

12 Whole Project Assessment

12.1 Whole Project Assessment

12.1.1 Introduction

- 12.1.1.1 This chapter presents an assessment of likely significant effects arising from the Project in its entirety (i.e. the three proposed offshore wind farms and all transmission infrastructure).
- 12.1.1.2 To cater for the differing nature of impacts associated with the offshore wind farms and the transmission infrastructure and in order to allow for the future partitioning of transmission assets to a future offshore transmission operator (OFTO), this Environmental Statement (ES) has thus far presented separately the outputs of impact assessment associated with either the proposed offshore wind farms or the proposed transmission infrastructure.
- 12.1.1.3 Environmental impacts should be assessed in regard to the Project in its entirety also and therefore the text that follows brings together the results of the two separate assessments and allows joint consideration of all offshore and onshore project components, based on the details of the onshore transmission infrastructure available at this time.

12.1.2 Approach

- 12.1.2.1 The whole Project assessment followed several stages, as set out below:
1. Collate the results of the offshore generating station and transmission infrastructure pre-mitigation impact assessments (ES Volumes 3 and 4 respectively). Identify which EIA receptors and impacts are relevant to the Whole Project Assessment and those which are specific to either the offshore generating station or the transmission infrastructure. For example: Intertidal Ecology, Terrestrial Ecology, and onshore Hydrology, Geology and Hydrogeology are receptors that will be affected only by the transmission infrastructure and therefore no further assessment work is required;
 2. Where topics have both generating station and transmission infrastructure elements to the assessments, consider whether bringing together the impact associated with the offshore generating station and the transmission infrastructure results in an additive effect (i.e. the combined effect is equal to the sum of the individual effects) or a synergistic effect (i.e. the combined effect is greater than the sum of the individual effects);
 3. Describe and assess the significance of each relevant topic area on a whole Project basis, applying the same assessment criteria and terminology used in the individual offshore generating station and transmission infrastructure assessments; and
 4. Identify and describe any additional mitigation measures that may be used to reduce the significance of whole Project impacts, beyond those measures already detailed in the individual offshore generating station and transmission infrastructure assessments. Where mitigation is proposed, describe and assess the significance of residual whole Project impacts.
- 12.1.2.2 Note that throughout this ES, impact assessment is based upon the realistic worst case development scenario as described for that topic area in the earlier impact assessment chapters. Similarly, the assessment criteria and terminology mirror those applied in the earlier impact assessment chapters.

12.1.3 Hydrodynamics Impact Assessment

Construction & Decommissioning

Changes to Wave and Tidal Regimes

- 12.1.3.1 The effect of all wind farm and offshore substation platform (OSP) infrastructure once installed is considered in the subsequent paragraphs (see 'Operation'). The effect of less than the total amount of infrastructure at an intermediate stage in the construction or decommissioning process is less than that reported for the operational phase of the development. Therefore, effects on hydrodynamics are not considered explicitly during the construction phase.
- 12.1.3.2 The transmission export cables will be laid onto the seabed through the water column. It is intended to then bury the cables along most of their length or, where this is not possible, apply cable protection measures (rock placement or mattressing). Introducing these materials and installation machinery to the baseline environment will present some small blockage to water movements locally. However, a negligible magnitude of change within the range of natural variability is predicted to arise in an area of low sensitivity. The resulting significance of effect is **not significant**.

Operation

Changes to Tidal Regime

- 12.1.3.3 Changes to the tidal regime (water levels and currents) may arise from interaction of the tide with obstacles in the water column, in this case the wind turbine and OSP foundations. The effect of individual foundations is principally controlled by the foundation shape and dimensions; the effect of an array is additionally controlled by the total number of foundations and their spacing and layout relative to the tidal axis. Modelling and assessment indicates that neither gravity base structures (GBS) nor jacket foundations will have a measurable effect on tidal water levels, tidal current directions, or non-tidal (surge) water levels. A small magnitude of change within the range of natural variability is therefore assessed to arise in an area of low sensitivity. The resulting effect is not significant and no sensitive receptors will be affected.
- 12.1.3.4 Sections of cable and / or cable protection measures that are (or become) exposed on the seabed have the potential to interact locally with tidal flows, but are of too small a physical scale to modify the regime and similarly result in **no significant effect**.

Changes to Wave Regime

- 12.1.3.5 Changes to the wave regime (joint statistics of height, period and direction) may arise from interaction of the waves with obstacles in the water column, in this case the wind turbine and OSP foundations. The effect of individual foundations is principally controlled by the foundation shape and dimensions; the effect of the array is additionally controlled by the total number of foundations and their spacing and layout relative to the wave coming direction.

- 12.1.3.6 In relation to wave height and period, the assessment finds that for jackets:
- Jacket foundations do not measurably affect wave height or period. i.e. localised maximum differences in significant wave height are < 0.1 m (2 %) and in wave period are < 0.3 s (2 to 3 %). Values are even less in most locations elsewhere within the wind farm sites.
- 12.1.3.7 For GBS:
- The main effect of the GBS foundations is to reduce the height of waves passing through the three proposed wind farms;
 - When all three wind farm sites are present in various tested configurations, the maximum reduction in wave height within the site boundary varies between 0.7 and 1.2 m or 12 to 19 % of the incident wave height (varying between 4 to 9 m) for all coming directions and return periods. The greatest absolute effects are on the largest waves that also pass through the long axis of three proposed wind farms (i.e. from 45 and 90°N). The highest proportional effects are on the largest and smallest waves (i.e. from 315 and 90°N); the smallest proportional effects are on waves from 270°N;
 - The area of maximum effect within the wind farms, in every case, is relatively small (length scale of order 1 km) and is located where waves have transitioned through the greatest width of the wind farm developments from that coming direction;
 - The effect gradually develops in proportion to the distance travelled through the site, i.e. 50 % of the wind farm site will experience less than 50 % of the maximum level of effect reported above, and 25 % will experience less than 25 % of the maximum effect, etc.;
 - Behind the sites, relative to the wave coming direction, the local reduction in wave height recovers towards ambient values at a non-linear rate (i.e. recovering quickly over small distances but smaller magnitude effects can persist over greater distances);
 - These residual effects extend in the direction of wave travel (with some lateral spreading); and
 - The maximum effect on wave period in all cases is, approximately, 0.3 s (3 to 5 %). The small magnitude of the effect is not measurable in practice.
- 12.1.3.8 In relation to wave direction, the assessment finds that:
- There is no measurable effect on instantaneous wave direction (i.e. differences are < ±1°) as a result of either the jacket or GBS scenarios either locally or regionally.
- 12.1.3.9 In the case of all receptors considered in the assessment (Smith Bank, designated coastal habitats, recreational surfing venues, stratification fronts), a small magnitude of change, typically within the range of natural variability is predicted to arise and the resulting effect is **not significant**.
- 12.1.3.10 Sections of cable and / or cable protection measures that are (or become) exposed on the seabed have the potential to interact locally with wave flows, but are of too small a physical scale to modify the regime and similarly result in **no significant effect**.

Summary

12.1.3.11 Table 12.1-1 below summarises the results of the whole Project assessment. The results presented in the table reflect Project impacts prior to mitigation being implemented.

Table 12.1-1 Hydrodynamics Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Changes to Tidal and Wave Regimes	Smith Bank	Partial effects – not significant	Negligible	Not significant
	Designated coastal habitats	Partial effects – not significant	Negligible	Not significant
	Stratification fronts	Partial effects – not significant	Negligible	Not significant
Operation				
Changes to the Tidal Regime	Smith Bank	Negligible	Negligible	Not significant
	Designated coastal habitats	Negligible	Negligible	Not significant
	Stratification fronts	Negligible	Negligible	Not significant
Changes to the Wave Regime	Smith Bank	Negligible	Negligible	Not significant
	Designated coastal habitats	Negligible	Negligible	Not significant
	Recreational surfing venues	Negligible	Negligible	Not significant

Proposed Mitigation and Residual Impacts

12.1.3.12 Table 12.1- 2 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 6.1 and 9.1 (Hydrodynamics: Wave Climate and Tidal Regime). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-2 Hydrodynamics Residual Impact Assessment Summary

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Changes to Tidal and Wave Regimes	Smith Bank	Partial effects – not significant	Negligible	Not significant
	Designated coastal habitats	Partial effects – not significant	Negligible	Not significant
	Stratification fronts	Partial effects – not significant	Negligible	Not significant
Operation				
Changes to the Tidal Regime	Smith Bank	Negligible	Negligible	Not significant
	Designated coastal habitats	Negligible	Negligible	Not significant
	Stratification fronts	Negligible	Negligible	Not significant
Changes to the Wave Regime	Smith Bank	Negligible	Negligible	Not significant
	Designated coastal habitats	Negligible	Negligible	Not significant
	Recreational surfing venues	Negligible	Negligible	Not significant

12.1.4 Sedimentary and Coastal Processes Impact Assessment

Construction & Decommissioning

Increase in Suspended Sediment Concentrations

12.1.4.1 An increase in Suspended Sediment Concentration (SSC) will arise where sediments are disturbed during energetic operations at or below the seabed. The magnitude of the effect locally will depend upon the sediment release rate. The nature of the effect and its extent and magnitude in the far field will depend upon the characteristics of the sediments being released (controlling the duration of time spent in suspension), the water depth (affecting the volume of water for dispersion and dilution) and the current speed and direction, both at the time of release and the residual current over longer periods of time (affecting rates and direction of advection). A change in levels of SSC locally does not necessarily imply an effect, if there are no receptors present that are sensitive to the change.

12.1.4.2 Dredging as part of bed preparation for GBS foundations will lead to:

- An increase in SSC of 30 to 35 mg / l above ambient levels depending on the tidal state and the local water depth at the time and location of the release. These maximum levels of effect are contained within 50 to 100 m of the dredger and only occurring during sediment release;
- A maximum increase in SSC of 20 mg / l or less above ambient levels within 500 to 1,000 m in a plume downstream and to 10 mg / l or less within 2,000 to 3,000 m downstream;

- Both of the above levels of effect are only present during dredging and no more than 1 hour after cessation of dredging; and
- A more widely dispersed residual increase in SSC of 1 to 4 mg / l above ambient levels.

12.1.4.3 Effects are generally of a magnitude consistent with the natural range of variability (< 5 mg / l during calm periods to 100s to 1,000s mg / l near to the seabed during storm events). Local effects around the dredger may however be potentially in excess of the natural range of variability in the upper water column but will be localised and temporary.

12.1.4.4 Drilling to install jacket pin piles will lead to:

- An increase in SSC of 30 to 40 mg / l above ambient levels depending on the tidal state and the local water depth at the time and location of the release. These maximum levels of effect are contained within 50 to 100 m of the dredger and only occur during sediment release;
- A maximum increase in SSC of 20 mg / l or less by 500 to 1,000 m above ambient levels in a plume downstream and to 10 mg / l or less by 2,000 to 3,000 m downstream;
- Both of the above levels of effect are only present during drilling and no more than 1 hour after cessation of drilling; and
- A more widely dispersed increase in SSC of 1 to 4 mg / l above ambient levels in some other areas.

12.1.4.5 Effects are generally of a magnitude less than the natural range of variability (< 5 mg / l during calm periods but 100s to 1,000s mg / l near to the seabed during storm events). Local effects around the dredger may however be potentially in excess of the natural range of variability in the upper water column but will be localised and temporary.

12.1.4.6 Overall, a small magnitude of change that may locally and temporarily exceed the range of natural variability, is therefore assessed to arise in an area of low sensitivity, resulting in a negative effect of **minor significance**.

