2011a). *Overarching National Policy Statement for Energy (EN-1).* Available at: 1938-overarching-nps-for-energy-en1.pdf (publishing.service.gov.uk). Accessed on: 21 September 2021.

Department for Energy and Climate Change (DECC) (2011b). *National Policy Statement for Renewable Energy Infrastructure (EN-3).* Available at: 1940-nps-renewable-energy-en3.pdf (publishing.service.gov.uk). Accessed on: 21 September 2021.

JNCC (2019). *Southern North Sea MPA | JNCC - Adviser to Government on Nature Conservation.* Available at www.jncc.gov.uk/our-work/southern-north-sea-mpa/#site-timeline. Accessed on 22 December 2021.

JNCC (2022). *Outer Firth of Forth and St Andrews Bay Complex SPA.* Available at: Outer Firth of Forth and St Andrews Bay Complex SPA | JNCC - Adviser to Government on Nature Conservation. Accessed on: 23 February 2022.

MacDonald, A., Speirs, D.C., Greenstreet, S.P.R. and Heath, M.R. (2018). *Exploring the Influence of Food and Temperature on North Sea Sandeels Using a New Dynamic Energy Budget Model*. Front. Mar. Sci. 5:339. doi: 10.3389/fmars.2018.00339. Available at: Exploring the influence of food and temperature on North Sea sandeels using a new dynamic energy budget model - Strathprints. Accessed on: 23 February 2022.

Marine Scotland (2021). *Marine Licence – Construction of Export Cable – Seagreen 1A Export Cable Corridor, Firth of Forth – 00009291.* Available at: Marine Licence – Construction of Export Cable – Seagreen 1A Export Cable Corridor, Firth of Forth - 00009291 | Marine Scotland Information. Accessed on: 23 February 2022.

Marine Scotland Licensing Operations Team (2021a). Scoping Opinion for Berwick Bank Offshore Wind Farm. Available at: Scoping Opinion – Berwick Bank Offshore Wind Farm | Marine Scotland Information.

Marine Scotland Licensing Operations Team (2021b). *HRA Screening Report Response for Berwick Bank Offshore Wind Farm*. Available at: HRA Screening Report Response - Berwick Bank Offshore Wind Farm | Marine Scotland Information.

RSPB (2017*). Kittiwake joins the red list of birds facing risk of global extinction*. Available at: https://www.rspb.org.uk/about-the-rspb/about-us/media-centre/press-releases/kittiwakeredlist/. Accessed on 17 January 2022.

Scottish Government (2018). *Sectoral Marine Plan for Offshore Wind Energy (encompassing Deep Water Plan Options). Context Report, June 2018.* Available at: Sectoral Marine Plan for Offshore Wind Energy (encompassing Deep Water Plan Options): Context Report (www.gov.scot). Accessed on: 21 September 2021.

Scottish Government (2019a). *The Global Climate Emergency - Scotland's Response: Climate Change Secretary Roseanna Cunningham's statemen*. Available at: The Global Climate Emergency - Scotland's Response: Climate Change Secretary Roseanna Cunningham's statement - gov.scot (www.gov.scot). Accessed on 31 August 2022.

Scottish Government (2019b). *Draft Sectoral Marine Plan for Offshore Wind Energy (2019).* Available at: Draft Sectoral Marine Plan for Offshore Wind Energy (2019) (www.gov.scot). Accessed on: 21 September 2021.

Scottish Government (2020). *Scottish House Condition Survey: 2019 Key Findings.* Available at: Scottish House Condition Survey: 2019 Key Findings (www.gov.scot). Accessed on: 29 November 2022.

Seagreen (2010a). *Zone Appraisal and Planning Firth of Forth Zone Characterisation*. Seagreen Document No. A6SW/SEAG-Z-DEV260-SWR-017-A2. Seagreen, Glasgow.

Seagreen (2010b). *Zone Consenting Strategy*. Seagreen Document No. A4MR/SEAG-Z-MGT110-SST-029. Seagreen, Glasgow.

Seagreen (2011). *Zone Appraisal and Planning: Update December 2011*. Seagreen Document No, A4MR/SEAG-Z-DEV260-SRP-118 (December 2011).

Seagreen (2014). *Zone Appraisal and Planning: Update 2*. Seagreen Document No. A4MR-SEAGZDEV260-SRP-279 (April 2014).

SSER (2020a). *2020 Berwick Bank Wind Farm Scoping Report*. Available at: https://www.sserenewables.com/media/0t5n05b4/berwick-bank-wind-farm-offshore-scoping-report.pdf

SSER (2020b). *Indicative Export Cable Corridor Design*. Seagreen Charlie Wind Energy Limited and Seagreen Delta Wind Energy Limited.

SSER (2020c). 2020 *Berwick Bank Wind Farm: HRA Screening Report*. Available at: https://www.berwickbank.com/planning-and-consent

SSER (2021a). *Berwick Bank Wind Farm Offshore Scoping Report*. Available at: https://www.berwickbank.com/planning-and-consent

SSER (2021b). *Berwick Bank Wind Farm Offshore HRA Screening Report*. Available at: https://www.berwickbank.com/planning-and-consent

SSE Renewables Developments (UK) (2021c). *Berwick Bank Wind Farm Berwick Bank Blade Tip to Sea Clearance Sensitivity Study*.

Trinder (2017). *Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality*. Unpublished report to The Crown Estate (submitted as Appendix 43 to Deadline I submission Hornsea Project Three: TCE Ornithology Headroom Estimates FINAL 24_02_2017 CLEAN (planninginspectorate.gov.uk)

UK Parliament (2019). "The most important issue of our time," Opposition calls to declare climate emergency - UK Parliament. Accessed on: 01/10/2022

UK Government (2022). Major acceleration of homegrown power in Britain's plan for greater energy independence - GOV.UK (www.gov.uk). Accessed 01/10/2022

van Deurs, M., Hartvig, M. and Steffensen, J.F (2011). *Critical threshold size for overwintering sandeels (Ammodytes marinus)*. Mar Biol 158, 2755–2764 (2011). Available at: Critical threshold size for overwintering sandeels (Ammodytes marinus) | SpringerLink. Accessed on: 23 February 2022.

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