12.1.4.7 Cable installation by burial into the seabed along the cable route and within the three proposed wind farm sites will have a relatively large magnitude effect on SSC (elevated to order 100s to 10,000s mg / l). However, the effect will be short-term (order of seconds to minutes, depending on the sediment grain size and degree of aggregation) and will be largely localised to the cable installation location (main effect within 10s of metres). A small to medium magnitude of change locally and temporarily exceeding the range of natural variability is therefore assessed to arise in an area of low sensitivity, resulting in a temporary negative effect of **minor significance**.

12.1.4.8 In its entirety the Project will not result in effects of greater than **minor significance** for all receptors.

Accumulation of Sediment and Change in Sediment Type

12.1.4.9 Sediment re-suspended by installation operations at or below the seabed will be initially transported and eventually re-deposited to the seabed. Rapid accumulations of a sufficient thickness may constitute an effect if and where a receptor is sensitive to the change.

- 12.1.4.10 The net effect of dredging as part of bed preparation for multiple GBS foundations will lead to:
- An accumulation of fine material (silts and clays) over a wide area to the south-south-west of the three proposed wind farms (coarser materials are considered to be retained in the dredger); and
 - The estimated thickness of the deposit is less than 1 mm, accumulating gradually over the whole construction period which is likely to be both undetectable in practice and also subject to progressive dispersion in this time by natural processes.
- 12.1.4.11 The net effect of drilling to install multiple jacket pin piles will lead to:
- A localised accumulation of sandy material up to 1 to 5 m thick in the near vicinity (within up to 200 m) of each foundation;
 - An accumulation of fine material (silts and clays) over a wide area to the south-south-west of the three proposed wind farms; and
 - The estimated thickness of the deposit is less than 1 mm accumulating gradually over the whole construction period, which is likely to be both undetectable in practice and subject to progressive dispersion by natural processes.
- 12.1.4.12 A small to medium magnitude of change that may locally and temporarily exceed the range of natural variability is therefore assessed to arise in an area of low sensitivity, resulting in a temporary negative impact of **minor significance**.

Indentations Left on Seabed

- 12.1.4.13 Jack-up barge legs and anchors are used to provide a stable or fixed working platform for installation vessels. On completion of the operation, these may leave an impression when extracted from the seabed. The exact nature of the initial disturbance will likely vary depending upon the design and dimensions of the leg or anchor, and the geotechnical properties of the seabed soils locally.
- 12.1.4.14 The scale of the depression left by a single leg soon after extraction is estimated to be a 12 m diameter conical pit, approximately 3.7 m deep from ambient bed level in the centre and possibly also surrounded by a raised area of seabed. In the short to medium term, the pits will tend to become shallower and less distinct as storm events re-suspended the raised sediment material around the edges of the pit and either redeposit it into the pit or move it elsewhere. There will be an initial tendency for some sediment being transported through the area to accumulate in the pits if they are sufficiently deep to reduce current speed and / or wave action locally. However, this tendency will decrease rapidly as the pits flatten. In the medium to long-term, the pits are likely to be filled by natural sediment transport on time scales in the order of 1 to 5 years following construction.
- 12.1.4.15 Anchors may also leave an impression on the seabed. The footprint length scale of the disturbance remaining soon after removal of an anchor will be approximately similar to the size of the anchor itself (1.5 to 3 m). The character of the disturbance may be highly variable (chaotic ridges and depressions) within the footprint of effect. In the worst case, the maximum depth of a conical pit with these footprint dimensions (assuming a stable slope angle of 32°) is 0.47 to 0.94 m. In the short to medium term, the disturbed surface will be reworked and flattened to a baseline condition by waves and currents during storm events. As

the sediment is essentially only locally redistributed in a small footprint, no tendency for it to intercept regional sediment transport is expected.

- 12.1.4.16 In the case of both jack-up legs and anchors, because no sediment has been introduced from elsewhere or removed and the sediment veneer is considered to be largely uniform within the upper 5 m, the sedimentary texture of the disturbed surface will be similar to that of the surrounding seabed.
- 12.1.4.17 A small magnitude of change within the range of natural variability is therefore assessed to arise in an area of low sensitivity. The resulting significance of effect is **not significant**.

Change in Coastal Morphology

- 12.1.4.18 The offshore export cable will be buried where it transits from the offshore to onshore environments, through the nearshore, intertidal, beach and hinterland areas of the export cable landfall. The disturbance caused by this operation may potentially lead to resuspension of sediments and a disruption to coastal processes.
- 12.1.4.19 Excavating a trench across the nearshore and intertidal zone has the potential to affect local morphology and sedimentary processes, including the relative bed level, seabed mobility and local longshore sediment transport. Trench excavation would be completed before the cable is installed and the trench backfilled. Given that the main operations will likely be undertaken during relatively calm conditions (when longshore transport rates are minimal) and only lasting a short period of time (expected to be no more than a few days), the only expected effect on coastal processes is likely to be a temporary and localised increase in SSC and the temporary presence of either a trenched depression or furrow in the beach. With or without backfilling, a trench in sand will be quickly incorporated back into the natural environment within at most a few tidal inundations. No wider or longer term effect is expected.
- 12.1.4.20 Alternatively, once the cable reaches landfall, horizontal directional drilling (HDD) works can be used to create an underground conduit for the cable between the offshore and onshore parts of the route. This method has historically been shown to cause minimal direct disturbance to the existing coastline and will also not leave any infrastructure exposed in the active parts of the beach (onshore or offshore) and so will not affect littoral processes.
- 12.1.4.21 The majority of drill arisings will be captured at the onshore end of the HDD route and so will not cause any effects with regards to water quality during installation.
- 12.1.4.22 The effects of cable landfall operations are generally of a magnitude consistent with the natural range of variation in beach morphology. The effect is therefore **not significant**.

Operation

Changes to the Sediment Transport Regime and Geomorphology

- 12.1.4.23 The sediment transport regime (rates, directions and the nature of sediment transport) is controlled by the interaction of surficial seabed sediments with the tidal and wave regimes locally.

- 12.1.4.24 The predicted effect of a reduction in wave height on sediment transport pathways in the three proposed wind farms and resulting morphology is:
- The areas within the three proposed wind farms may tend to accumulate sediment at a slightly higher rate than would have otherwise occurred during the operational lifetime of the development;
 - The supply of sediment to areas located further into the Moray Firth might be slightly less than would have otherwise occurred during the operational lifetime of the development; and
 - However, as stated above, the absolute difference in sediment transport attributable to the wind farm is less than the potential for natural variability over the same period.
- 12.1.4.25 A small magnitude of change within the range of natural variability is therefore assessed to arise and the resulting significance of effect on offshore receptors (i.e. Smith Bank) is not significant. The effect of the wind farm array on wave height, period and direction at the location of designated coastal habitats was found to be not significant both in absolute terms and in the context of natural variability. There will, therefore, be **no** corresponding **effect** upon the rates or directions of nearshore sediment transport at these locations.

Scour Effects

- 12.1.4.26 Scour can occur as the result of a localised increase in erosion potential, caused by the interaction between obstacles and water movements near to the seabed. As such, extensive scour is not naturally present in the marine environment and its introduction may constitute a further area of modification to the nature and level of the seabed. In addition to the slopes that may develop, the surface of the scour pit may develop a sediment texture different to that of the ambient seabed due to the difference in sediment transport potential.
- 12.1.4.27 Overall, in terms of scour depth the GBS is predicted to cause the largest effect with a maximum depth of, approximately, 9 to 12 m local to the structure. In reality, this depth is unlikely to be attained, at least in all locations around a given foundation, due to potential constraints arising from the sub-surface geology.
- 12.1.4.28 The extent of scour from the edge of each foundation is calculated assuming the profile of the scour pit is an inverted cone with slopes at the angle of repose for sand (32°). It is noted that the minimum separation between turbine locations is approximately 600 m and the greatest extent of scour from the centroid of a foundation location is only 51 m. Therefore, scour effects are not predicted to interact or coalesce between foundations.
- 12.1.4.29 The greatest volume of scoured material from a single foundation results from the 65 m GBS or GBS plinth with a scoured volume of 26,663 m³ per turbine or OSP. As already described, this full volume may not be attained due to geological conditions in the site (and embedded mitigation from the likely placement of scour protection materials within a few metres of the seabed surface as an integral part of the engineering design).
- 12.1.4.30 The effects of the turbine and OSP foundations in causing scour are of a small to medium magnitude relative to the range of naturally occurring variability in seabed level but do not cause the normal range of water depths to be exceeded. The effects of scour are limited to only a small proportion of the area of each of the three proposed wind farms and an even smaller proportion of the area of Smith Bank.

- 12.1.4.31 A small to medium magnitude of change that does not exceed the range of natural variability is therefore assessed to arise in an area of low sensitivity. The resulting effect is of **minor significance**.
- 12.1.4.32 The effects of scour potentially resulting from the exposure of inter-array and inter-platform cables onto the seabed are considered to be of a small magnitude relative to the range of naturally occurring variability. Effects on morphology or sediment surface texture will be localised to the cable route. This effect is therefore **not significant**.
- 12.1.4.33 Scour protection measures that might be deployed onto surface laid or otherwise exposed sections of transmission infrastructure may take various forms, most likely a form of:
- Rock placement; or
 - Concrete mattressing.
- 12.1.4.34 Protection measures are used to mitigate the engineering risk posed by scour and exposure of the offshore export cable to external damage. The measures will prevent scour from developing around the cable; however, the area occupied by the scour protection might also be similarly considered as a modification to the sedimentary environment and may cause a more limited depth and area of secondary scour to develop. The effects of cable protection measures are considered to be of a small magnitude relative to the range of naturally occurring variability and will not have a measurable effect on sediment transport beyond a short to medium term period of initial adjustment. Effects on morphology or sediment surface texture will be localised to the cable route. The effect is therefore **not significant**.
- 12.1.4.35 The effects of the Project in its entirety will not exceed minor adverse significance.

Summary

- 12.1.4.36 Table 12.1-3 below summarises the results of whole Project assessment. The results presented in the table reflect project impacts prior to mitigation being implemented.

Table 12.1-3 Sedimentary and Coastal Processes Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Increase in Suspended Sediment Concentrations	Smith Bank	Negligible	Minor adverse	Minor adverse
Accumulation of Sediment and Change in Sediment Type	Smith Bank	Minor adverse	N / A	Minor adverse

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Indentations Left on Seabed by Construction Vessels/Anchors	Smith Bank	Negligible	N / A	Not significant
Disturbance of Coastal Morphology	Fraserburgh landfall	N / A	Negligible	Not significant
Operation				
Changes to the Sediment Transport Regime and Geomorphology	Smith Bank	Not significant	Negligible	Not significant
	Designated coastal habitats	Negligible	Negligible	Not significant
Scour Effects	Smith Bank	Minor adverse	Negligible	Minor adverse

Proposed Mitigation and Residual Impacts

12.1.4.37 Table 12.1-4 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 6.2 and 9.2 (Sedimentary and Coastal Processes). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-4 Sedimentary and Coastal Processes Residual Impact Assessment Summary

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Increase in Suspended Sediment Concentrations	Smith Bank	Minor adverse	Minor adverse	Minor adverse
Accumulation of Sediment and Change in Sediment Type	Smith Bank	Minor adverse	N / A	Minor adverse
Indentations Left on Seabed by Construction Vessels/Anchors	Smith Bank	Negligible	N / A	Not significant
Disturbance of Coastal Morphology	Fraserburgh landfall	N / A	Negligible	Not significant

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Operation				
Changes to the Sediment Transport Regime and Geomorphology	Smith Bank	Not significant	Negligible	Not significant
	Designated coastal habitats	Negligible	Negligible	Not significant
Scour Effects	Smith Bank	Minor adverse	Negligible	Minor adverse

12.1.5 Hydrology, Geology and Hydrogeology Impact Assessment

12.1.5.1 Assessment of likely significant effects on hydrology, geology and hydrogeology has been undertaken in relation to the installation, operation and decommissioning of the onshore transmission infrastructure between the Fraserburgh Beach landfall and the onshore substation(s) location. Offshore wind farm installation, operation and decommissioning will have no effect on hydrology, geology and hydrogeology.

12.1.5.2 The following residual effects were assessed as being of minor significance or insignificant to Hydrology, Geology and Hydrogeology receptors:

- Construction / Decommissioning
 - Changes to surface runoff and drainage;
 - Subsoil compaction and reduced infiltration;
 - Localised overland flooding;
 - Excessive erosion and sedimentation;
 - Alteration of groundwater levels / patterns;
 - Water quality deterioration due to construction activities;
 - Loss of agricultural soils and peat;
 - Sterilisation of mineral reserves;
 - Disturbances to small watercourses at crossing locations;
 - Disturbance to medium and large rivers and floodplains;
 - Loss of coastal flood protection;
 - Damage to geological / geomorphological sites;
 - Disturbance and movement of contaminated material;
 - Pollution of water supplies;
 - Human health effects from contaminated materials; and
 - Damage to construction materials by contaminated ground.

- Operation
 - Human health effects from contaminated materials; and
 - Changes to surface runoff and drainage patterns of the proposed substation.

12.1.6 Noise (Onshore) Impact Assessment

- 12.1.6.1 Assessment of likely significant effects on noise (onshore) has been undertaken in relation to the installation and decommissioning of the onshore transmission infrastructure between the Fraserburgh Beach landfall and the onshore substation(s) location. Offshore wind farm installation, operation and decommissioning will have **no effect** on onshore noise.
- 12.1.6.2 Discussions are ongoing with landowners to determine the exact location and layout of the onshore substation(s) on their land within the preferred onshore substation area. This will be finalised following production of a masterplan by the owner / operator of the Peterhead Power Station compound which forms part of the preferred area. Once the precise location and layout for the onshore substation(s) and export cable location has been confirmed, an application for planning permission for the OnTI will be submitted to Aberdeenshire Council and will be supported by this ES and such further information as is required to support the planning application.
- 12.1.6.3 With an Environmental Management Plan (EMP), enforced by the appointed Contractor throughout the construction period, the residual effect at all noise sensitive receptors is predicted to be moderate adverse and temporary where works are occurring in close proximity to dwellings (within 20 – 50 m, depending on the activity being undertaken) and minor adverse or negligible and temporary when occurring at greater separation distances. Overall, **no significant effects** are anticipated.

12.1.7 Benthic Ecology Impact Assessment

Construction & Decommissioning

Temporary Direct Seabed Disturbances

- 12.1.7.1 Seabed habitats will be temporarily directly disturbed as a result of placement of the feet of construction vessels and the installation of cables. These temporary direct seabed disturbances will result in a change in the benthic ecology relative to baseline conditions. Temporary direct effects will be limited to the direct area of the footprint of the activity (negligible spatial scale). Recovery of the seabed and associated communities is expected well within the life time of the Project. The magnitude of the effect is considered low in relation to both offshore wind farm and transmission infrastructure installation, though receptor sensitivity is variable. For the sand and gravel sediment habitats and communities found within the proposed wind farm and transmission infrastructure footprints, receptor sensitivity is low and effect significance is minor. For the burrowed mud Priority Marine Feature (PMF) habitat within the footprint of the transmission infrastructure, receptor sensitivity is low and effect significance is minor. For the Annex I *Sabellaria spinulosa* reef and stony and rocky reef habitat within the nearshore footprint of the transmission infrastructure cable route, receptor sensitivity is high and effect significance is **major**.

- 12.1.7.2 As a result of effects being limited to the direct area of the footprint of the activity, additive or synergistic effects on receptors will not occur. The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters.

Temporary Indirect (Sediment) Disturbances

- 12.1.7.3 Seabed preparatory work including dredger over-spill, placement of turbines and installation of cables is likely to suspend fine sediments into the water column increasing suspended sediment concentrations (SSCs) in the locale. Suspended sediments from these sources will be transported via tidal currents for re-settlement over adjacent seabed areas. This effect is of potential interest as the re-settlement of sediment back to the seafloor may have negative indirect effects on benthic ecology.
- 12.1.7.4 Effects on benthic ecology over and above the natural variation are predicted to be highly localised and temporary, lasting for the duration of the construction activity only. Effect magnitude is therefore considered to be low. The sensitivity of sand and gravel sediment habitats and communities is regarded as low and indirect sediment effects resulting from both wind farm and transmission infrastructure are therefore considered to be of **minor significance**.
- 12.1.7.5 Burrowed mud habitats are considered to have low sensitivity, and indirect sediment effects are predicted to be of **minor significance** for transmission infrastructure installation, and **not significant** for offshore wind farm installation (where the receptor is only impacted by far field effects of negligible magnitude).
- 12.1.7.6 Annex I habitats in the nearshore transmission works footprint are also of low sensitivity to indirect sediment effects, and so the significance of temporary indirect disturbances on benthic ecology is considered to be **minor**.
- 12.1.7.7 As a result of effects being limited to the direct area of the footprint of the activity, additive or synergistic effects on receptors will not occur. The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters.

Seabed Deposition of Sediment Arisings from Drilling of Jacket Piles

- 12.1.7.8 The deposition of sediment arisings from drilling activities is specific to the jacket foundation option for the offshore wind turbines. Receiving seabed habitats within the three proposed sites are predominately sedimentary and would therefore be expected to be tolerant of temporary settlement of sediments and locally raised SSCs. Consequently, effects associated with deposition of sediment arisings from drilling of piles are forecast to be of **minor significance**.

Accidental Spillages of Chemicals

- 12.1.7.9 Accidental spillages or release during the construction (and operation and decommissioning phases) of the wind farms may potentially contaminate seabed sediments. The severity of this effect on benthic ecology depends upon the quantities and nature of the spillage / release, the dilution and dispersal properties of the receiving waters and the bio-availability of the contaminant to benthic species.

- 12.1.7.10 At this stage, the quantities and types of material which might conceivably enter the marine environment in this way are not known and so scale and magnitude of effects are unquantifiable at present. In the worst case scenario the potential significance of an accidental spillage resulting from either offshore wind farm or offshore transmission infrastructure works would be major. Accidents are by definition unknown and the uncertainty associated with this effect is therefore high. The effects of accidental spillages for the whole Project can be up to **major**.

Operation

Net reduction of Area of Seabed Habitat

- 12.1.7.11 Existing seabed habitat will be lost as a result of the direct placement of offshore wind farm and transmission infrastructure. The effect will result in a reduction in the total area of original seabed habitat. However, given the small spatial scale, relative to the size of the overall Project area and / or the wider availability of comparative habitats throughout the outer Moray Firth, the effect of the direct placement of turbines, OSPs and cables on the seabed is judged to be of **minor significance**.
- 12.1.7.12 As a result of effects being limited to the direct area of the footprint of the activity, additive or synergistic effects on receptors will not occur. The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters.

Habitat and Associated Community Change

- 12.1.7.13 Although the operation of the three proposed wind farms and offshore transmission infrastructure will result in the loss of original seabed habitat, a substantial proportion of this will become new habitat, which will be available for colonisation by attaching and encrusting species such as barnacles, hydroids and bryozoans. The new habitat type and colonising fauna will be different from baseline conditions. The increase in the availability of hard substrata increases the risk of enhancing the spread of non-indigenous species (NIS).
- 12.1.7.14 Hard structures (turbine and OSP foundations and scour and cable protection material) are likely to be colonised by communities of sessile epifauna and larger mobile epibenthos with species being imported or migrating from adjacent areas in the Moray Firth. Whilst clearly having potential for greater habitat and species richness and diversity, there will be a change in these receptors from baseline conditions. Impact significance of habitat and associated community change resulting from both the wind farms and the transmission infrastructure is therefore judged to be **minor**.
- 12.1.7.15 The likely significant effects of NIS on biodiversity are currently unknown and so the uncertainty associated with this particular assessment is high. Consequently the significance of the effects of NIS is regarded as **moderate**.

Effects on Physical Processes and Related Biological Changes

- 12.1.7.16 Benthic habitats and associated communities are strongly influenced by seabed sediment type and stability which are themselves typically functions of prevailing hydrodynamic and wave regimes. Effects of the wind farms and transmission infrastructure on physical processes may lead to changes in baseline benthic ecological conditions.

- 12.1.7.17 Impact assessment chapters explain that very small changes in physical process are forecast and that receiving habitats are predominately sedimentary and / or are not considered sensitive to light accumulation of sediments. This results in 'local' effects (of individual turbine structures) of minor significance, but no significant effects at a wider scale (i.e. wind farm array). The effects of the offshore transmission infrastructure on physical processes and associated impacts on benthic ecology are assessed to be of **no significance**.
- 12.1.7.18 The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters.

Temporary Direct Seabed Disturbances During Operation

- 12.1.7.19 Ongoing operations and maintenance, major interventions and overhauls of turbines may result in seabed disturbance. The spatial extent and duration of this effect is negligible. Biotopes have high recoverability and receptor sensitivity is low. Accordingly, associated effects are expected to be **not significant**. It is considered that this effect will not occur in relation to the offshore transmission infrastructure.

Effects of EMFs

- 12.1.7.20 The overall effect of EMFs from both export and inter-array cables is thought to be highly localised around the cable. Effects will be long term, lasting for the duration of the operational phase of the development but will be reversible upon decommissioning. Effect magnitude is therefore considered to be low. These factors coupled with current field observations described above (low or negligible receptor sensitivity) and the mitigation through burial suggests that EMF effects of the whole Project on benthic ecology will be **not significant**.

Effects of Heat

- 12.1.7.21 Given the highly localised effect predicted (within a few centimetres of the inter-array and export cables) the magnitude of this potential effect is assessed as being negligible. The effect will be of long duration, lasting throughout the operational phase of the Project but will be reversible upon decommissioning. Accordingly, the impact significance of heating from the whole Project is assessed to be **not significant**.

Summary

- 12.1.7.22 Table 12.1.5 below summarises the results of Whole Project Assessment. The results presented in the table reflect Project impacts prior to mitigation being implemented.

Table 12.1-5 Benthic Ecology Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Temporary Direct Seabed Disturbance	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Major adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Temporary Indirect (Sediment) Disturbances	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Minor adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Seabed Deposition of Sediment Arisings from Drilling of Jacket Piles	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	N / A	Minor adverse
Seabed Contamination as a Result of Accidental Spillage of Chemicals	Sand and gravel sediment habitats and communities (biotopes)	Up to major adverse	Up to major adverse	Up to major adverse
Operation				
Net Reduction of Area Of Seabed Habitat / Loss of Original Habitat	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Minor adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Habitat and Associated Community / Species Change	Sand and gravel sediment habitats and communities (biotopes)	Moderate adverse	Minor adverse	Moderate adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Minor adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Effects on Physical Processes and Related Biological Changes	Sand and gravel sediment habitats and communities (biotopes)	Not significant – minor adverse	N / A	Not significant – minor adverse
Temporary Direct Seabed Disturbances During Operation	Sand and gravel sediment habitats and communities (biotopes)	Not significant	N / A	Not significant
Seabed Contamination as a Result of Accidental Spillage of Chemicals	Water quality and benthic species	Up to major adverse	Up to major adverse	Up to major adverse
Effect of EMFs	Electro-magnetic sensitive and migratory invertebrate species	Not significant	Not significant	Not significant
Effect of Heat	Deep burrowing species such as <i>Nephrops norvegicus</i>	Not significant	Not significant	Not significant

Proposed Mitigation and Residual Impacts

12.1.7.23 Table 12.1-6 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 7.1 and 10.1 (Benthic Ecology). No additional mitigation measures are deemed necessary to reduce whole Project effects.

Table 12.1-6 Benthic Ecology Residual Impact Assessment Summary

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Temporary Direct Seabed Disturbance	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Not significant	Not significant
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Temporary Indirect (Sediment) Disturbances	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Temporary Indirect (Sediment) Disturbances (continued)	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Minor adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Seabed Deposition of Sediment Arisings from Drilling of Jacket Piles	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	N / A	Minor adverse
Seabed Contamination as a Result of Accidental Spillage of Chemicals	Water quality and benthic species	Minor adverse	Minor adverse	Minor adverse
Operation				
Net Reduction of Area of Seabed Habitat	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Minor adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Habitat and Associated Community Change	Sand and gravel sediment habitats and communities (biotopes)	Minor adverse	Minor adverse	Minor adverse
	Annex I <i>Sabellaria spinulosa</i> reef and stony and rocky reef	N / A	Minor adverse	Minor adverse
	Burrowed mud PMF habitat	N / A	Minor adverse	Minor adverse
Effects on Physical Processes and Related Biological Changes	Sand and gravel sediment habitats and communities (biotopes)	Not significant – minor adverse	N / A	Not significant – minor adverse
Temporary Direct Seabed Disturbances During Operation	Sand and gravel sediment habitats and communities (biotopes)	Not significant	N / A	Not significant
Seabed Contamination as a Result of Accidental Spillage of Chemicals	Water quality and benthic species	Minor adverse	Minor adverse	Minor adverse
Effect of EMFs	Electro-magnetic sensitive and migratory invertebrate species	Not significant	Not significant	Not significant
Effect of Heat	Deep burrowing species such as <i>Nephrops norvegicus</i>	Not significant	Not significant	Not significant

12.1.8 Fish and Shellfish Ecology Impact Assessment

Construction & Decommissioning

Temporary Disturbance of the Seabed

- 12.1.8.1 The physical disturbance of the seabed associated with construction works will result in an increase in suspended sediment concentrations (SSCs) and subsequent sediment re-deposition. This could indirectly result in an effect on fish and shellfish species. These construction activities include dredging as part of seabed preparation for installation of Gravity Base Foundations (GBS), drilling to install jacket pin piles and cable trenching by energetic means. The increase in SSCs expected in the immediate vicinity of construction vessels (50 to 100 m) is: 30 to 35 mg / l for dredging as part of seabed preparation for gravity bases and 30 to 40 mg / l for drilling for the installation of pin piles, reducing to 20 mg / l or less in the main plume by 500 to 1,000 m downstream and to 10 mg / l or less by 2,000 to 3,000 m downstream. These effects are expected to only occur during and up to an hour after dredging / drilling. After this time SSCs are reduced to < 4 mg / l above ambient levels due to dispersion and deposition. Local effects around construction vessels may be potentially in excess of this but will be very localised and short term.
- 12.1.8.2 Life stages, such as eggs and larvae, will not be able to avoid disturbed areas as they may passively drift (if pelagic) or remain (if demersal / benthic) in areas where construction works are being undertaken. Eggs and larvae are generally considered to be more sensitive to suspended sediment effects than later life stages, although sensitivities vary between species. In addition to increased SSCs, fish eggs could be affected by re-deposition of suspended sediment. This is of particular importance to species which lay their eggs on the seabed, such as sandeels and herring.
- 12.1.8.3 Adult and juvenile fish, being mobile, will be able to avoid localised areas disturbed by significant increased SSCs. If displaced, juveniles and adults would be able to move to adjacent undisturbed areas within their normal distribution range. In the case of migratory species, assuming fish are migrating through the site, increased SSCs may result in localised disturbance to migration.
- 12.1.8.4 The principal shellfish species present in areas relevant to the three proposed wind farm sites are, with the exception of squid, of limited mobility (i.e. scallops, *Nephrops*, crabs and lobsters). It is therefore likely that these will remain in areas disturbed by increased SSCs whilst construction works are taking place. In addition, they could be affected by smothering as a result of sediment re-deposition. Increases in SSC in the case of filter feeders such as scallops could also potentially affect their ability to feed.
- 12.1.8.5 It should be noted, however, that only discrete areas will be disturbed at a given time, and that disturbance will be short term. The majority of fish and shellfish species present in the area are relatively mobile and their distribution ranges large in comparison to areas potentially being disturbed at a given time.
- 12.1.8.6 As a result of effects being limited to the direct area of the footprint of the activity, additive or synergistic effects on receptors will not occur. The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters.

Noise

- 12.1.8.7 A number of wind farm construction related activities generate underwater noise and vibration. These include suction dredging, drilling, operational noise, impact piling, cable laying, rock placement, seismics, trenching and vessel noise. In order to assess the likely significant effect of construction noise on fish, modelling was undertaken using the dB_{ht} (*Species*) metric, which allows for effect ranges to be defined taking account of species specific sensitivities (as described below).
- 12.1.8.8 The noise modelling undertaken to support this impact assessment has focused on species for which there is detailed information on their hearing ability and which represent different ranges of hearing capabilities and sensitivity to noise. These are dab (*Limanda limanda*), salmon (*Salmo salar*), cod (*Gadus morhua*) and herring (*Clupea harengus*).
- 12.1.8.9 A comparative indication of the impact ranges of noise on the species modelled at the 90 dB_{ht} and 75 dB_{ht} (*Species*) level for different construction activities. The majority of construction activities have negligible impact ranges on fish. An exception to this is impact piling which is the activity predicted to result in the greatest effect on fish species. This activity therefore forms the basis of this part of the impact assessment.
- 12.1.8.10 The assessment of noise on fish has been primarily focused on the outputs of the modelled 90 dB_{ht} (*Species*) impact ranges, at which the greatest behavioural effects are to be expected. Noise at the 130 and 110 dB_{ht} (*Species*) level above which possibility of traumatic hearing damage and unbearably loud sounds may be expected respectively, would only occur in close proximity of where piling is taking place (order of 10's to 100's of metres at 130 dB_{ht} (*Species*) level and order 100's to few 1,000's of metres at the 110 dB_{ht} level, depending on species specific hearing abilities. It should be noted, that soft start piling will be used with the aim that mobile species are not exposed to the 110 and 130 dB_{ht} (*Species*) levels, as this will allow fish to leave the vicinity of the foundations before the highest noise levels are reached.
- 12.1.8.11 The level of hearing specialisation in fish is assumed to be associated with possession of a swim bladder and whether this is connected to the ear. Fish with specialist structures are considered of highest sensitivity, non-specialists with swim bladder of medium sensitivity and non-specialists without swim bladder of lowest sensitivity.
- 12.1.8.12 Life stages of limited mobility such as larvae, and in the case of European eel, their juvenile form (glass eels), will not be able to avoid areas where the highest noise levels are reached during construction, assuming they drift through the proposed wind farm sites. However, findings suggest that larval mortality would only occur within a few hundred metres from where piling is taking place.
- 12.1.8.13 The majority of shellfish species present in areas relevant to the proposed sites, with the exception of squid, have limited mobility in comparison to most fish species; hence they may not be able to avoid areas in close proximity to piling operations. The hearing mechanism of invertebrate species is currently not well understood. They are generally assumed to be less sensitive to noise than fish due to the lack of a swim bladder. No species specific information on the sensitivity of *Nephrops*, crabs and lobsters is currently available; however, they are expected to be present in areas relevant to the three proposed wind farm sites in relatively low numbers, being more prevalent in other areas within the region. Squid are seasonally present in the Moray Firth to spawn and, as previously mentioned, may

potentially be affected by noise in a similar way as fish. However, they are mobile and mainly occur in coastal areas to the south of the proposed sites. Scallops are the principal commercial shellfish species targeted in the proposed sites. Whilst detailed information on the hearing ability of scallops is currently lacking, they are not considered to be sensitive to noise.

- 12.1.8.14 As a result of effects being species specific and the current available knowledge of species within the three proposed wind farm sites, additive or synergistic effects on receptors will not occur. The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters.

Operation

Loss of Habitat

- 12.1.8.15 The installation of the three proposed wind farms will result in a loss of habitat for fish and shellfish species proportional to their total footprint. A maximum net reduction of seabed habitat of 3.76 km² may occur. This accounts for 0.99 % of the total area of the three proposed wind farm sites. Further to the above direct loss of seabed area, the introduction of the wind farm infrastructure could result in changes in the distribution of seabed sediment in the development area during the operational phase, which could potentially result in an indirect loss of habitat to some species. As changes to tidal, wave and sediment transport regime due to the presence of the wind farm foundations are expected to be not significant. The potential for changes in sediment type and sediment distribution within the site and the wider area to have an effect on fish and shellfish species are therefore not considered further.
- 12.1.8.16 The majority of fish and shellfish species present in the area have relatively wide distribution ranges. These vary depending on the species under consideration but are consistently large relative to the predicted loss of habitat of 3.76 km². An exception to this are spawning herring and sandeels, which are dependent on the existence of a suitable substrate. For these reasons, it is assumed that Herring are present within the assessment.
- 12.1.8.17 MORL commissioned a sandeel survey to investigate the distribution of sandeels across the three proposed wind farm sites and the Western Development Area. Sandeels were caught in low numbers across the three proposed wind farm sites ranging from 0 to 40 individuals. Whilst sandeels are considered to be present in the Smith Bank and in the wider Moray Firth, the results of the sandeel survey suggest that within the three proposed wind farm sites there are not extensive areas supporting important sandeel populations.
- 12.1.8.18 As a result of effects being species specific and the current knowledge of species within the three proposed wind farm sites, additive or synergistic effects on receptors will not occur. The effects of the Project as a whole do not exceed those reported in earlier impact assessment chapters). The introduction of the structures will replace areas of existing predominantly sandy or slightly gravelly biotopes with communities typical of harder substrates.

Introduction of New Habitat

- 12.1.8.19 The sub-surface sections of turbine towers, foundations, scour protection and concrete mattressing / rock dumping for cable protection (where required) will result in the introduction of hard substrate which is expected to be colonised by a

number of organisms, including a range of encrusting and attaching species (epifauna) such as mussels, barnacles, tubeworms, sponges, hydroids, etc. This is likely to increase local species diversity as well as the abundance and biomass of epifaunal organisms.

- 12.1.8.20 The increase in diversity and productivity of seabed communities may have an effect on fish resulting in either attraction or increased productivity. Assessment of likely significant effects derived from the introduction of new habitat gives rise to the difficulty of assigning both sensitivities to potential receptors and a magnitude to the likely effect. Furthermore, receptors may change through the operational phase of the Telford, Stevenson and MacColl sites as changes in the benthic community take place. The assessment of this effect has therefore been based on a review of current knowledge and on evidence from monitoring programmes undertaken in operational wind farms and other offshore infrastructures.
- 12.1.8.21 Based on the available information in general terms effects of the whole Project on fish and shellfish species are considered **minor**. This effect may be positive or negative depending on the species under consideration (i.e. positive for species for which feeding opportunities are increased and protection is found within the array and negative for other species, if subject to increased predation within the site).

Electromagnetic Fields (EMFs)

- 12.1.8.22 The export and inter-platform cables will generate EMFs during the operational phase of the three proposed wind farms and OfTI. The inter-platform cables will be 220 kV AC cables and the export cables 320 kV DC cables. Both cable types will generate an electric field (E) and a magnetic field (B). The sheathing and armoured cores, prevent the propagation of electric fields (E) into the environment, however, these materials are permeable to magnetic fields (B), which therefore emanate into the surrounding environment.
- 12.1.8.23 The magnetic fields generated by AC cables are constantly changing. In turn, the motion of these B fields through the surrounding seawater induces varying electric (E_i) fields. Therefore both B and E_i fields will be generated by inter-platform cables during the operational phase of the OfTI.
- 12.1.8.24 Due to the static nature of the B field, induced E_i fields will not be produced directly by DC cables. It should be noted, however, that in the marine environment organisms and tidal streams will pass through the static B field and this will indirectly result in the production of an E_i field. As a result, both B and E fields will be produced during the operational life of the export cables. Furthermore, magnetic fields generated by DC cables interact with the geomagnetic field. The intensity, shape, and spatial extent of the resulting magnetic field (cable + geomagnetic) is therefore affected by the orientation of the cable system with respect to the earths' north-south magnetic dipole (Normandeau *et al.*, 2011). This makes evaluating resulting EMFs from DC cables complicated.
- 12.1.8.25 The strength of the magnetic field generated by both AC and DC cables decreases exponentially horizontally and vertically with distance from source (Normandeau *et al.*, 2011). Cables will be buried to a target depth of 1 m. Cable burial does not completely mitigate B or E_i fields, although it reduces exposure of electromagnetically sensitive species to the strongest EMFs that exist at the 'skin' of the cable owing to the physical barrier of the substratum (OSPAR, 2008). In instances where adequate burial cannot be achieved, alternative protection

such as mattresses or rock placement will be used. Benthic and demersal fish and shellfish species will therefore not be directly exposed to the strongest EMFs as a result of the physical barrier that burial and cable protection constitute.

- 12.1.8.26 Since the strength of the magnetic field decreases with distance from the source, the likely effects of EMFs on fish and shellfish will be influenced by the position of particular species in the water column and water depth.
- 12.1.8.27 The expected B fields generated by DC export cables and inter-platform AC cables are, taking cable burial to 1 m, well below the Earth's magnetic field (assumed to be 50 μ T). Where DC cables cannot be buried and are instead protected (0.25 m under rock placement), B fields will be higher at the seabed, however, they are also expected to decrease to values below the Earth's magnetic field within 5 m from the seabed.
- 12.1.8.28 The overall effect of EMFs from both export and inter-array cables is thought to be highly localised around the cable. Effects will be long term, lasting for the duration of the operational phase of the development but will be reversible upon decommissioning. Effect magnitude is therefore considered to be low and the mitigation through burial suggests that EMF effects on fish and shellfish ecology will be **not significant**.

Operational Noise

- 12.1.8.29 During the operational phase of a wind farm, noise is principally generated by the turbine's gear boxes and transferred into the water and sediment through the towers and foundations. Sound emissions during this period are expected to be in the low-frequency range. Detailed information on the likely effects of operational noise on fish and shellfish is limited to date, it is however generally accepted that the effects of operational noise are restricted to masking of communication and orientation signals, rather than causing damage or consistent avoidance reactions. The implication of these will depend on the ecology and use that particular species make of the area of the three proposed wind farm sites and its vicinity and on the hearing ability of different species.
- 12.1.8.30 The assessment of operational noise has assumed the maximum number of turbines. It should be noted that there is a lack of species / species group specific knowledge on the effects of operational noise to allow for sensitivities and receptors being described. The assessment has therefore been based on a literature review of current knowledge on the subject and on indirect evidence derived from the results of monitoring programmes carried out in operational wind farms.
- 12.1.8.31 On the basis of a detailed literature review it is considered that operational noise for the Project as a whole will have an effect of **minor significance** on Fish and Shellfish species in general.

Changes to Fishing Activity

- 12.1.8.32 Changes to fishing activity as a result of the installation of the three proposed wind farm sites could potentially affect fish and shellfish species. Primarily this would be species commercially targeted and / or caught as by-catch, although a wider range of organisms may also be affected due to changes in seabed communities associated to seabed disturbance.

- 12.1.8.33 A reduction in fishing activity in the three proposed wind farm sites may have some benefits to seabed communities, this could, in turn, benefit fish and shellfish species, provided the productivity of the area increases. In addition, target and by-catch species would be positively affected through a direct decrease in fishing mortality on a site specific basis. The potential displacement of fishing into other sensitive areas should however be recognised.
- 12.1.8.34 A fishing exclusion zone of 50 m will be established around each turbine, and fishing activity may continue in the sites during the operational phase, although a reduction in the level of activity may occur. The degree to which fishing may be reduced in the wind farm sites and the areas where fishing efforts may be potentially displaced are however currently unknown. As noted above, fish and shellfish receptors may benefit as a result of a reduction in fishing activity, however, for a net benefit to occur fishing activity should not be displaced to equally or more productive / sensitive areas. Whilst the potential for changes to fishing activity to have an effect on fish and shellfish receptors is recognised, given the numerous uncertainties to this respect (e.g. actual degree of fishing reduction and areas where fishing effort may be displaced) it is not possible for a meaningful assessment to be made. On the basis that fishing will continue to be possible in the wind farms during the operational phase, it is however not expected that a significant effect (above minor) associated to this may occur.
- 12.1.8.35 No significant additive effects on changes to fishing activity are predicted from the three proposed wind farms and OfTI on the whole Project assessment for commercial fisheries described in 12.1.13 below.

Summary

- 12.1.8.36 Table 12.1-7 below summarises the results of whole Project assessment. The results presented in the table reflect Project impacts prior to mitigation being implemented.

Table 12.1-7 Fish and Shellfish Ecology Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Temporary Disturbance to the Seabed.	Fish and Shellfish (including adult and juvenile and diadromous species)	Minor significance	Minor Significance	Minor significance
	Herring	Minor significance	Minor significance	Minor significance
	Sandeels	Minor significance	Minor significance	Minor significance
Underwater Noise	Salmon and Sea Trout	Minor-Moderate significance	Minor significance	Minor-Moderate significance
	Cod	Moderate-Major significance	Minor significance	Moderate-Major significance
	Herring	Moderate significance	Minor significance	Moderate significance
	Plaice	Minor significance	Not significant	Minor significance
	Whiting	Minor significance	Minor significance	Minor significance
	Larvae and Glass Eel	Minor significance	Minor significance	Minor significance
	Shellfish Species	Minor significance	Minor significance	Minor significance

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Operation				
Loss of Habitat	Fish and Shellfish in General	Not Significant	Not Significant	Not Significant
	Spawning Herring	Minor significance	Not Significant	Minor significance
	Sandeels	Minor significance	Not Significant	Minor significance
Introduction of New Habitat	Fish and Shellfish in General	Minor significance	Not Significant	Minor significance
	Edible Crab	Minor significance	Not Significant	Minor significance
EMFs	Elasmobranchs	Minor significance	Minor significance	Minor significance
	River and Sea Lamprey	Minor significance	Minor significance	Minor significance
	Salmon and Sea Trout	Minor significance	Minor significance	Minor significance
	European eel	Minor significance	Minor significance	Minor significance
	Larvae and Glass Eel	Minor significance	Minor significance	Minor significance
	Shellfish Species	Minor significance	Minor significance	Minor significance
Operational Noise	All (General)	Minor significance	N / A	Minor significance
	Cod	Minor significance	N / A	Minor significance
Changes to Fishing Activity	General (All)	Below Moderate	Below Moderate	Below Moderate

Proposed Mitigation and Residual Impacts

12.1.8.37 Table 12.1-8 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 7.2 and 10.2 (Fish and Shellfish Ecology). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-8 Fish and Shellfish Ecology Residual Impact Assessment Summary

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Temporary Disturbance to the Seabed.	Fish and Shellfish (including adult and juvenile and diadromous species)	Minor significance	Minor Significance	Minor significance
	Herring	Minor significance	Minor significance	Minor significance
	Sandeels	Minor significance	Minor significance	Minor significance
Underwater Noise	Salmon and Sea Trout	Minor significance	Minor significance	Minor significance
	Cod	Minor significance	Minor significance	Minor significance
	Herring	Minor significance	Minor significance	Minor significance
	Plaice	Minor significance	Not significant	Minor significance
	Whiting	Minor significance	Minor significance	Minor significance
	Other Fish Species	Minor significance	Minor significance	Minor significance
	Shellfish Species	Minor significance	Minor significance	Minor significance

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Operation				
Loss of Habitat	Fish and Shellfish in General	Not Significant	Not Significant	Not Significant
	Spawning Herring	Minor significance	Not Significant	Minor significance
	Sandeels	Minor significance	Not Significant	Minor significance
Introduction of New Habitat	Fish and Shellfish in General	Minor significance	Not Significant	Minor significance
	Edible Crab	Minor significance	Not Significant	Minor significance
EMFs	Elasmobranchs	Minor significance	Minor significance	Minor significance
	River and Sea Lamprey	Minor significance	Minor significance	Minor significance
	Salmon and Sea Trout	Minor significance	Minor significance	Minor significance
	European eel	Minor significance	Minor significance	Minor significance
	Other Fish Species	Minor significance	Minor significance	Minor significance
	Shellfish Species	Minor significance	Minor significance	Minor significance
Operational Noise	All (General)	Minor significance	N / A	Minor significance
	Cod	Minor significance	N / A	Minor significance
Changes to Fishing Activity	General (All)	Below Moderate	Below Moderate	Below Moderate

12.1.9 Marine Mammals Impact Assessment

Construction & Decommissioning

Hearing Damage and Disturbance / Displacement

- 12.1.9.1 It is considered that the greatest effect on marine mammals during construction will be from increased levels of underwater anthropogenic noise. Effects from increased noise levels can be divided into two broad categories: disturbance/ displacement and physical injury (i.e. hearing damage).
- 12.1.9.2 The results of the SPEAR modelling study showed that the primary source of noise during construction (and therefore exerting the greatest potential effect on marine mammals) will be from piling.
- 12.1.9.3 Detailed noise modelling was carried out for the three proposed wind farms (using a 2.5 m pile diameter) for three construction scenarios and for the OSPs (using a 3 m pile diameter). The piling activity associated with the installation of the wind turbines is considerably larger than for the OSPs (1,356 piles for the wind turbines and 128 piles for the OSPs in the worst case scenario).
- 12.1.9.4 The majority of the OSPs are likely to be installed within the same time frame of the wind turbines and it is suggested that any effects from the installation of these piles will be incorporated into the effects of piling turbine foundations, without increasing the predicted effects of either event.

Collision Risk

- 12.1.9.5 The precise number and type of vessels to be used during construction is yet to be confirmed, but as reported in Chapters 8.2 and 11.2 (Shipping and Navigation), it was concluded that any vessel traffic would be slow moving in a predictable manner (along a predefined corridor). No significant additive effects are predicted for collision risk between the three proposed wind farms and the TI.
- 12.1.9.6 No significant additive effects are also predicted on seals from the use of ducted propellers. As mentioned in Chapter 7.3 and 10.3 (Marine Mammals), although the construction port has yet to be identified for the three proposed wind farms and TI, much of the vessel movement will be offshore and within pre-defined vessel corridors. The greatest use of ducted propellers for dynamic positioning is likely to be within the construction area, over 55 km (30 nm) away from haul-out sites within the inner Firth (including the harbour seal SAC). Within the wind farm construction sites (where the OSPs will also be located), the construction associated noise would act as a self-mitigating deterrent, with the noise encouraging seals to keep away from the area and therefore reducing opportunities for harm. The cable route is also over 30 nm of the inner Firth, and therefore the risk remains **minor**.

Reduction in Prey Due to Noise from Construction Activities

- 12.1.9.7 This indirect effect on marine mammals relates to changes in prey availability (fish) due to noise from construction activities. As described above, the majority of the OSPs are likely to be installed within the same time frame of the wind turbines. Any effects on fish from the installation of the OSPs (piling of foundations) will be incorporated into the effects of piling turbine foundations, without increasing the predicted effects of either event. Therefore, no additive effect is therefore predicted.

Reduction in Foraging Ability (From Increased Suspended Sediment)

- 12.1.9.8 Increases in turbidity (suspended sediment) as a result of construction activities could affect foraging or social interactions of marine mammals. Chapters 6.2 and 9.2 (Sedimentary and Coastal Processes for the three proposed wind farms and TI respectively) consider the effect construction activities have on local sedimentary processes. Increased suspended sediment concentration is predicted to be of minor significance to mobile fish species and no significant additive effects are predicted to secondary effects on marine mammals.

Operation

Disturbance / Displacement

- 12.1.9.9 This disturbance / displacement assessment relates to operating noise from turbines and therefore no additive effects are considered for the three proposed wind farms and TI.

Long Term Changes in Prey Availability

- 12.1.9.10 This indirect effect on marine mammals relates to changes in prey availability due to habitat loss from the placement of wind turbine and OSPs foundations. No significant additive effects are predicted given the small footprint of the OSPs foundations (eight OSPs) when compared with the wind turbines foundations (339 turbines).

Collision Risk

- 12.1.9.11 No significant additive effects are predicted due to operational collision risk from the three proposed wind farms and TI. As described in Chapter 10.3 (Marine Mammals), the vessel program is yet to be decided, but it was considered that maintenance traffic of the generation station would be unlikely to represent a significant increase above existing vessel traffic within the Firth. It is likely that the maintenance of the OSPs would constitute only a small part of the increase in vessel traffic.

Stranding Due to Electromagnetic Fields

- 12.1.9.12 The primary effect relating to cables during the operational phase of the developments will be disturbance from EMF.
- 12.1.9.13 Information on the influence of EMF on marine mammals is very limited, with much of the available evidence concentrating on fish. There is no evidence to date suggesting a change (positive or negative) in cetacean activity related to magnetic fields from cables used for transmitting power from offshore wind farms. It is thought magnetic fields from cables are likely to be detected by cetaceans as a new localised addition to heterogeneous pattern of geomagnetic anomalies in the surrounding area. There are no indications in the literature that seals are sensitive to magnetic fields.
- 12.1.9.14 Where possible, export cables will be buried to a minimum target depth of 1 m. In areas where this is not possible, cables will be protected by a layer of rock or concrete. Therefore, cetaceans will not be directly exposed to any electromagnetic fields produced. Although unproven, it is thought unlikely that magnetic fields will affect cetaceans.
- 12.1.9.15 In conclusion, the effects of electromagnetic fields on marine mammals are uncertain and no significant additive effects from the three proposed wind farms and the TI are predicted.

Toxic Contamination

- 12.1.9.16 Leaching of compounds (in particular heavy metals) from sacrificial anodes or antifouling paints has the potential to contaminate marine mammals and their food supply. Given that such systems are likely to be present on most (if not all) shipping vessels already present within the Moray Firth and taking into account the tidal regime around the proposed development area (three proposed wind farm sites and TI), it is not considered there will be any detectable increase in metal concentrations within the Moray Firth should these systems be applied. No additive effects are therefore predicted.

Summary

- 12.1.9.17 Table 12.1-9 below summarises the results of whole Project assessment. The results presented in the table reflect Project effects prior to mitigation being implemented.

Table 12.1-9 Marine Mammals Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction				
Hearing Damage Disturbance / Displacement Collision Risk Reduction in Prey Sources Reduction in Foraging Ability	Harbour seal	No significant long term effect	No significant long term effect	Not significant
	Grey seal	No significant long term effect	No significant long term effect	Not significant
	Harbour porpoise	No significant long term effect	No significant long term effect	Not significant
	Bottlenose dolphin	No significant long term effect	No significant long term effect	Not significant
	Minke whale	No significant long term effect	No significant long term effect	Not significant
Operation				
Displacement/Disturbance Long Term Changes in Prey Availability Collision Risk Stranding Due to Electromagnetic Fields Toxic Contamination	Harbour seal	Not Significant	Not significant	Not Significant
	Grey seal	Not Significant	Not Significant	Not Significant
	Harbour porpoise	Not Significant	Not Significant	Not Significant
	Bottlenose dolphin	Not Significant	Not Significant	Not Significant
	Minke whale	Not Significant	Not Significant	Not Significant
Decommissioning				
Hearing Damage Disturbance / Displacement	Harbour seal	Not significant	Not significant	Not significant
	Grey seal	Not significant	Not significant	Not significant
	Harbour porpoise	Not significant	Not significant	Not significant
	Minke whale	Not significant	Not significant	Not significant

Proposed Mitigation and Residual Effects

12.1.9.18 Primary mitigation during construction will include adherence to the Joint Nature Conservation Committee (JNCC) protocol for minimising the risk of injury to marine mammals from piling noise. Currently, this protocol involves the use of marine mammal observers and 'soft start' piling procedures. All effects are residual effects that could occur assuming these, or future, best practice guidelines are implemented. In addition, to minimise the risk of collision with vessels involved in the construction, operation and decommissioning of the wind farms, all vessels will operate within designated routes, ensuring predictable vessel movement.

12.1.9.19 The effect significance of the residual effects is as detailed above in Table 12.1-9 for the pre-mitigation impact assessment summary.

12.1.10 Ornithology Impact Assessment

Construction & Decommissioning

Disturbance

12.1.10.1 During construction and decommissioning, effects are predicted to be limited to disturbance (arising from turbines, OSPs, cable installation / removal and associated vessel traffic) and the indirect effects on prey species. These are expected to be of short-term duration and reversible.

12.1.10.2 No additive effects are predicted between the three proposed wind farms and the TI as disturbance is limited to the area of activity, assessed as wind farm area (three proposed wind farms) and offshore export cable route.

Operation

Disturbance / Displacement

12.1.10.3 There is potential for disturbance effects to continue into the operation phase due to operation / maintenance activities. As for the construction and decommissioning, no additive effects are predicted for the three proposed wind farms and OfTI.

12.1.10.4 Displacement affects bird populations by denying them access to a habitat on a long-term basis, as a result of the presence of structures having an impact on prey distribution / abundance. The effect that displacement has on a population depends on the species' dependence on specific habitats and the availability of viable alternatives to the area from which the birds have been displaced. Given the relatively small footprint of the OfTI (limited to the eight OSPs), the effects on all ornithological receptors are predicted to be negligible and therefore, no additive displacement effects are considered from the TI for the three proposed wind farms.

Collision Risk

12.1.10.5 There is the potential for birds flying through the wind farms to collide with the rotating turbines, which would then be predicted to result in mortality. The assessment takes into account turbine parameters, number of turbines, the number of birds flying through the risk area, the species avoidance behaviour and flight speed and bird size.

12.1.10.6 No collision risk is predicted for the OfTI and therefore no additive effects from the offshore generating station and TI are predicted.

Barrier Effects

12.1.10.7 Barrier effects may arise when birds incur extra energetic costs as a result of avoiding a wind farm area. No additive effects for the OfTI are predicted given the small number of OSPs.

Summary

12.1.10.8 Table 12.1-10 below summarises the results of Whole Project Assessment. The results presented in the table reflect Project effects prior to mitigation being implemented.

Table 12.1-10 Ornithology Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction/Decommissioning				
Disturbance	Pink-footed goose	Disturbance (direct and indirect) - no risk (certain). No significant effect predicted.	N / A	Not significant
	Greylag goose	Disturbance (direct and indirect) - no risk (certain). No significant effect predicted.	N / A	Not significant
	Fulmar	Disturbance (direct and indirect) - minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Gannet	Disturbance (direct and indirect) - minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Kittiwake	Disturbance (direct and indirect) - minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Herring gull	Disturbance (direct and indirect) - minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Great black-backed gull	Disturbance (direct and indirect) - minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Guillemot	Disturbance (direct and indirect) - minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Disturbance	Razorbill	Disturbance (direct and indirect) – minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Puffin	Disturbance (direct and indirect) – minor risk (certain; short-term, temporary). No significant effect predicted.	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Eider	N / A	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Long tailed duck	N / A	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Common scoter	N / A	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Velvet scoter	N / A	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Red throated diver	N / A	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant
	Great northern diver	N / A	Disturbance (direct and indirect) - minor risk (probable; short-term, temporary). No significant effect predicted.	Not significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Operation				
Disturbance / Displacement Collision Risk Barrier Effects	Pink-footed goose	Disturbance / displacement (direct and indirect) - no risk (certain). Collision - minor risk (probable; medium-term, temporary). Barrier effects - minor risk (probable; medium-term, temporary). No significant effect predicted.	N / A	Not significant
	Greylag goose	Disturbance / displacement (direct and indirect) - no risk (certain). Collision - minor risk (probable; medium-term, temporary). Barrier effects - minor risk (probable; medium-term, temporary). No significant effect predicted.	N / A	Not significant
	Fulmar	Disturbance / displacement (direct and indirect) - minor risk (certain; medium-term, temporary). Collision – negligible risk (certain; medium-term, temporary). Barrier effects – minor risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis - < 0.1 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Gannet	Disturbance / displacement (direct and indirect) – minor risk (certain; medium-term, temporary). Collision – moderate risk (probable; medium-term, temporary). Barrier effects – minor risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis – < 5 % increase in likelihood of 20 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Disturbance / Displacement Collision Risk Barrier Effects	Kittiwake	Disturbance / displacement (direct and indirect) – minor risk (certain; medium-term, temporary). Collision – minor risk (probable; medium-term, temporary). Barrier effects – minor risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis - < 1 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Herring gull	Disturbance / displacement (direct and indirect) – minor risk (certain; medium-term, temporary). Collision – moderate risk (probable; medium-term, temporary). Barrier effects – negligible risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis - 10 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Great black-backed gull	Disturbance / displacement (direct and indirect) – minor risk (certain; medium-term, temporary). Collision – minor risk (certain; medium-term, temporary). Barrier effects – negligible risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis – < 1 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Guillemot	Disturbance / displacement (direct and indirect) – minor risk (certain; medium-term, temporary). Collision – negligible risk (certain). Barrier effects – minor risk (certain; medium-term, temporary). No significant effect predicted (based on PVA analysis - < 0.1 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Disturbance / Displacement Collision Risk Barrier Effects	Razorbill	Disturbance / displacement (direct and indirect) – minor risk (probable; medium-term, temporary). Collision – negligible risk (certain). Barrier effects – minor risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis - < 0.1 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Puffin	Disturbance / displacement (direct and indirect) – minor risk (certain; medium-term, temporary). Collision – negligible risk (certain). Barrier effects – minor risk (probable; medium-term, temporary). No significant effect predicted (based on PVA analysis - < 0.1 % increase in likelihood of 10 % population reduction).	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Eider	N / A	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Long tailed duck	N / A	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Common scoter	N / A	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Velvet scoter	N / A	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Disturbance / Displacement Collision Risk Barrier Effects	Red throated diver	N / A	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant
	Great northern diver	N / A	Disturbance (direct and indirect) – minor risk (certain; medium-term, temporary). No significant effect predicted.	Not significant

Proposed Mitigation and Residual Effects

12.1.10.9 Primary mitigation includes best-practice in terms of setting standard wind farm vessel corridors in order to minimise any potential disturbance. Operational monitoring requirements will be agreed with regulators and Statutory Nature Conservation Agencies (SNCA's).

12.1.10.10 The effect significance of the residual effects is as detailed above in Table 12.1-10 for the pre-mitigation impact assessment summary.

12.1.11 Intertidal Ecology Impact Assessment

12.1.11.1 Assessment of likely significant effects on intertidal ecology has been undertaken in relation to the installation, operation and decommissioning of the offshore export cable at the landfall location at Fraserburgh Beach. Offshore wind farm installation, operation and decommissioning will have no effect on intertidal ecology.

12.1.11.2 The following effects were assessed as being of no significance to intertidal ecological receptors including habitats and species:

- Temporary direct intertidal habitat disturbance;
- Temporary indirect (sediment) disturbance; and
- Heating and EMF effects.

12.1.12 Terrestrial Ecology Impact Assessment

12.1.12.1 Assessment of likely significant effects on terrestrial ecology has been undertaken in relation to the installation, operation and decommissioning of the onshore transmission infrastructure between the Fraserburgh Beach landfall and the onshore substation(s) location. Offshore wind farm installation, operation and decommissioning will have no effect on terrestrial ecology.

12.1.12.2 The impact assessment was carried out on all valued ecological receptors (VERs), standard mitigation was proposed and the following residual effects were found to be of only negligible-minor significance:

- Effects on Loch of Strathbeg SPA and SSSI qualifying species from habitat loss and disturbance / displacement;
- Effects on breeding and wintering coastal and terrestrial birds from habitat loss and disturbance / displacement;

- Effects on habitats and conservation designated sites from pollution, damage and disturbance;
- Effects on otter and badger from habitat loss and disturbance/ displacement; and
- Effects from damage to bat habitat.

12.1.13 **Commercial Fisheries Impact Assessment**

12.1.13.1 Commercial fishing is defined as any legal fishing activity undertaken for declared taxable profit. This chapter summarises the assessment of the potential effects on commercial fishing from the construction, operation and decommissioning of the three proposed wind farm sites and transmission infrastructure. Effects on fish and shellfish species, including salmon and sea trout, are considered in **Error! Reference source not found.** in this chapter.

Construction

12.1.13.2 The assessment of effects has identified significant effects during the construction phase, principally arising from the temporary loss or restricted access to fishing grounds within the three proposed wind farm sites and along the OfTI route during the construction phase, and the associated displacement of vessels during this time. In addition, the potential for conflict between static gear and construction vessels has identified a significant effect, although the implementation of the construction management programme would result in a residual impact during the construction phase of negative and minor.

12.1.13.3 In addition to the 500 m safety zones around major construction works, it is likely that all installed infrastructure, including turbines, offshore substation platforms (OSPs) and met masts will have 50 m safety zones applied around them during construction. It is not considered, however, that the inter array or export cables will have the same safety zones and the risks associated with fishing in the immediate vicinity of this infrastructure during the construction phase are considered to be outside of acceptable limits. This would result in vessels being excluded from these areas. The residual effect upon commercial fishing activities would be a moderate loss of fishing grounds during the construction phase.

12.1.13.4 A construction management programme will be produced and it should be noted that one of the purposes of this is to ensure that the effects described are kept within the significance levels ascribed in this ES throughout both the construction and operational phases of the development.

12.1.13.5 There are no additional effects expected beyond or in addition to those detailed in Chapters 8.1 and 11.1 (Commercial Fisheries). Pre and post- mitigation effects of the proposals are summarised in Table 12.1-11 and Table 12.1-12 below respectively.

Operation

12.1.13.6 As described in the commercial fisheries baseline chapter (Chapter 5.1, and supported in Technical Appendix 5.1 A: Commercial Fisheries Technical Report), the three proposed wind farm sites are principally located on scallop grounds, and to a lesser extent squid grounds. There is a very low level of whitefish activity. The site records moderate levels of fishing activity compared to grounds elsewhere in the Moray Firth, and relatively low levels of activity on a national scale. In addition, the OfTI cable passes through areas fished with static gear en route to the landfall at Fraserburgh.

- 12.1.13.7 It is likely that 50 m safety zones will apply to all fully installed turbines, OSPs and met masts. Outside of these zones it is considered that vessels will regain access to fishing grounds in the operational wind farm and along the OfTI route once the appropriate post-construction surveys, and if necessary seabed rectification measures, have been undertaken and the safety risk is considered to fall within acceptable limits. The degree to which access is regained is however dependent upon the final design of the three proposed wind farms and the resulting changes to normal fishing practices. The level of effect arising from complete loss or restricted access to fishing grounds in the operational phase therefore remains at moderate within the three proposed wind farm sites.
- 12.1.13.8 Along the OfTI route, the effect of the loss or restricted access to fishing grounds in the operational phase will be reduced to negative and minor, as a result of the post construction and installation surveys and, if necessary, seabed rectification measures to ensure that fishing activities can safely resume.
- 12.1.13.9 There are no additional effects expected beyond or in addition to those detailed in Chapters 8.1 and 11.1 (Commercial Fisheries). Pre-mitigation effects of the proposals are summarised in Table 12.1-11 below.

Table 12.1-11 Commercial Fisheries Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Complete Loss or Restricted Access to Traditional Fishing Grounds	Commercial fisheries	Moderate adverse – scallop fishery Moderate adverse – squid fishery Minor adverse – whitefish fishery	Minor adverse for scallop, squid and whitefish fisheries Moderate adverse - nephrops and crab and lobster fisheries	Moderate adverse – scallop, squid, nephrops and crab and lobster fisheries Minor adverse – whitefish fishery
Safety Issues for Fishing Vessels	Commercial fisheries	Acceptable for turbines, met masts and gravity base OSPs installed during the construction phase, providing 50 m safety zones are applied Outside of acceptable limits for inter array cables	Application of safety zones for unfinished and completed OSPs to ensure risks are within acceptable limits Outside of acceptable limits for inter platform and export cables	Acceptable for turbines, met masts and gravity base OSPs installed during the construction phase, providing 50 m safety zones are applied Outside of acceptable limits for inter array cables
Increased Steaming Times to Fishing Grounds	Commercial fisheries	Minor adverse	Minor adverse	Minor adverse

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Displacement of Fishing Vessels into Other Areas	Commercial fisheries	Moderate adverse – scallop fishery Moderate adverse – squid fishery Minor adverse – whitefish fishery	Minor adverse - scallop, squid and whitefish fisheries Moderate adverse - nephrops and crab and lobster fisheries	Moderate adverse – scallop, squid, nephrops and crab and lobster fisheries Minor adverse – whitefish fishery
Interference with Fishing Activities	Commercial fisheries	Minor adverse – all fisheries except crab and lobster fishery Moderate adverse - crab and lobster fishery	Minor adverse	Minor adverse – all fisheries except crab and lobster fishery Moderate – crab and lobster fishery
Temporary Disturbance to Seabed	Salmon and sea trout	Minor adverse	Minor adverse	Minor adverse
Noise	Salmon and sea trout	Minor – Moderate adverse	Minor adverse	Minor – moderate adverse
Operation				
Complete Loss or Restricted Access to Traditional Fishing Grounds	Commercial fisheries	Moderate– scallop fishery Moderate – squid fishery Minor – whitefish fishery	Minor-all fisheries	Moderate – scallop and squid fisheries Minor – nephrops, and whitefish fisheries
Safety Issues for Fishing Vessels	Commercial fisheries	Acceptable for fully installed turbines, met masts and gravity base OSPs, providing 50 m safety zones are applied Within acceptable limits for inter array cables provided appropriate post installation measures are completed	Application of safety zones for completed OSPs to ensure risks are within acceptable limits Acceptable for installed inter-platform and export cables	Acceptable for fully installed turbines, met masts and gravity base OSPs, providing 50 m safety zones are applied Within acceptable limits for inter array and export cables provided appropriate post installation measures are completed

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Increased Steaming Times to Fishing Grounds	Commercial fisheries	Minor – all fisheries	Minor-all fisheries	Minor
Obstacles on the Seabed Post Construction	Commercial fisheries	Within acceptable limits	Within acceptable limits	Within acceptable limits provided appropriate post installation measures are completed
Displacement of Fishing Vessels into Other Areas	Commercial fisheries	Moderate– scallop fishery Moderate – squid fishery Minor – whitefish fishery	Minor-all fisheries	Moderate – scallop and squid fisheries Minor – nephrops and whitefish, fisheries
Interference with Fishing Activities	Commercial fisheries	Minor – all fisheries	Minor-all fisheries	Minor
Loss of Habitat	Salmon and sea trout	Minor	N / A	Minor
Introduction of new Habitat	Salmon and sea trout	Minor	N / A	Minor
EMFs	Salmon and sea trout	Minor	Minor	Minor
Operational Noise	Salmon and sea trout	Minor	N / A	Minor
Changes to Fishing Activity	Salmon and sea trout	Not significant	N / A	Not significant

Proposed Mitigation and Residual Impacts

- 12.1.13.10 MORL has undertaken a significant programme of early engagement with the fishing industry and is committed to continuing to explore and develop mitigation options in consultation with the industry. At the current time, MORL is proposing to undertake fishing trials using modified scallop dredge gear with a view to identifying enhancements to traditional scallop fishing practices that may be of benefit to both the developer and the scallop fleet.
- 12.1.13.11 MORL will continue to facilitate ongoing dialogue throughout the pre-construction, construction and operational phases of the development, which will continue to discuss the mitigation options under investigation, as well as defining the protocol for engagement during the construction and operation phases.
- 12.1.13.12 In general terms, the likely effects of the construction phase on fish and shellfish species have been assessed to be of **minor significance**. An exception to this is construction noise, which has been identified as having potential to result in **significant effects (above minor)** namely cod, herring, salmon and sea trout.

- 12.1.13.13 The impact assessment (Chapter 7.2: Fish and Shellfish Ecology) on these species has taken a precautionary approach, where conservative assumptions have had to be applied as a result of the uncertainty surrounding currently available information on the use that these species may make of the area of the three proposed wind farms during the construction phase.
- 12.1.13.14 In order to mitigate this uncertainty, MORL is committed, in consultation with Marine Scotland and the relevant fisheries stakeholders, to undertake additional survey work and monitoring with the objective of increasing the confidence in this impact assessment and identifying whether mitigation is required and, if so, to define feasible measures in order to reduce the significance of the likely effects.
- 12.1.13.15 Some surveys, such as the sandeel (a key prey species for other fish species) survey were undertaken in consultation with Marine Scotland pre-application during their optimal survey periods the results of which are included in Chapter 7.2 (Fish and Shellfish Ecology). Due to the seasonal nature of these surveys, MORL expects that specific surveys and monitoring will be defined and implemented at the appropriate time of year in consultation with Marine Scotland and other stakeholders.
- 12.1.13.16 There are no additional effects expected beyond or in addition to those detailed in Chapters 8.1 and 11.1 (Commercial Fisheries). Post mitigation effects of the proposals are summarised in Table 12.1-12 below.

Table 12.1-12 Commercial Fisheries Post-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Complete Loss or Restricted Access to Traditional Fishing Grounds	Commercial fisheries	Moderate – scallop fishery Moderate – squid fishery Minor – whitefish fishery	Minor for scallop, squid and whitefish fisheries Moderate-nephrops and crab and lobster fisheries	Moderate – scallop, squid, nephrops and crab and lobster fisheries Minor – whitefish fishery
Safety Issues for Fishing Vessels	Commercial fisheries	Within acceptable limits table	Within acceptable limits table	Acceptable for turbines, met masts and gravity base OSPs installed during the construction phase, providing 50 m safety zones are applied Outside of acceptable limits for inter array cables
Increased Steaming Times to Fishing Grounds	Commercial fisheries	Minor – all fisheries	Minor-all fisheries	Minor
Displacement of Fishing Vessels into Other Areas	Commercial fisheries	Moderate– scallop fishery Moderate – squid fishery Minor – whitefish fishery	Minor for scallop, squid and whitefish fisheries Moderate-nephrops and crab and lobster fisheries	Moderate – scallop, squid, nephrops and crab and lobster fisheries Minor – whitefish fishery
Interference with Fishing Activities	Commercial fisheries	Minor – all fisheries	Minor-all fisheries	Minor
Temporary Disturbance to Seabed	Salmon and sea trout	Minor	Minor	Minor
Noise	Salmon and sea trout	Minor-moderate	Minor	Minor-moderate

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Operation				
Complete Loss or Restricted Access to Traditional Fishing Grounds	Commercial fisheries	Moderate– scallop fishery, could be reduced through the gear modification trials Moderate – squid fishery Minor – whitefish fishery.	Minor - all fisheries	Moderate – scallop and squid fisheries Minor – nephrops, and whitefish fisheries
Safety Issues for Fishing Vessels	Commercial fisheries	Within acceptable limits table	Within acceptable limits table	Acceptable for fully installed turbines, met masts and gravity base OSPs, providing 50 m safety zones are applied Within acceptable limits for inter array and export cables provided appropriate post installation measures are completed
Increased Steaming Times to Fishing Grounds	Commercial fisheries	Minor – all fisheries	Minor - all fisheries	Minor
Obstacles on the Seabed Post Construction	Commercial fisheries	Within acceptable limits	Within acceptable limits	Within acceptable limits provided appropriate post installation measures are completed
Displacement of Fishing Vessels into Other Areas	Commercial fisheries	Moderate– scallop fishery, could be reduced through the gear modification trials Moderate – squid fishery Minor – whitefish fishery.	Minor-all fisheries	Moderate – scallop and squid fisheries Minor – nephrops and whitefish, fisheries
Interference with Fishing Activities	Commercial fisheries	Minor – all fisheries	Minor-all fisheries	Minor
Loss of Habitat	Salmon and sea trout	Minor	N / A	Minor

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Introduction of New Habitat	Salmon and sea trout	Minor	N / A	Minor
EMFs	Salmon and sea trout	Minor	Minor	Minor
Operational Noise	Salmon and sea trout	Minor	N / A	Minor
Changes to Fishing Activity	Salmon and sea trout	Not significant	N / A	Not significant

12.1.14 Shipping and Navigation Impact Assessment

Construction & Decommissioning

Collision Risk and Re-Routing

12.1.14.1 There is a relatively low level of commercial shipping activity and recreational vessels in the three proposed wind farm sites, in the vicinity of the OSPs and along the export cable route, with a denser volume of traffic transiting to the east of the developments. However, given the available sea room, commercial, recreational and fishing vessels should be able to re-route and increase passing distance from installation vessels and associated works leading to a direct negative **minor effect** on shipping and navigation during construction and decommissioning, as expected in both impact assessment chapters.

Operation

Collision Risk and Re-Routing of Vessels

12.1.14.2 The proposed sites and OfTI are located in an area of relatively low commercial shipping densities with the main ship route passing at a mean distance of 4 nm north east of the Telford site boundary (the Pentland Firth route). Vessels passing through the proposed sites should be able pre-plan any revised passages in advance of encountering the wind farms and OfTI and there is available sea room to re-route around turbines, resulting in a probable minor negative effect on commercial shipping voyage distance and time.

12.1.14.3 The change in collision frequency in the presence of the three proposed sites was estimated to be small, (given the low baseline risk in the area), supporting a conclusion of a low (**minor**) negative effect on commercial shipping and collision risk and a probability of unlikely to occur. The presence of the OfTI infrastructure does not alter this.

12.1.14.4 Fishing vessels were recorded within the MacColl and Stevenson wind farm areas. The worst case fishing vessel to wind farm or OfTI structure collision risk has been identified as one every 16 years for Scenario 1, which reflects the maximum target area and fishing continuing in the area. However, based on the sizes of fishing vessel recorded, vessels should be able to navigate within the wind farm and OSP areas, and assuming industry standard mitigation (including liaison and information promulgation) a probable minor negative effect is predicted from a navigation perspective. The export cable will have no additional effect.

12.1.14.5 There was limited recreational vessel activity recorded within the proposed sites during the baseline maritime surveys. Recreational routing is dependent upon sea and weather conditions, therefore routing through the wind farms and OSPs is not expected to be a frequent event. Overall the effect on recreational vessel routing is probable, but given the low levels of activity and assuming industry standard mitigation (including minimum blade clearance) is expected to be **minor**. There will be no effect along the export cable route beyond the location of the OSPs.

Search and Rescue Operations

12.1.14.6 In terms of Search and Rescue (SAR) issues, given the relatively low level of incidents in the vicinity of the proposed sites it is considered unlikely that the proposed wind farms and OfTI will exacerbate maritime safety risks. Giving account to commitments to meet the MCA MGN 371 guidance and the development of an Emergency Response Cooperation Plan (ERCoP), it is considered that SAR issues can be well managed, resulting in a minor effect that is unlikely to occur.

12.1.14.7 The effect on SAR helicopter operations and access will be **minor** and unlikely to occur, based on MGN 371 compliance and development of an ERCoP.

Shipborne Navigation

12.1.14.8 Radar interference on marine equipment could be experienced by a small number of commercial vessels (including those routing to Wick) and offshore vessels (associated with Beatrice and Jacky platforms). However, based on the revised routing, interference is predicted to be low. Vessels inbound and outbound from ports in the area are likely to be attentive to navigational hazards, therefore it was concluded that the combined effect of the wind farms and the OfTI on marine radar systems will be likely to occur but of minor effect. The OfTI will have a negligible effect on shipborne navigational equipment.

Additional Effects of OfTI

12.1.14.9 In addition to the combined effects described above, the OfTI will have a direct negative effect of **minor significance**, post-mitigation measures, on the following shipping and navigation receptors:

- Commercial and small vessel anchoring and snagging risk; and
- The risk of fishing vessel gear interaction and snagging during the operational phase.

12.1.14.10 There is a chartered anchorage within Fraserburgh Beach. Provided industry standard mitigation (cable burial / protection) and surveys to monitor burial depth are carried out, the direct effect on commercial ship anchoring is considered to be **minor**.

12.1.14.11 Pre-mitigation, (i.e. without cable protection) the direct risk of fishing vessels snagging gear north of the Southern Trench along the export cable route was considered to be **moderate**, given demersal trawling and scallop dredging was recorded in the area. However, provided appropriate mitigation is put in place with cable protection / burial and liaison with the fishing industry, the residual negative effect on fishing vessels are considered to be **minor**.

Summary

12.1.14.12 Table 12.1-13 below summarises the results of Whole Project Assessment. The results presented in the table reflect Project effects prior to mitigation being implemented.

Table 12.1-13 Shipping and Navigation Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Risk of Ship to Ship Collision	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
	Fishing vessels	Minor adverse	Minor adverse	Minor adverse
	Recreation vessels	Minor adverse	Minor adverse	Minor adverse
Re-Routing of Vessels	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
	Fishing vessels	Minor adverse	Minor adverse	Minor adverse
	Recreation vessels	Minor adverse	Minor adverse	Minor adverse
Operation				
Risk of Collision	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
Re-Routing of Vessels	Fishing vessels	Minor adverse	Minor adverse	Minor adverse
	Recreation vessels	Minor adverse	Minor adverse	Minor adverse
	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
Anchor Interaction	Commercial vessels	N / A	Minor adverse	Minor adverse
	Small/recreational vessels	N / A	Minor adverse	Minor adverse
Increase in Safety Risks or of Effect on SAR Operations	SAR operations	Minor adverse	Negligible	Minor adverse
	SAR helicopter operations	Minor adverse	Negligible	Minor adverse
Radar Interference	Marine radar systems	Minor adverse	Negligible	Minor adverse
Scallop Dredging Operability	Fishing vessels	Negligible	Moderate adverse	Moderate adverse

Proposed Mitigation and Residual Impacts

12.1.14.13 Table 12.1-14 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 8.2 and 11.2 (Shipping and Navigation). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-14 Shipping and Navigation Residual Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Risk of Ship to Ship Collision	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
Re-Routing of Vessels	Fishing vessels	Minor adverse	Minor adverse	Minor adverse
	Recreation vessels	Minor adverse	Minor adverse	Minor adverse
Operation				
Risk of Collision	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
Re-Routing of Vessels	Fishing vessels	Minor adverse	Minor adverse	Minor adverse
	Recreation vessels	Minor adverse	Minor adverse	Minor adverse
	Commercial shipping	Minor adverse	Minor adverse	Minor adverse
Anchor Interaction	Commercial vessels	N / A	Minor adverse	Minor adverse
	Small / recreational vessels	N / A	Minor adverse	Minor adverse
Increase in Safety Risks or of Effect on SAR Operations	SAR operations	Minor adverse	Negligible	Minor adverse
	SAR helicopter operations	Minor adverse	Negligible	Minor adverse
Radar Interference	Marine radar systems	Minor adverse	Negligible	Minor adverse
Scallop Dredging Operability	Fishing vessels	Negligible	Minor adverse	Minor adverse

12.1.15 **Military and Civil Aviation Impact Assessment**

- 12.1.15.1 A desk-top study has been undertaken using comprehensive aviation documentation and charts to complete the impact assessment on the effects of the three proposed wind farm sites and transmission infrastructure during the construction, operation and decommissioning phases of the development. Information supporting the assessment is drawn from a review of data contained within the UK Integrated Aeronautical Information Publication (UK IAIP) and the Military Aeronautical Information Publication (Mil AIP) and consultation with helicopter operators and NATS En Route Plc.
- 12.1.15.2 Radar performance and propagation modelling has been undertaken to determine the likely detection of proposed turbines from the region's civil and military radar infrastructure, the results of which can be found in Technical Appendix 5.3 C.

Construction

- 12.1.15.3 In the absence of mitigation, construction of the three proposed wind farm sites is predicted to have significant effects on:
- Helicopter main routes (HMR X-Ray used by helicopters transiting between Aberdeen, via Wick to the Atlantic Rim offshore installations west of the Shetland Islands);
 - Helicopter operations to offshore installations; and
 - Minimum Safe Altitude (MSA) (the lowest altitude set in areas to ensure separation between aircraft and known obstacles).
- 12.1.15.4 All the significant effects will arise as a result of the construction of the wind farms and the transmission infrastructure will have no additional effect on any of the military or civil aviation receptors.

Operation

- 12.1.15.5 As for the construction period, all significant operational effects upon military and civil aviation receptors will arise as a result of the wind farms and the transmission infrastructure will have no additional effect.
- 12.1.15.6 At a maximum height of 70 m (230 ft) above Lowest Astronomical Tide (LAT), the OSPs will be lower in height than the projected turbines for the three proposed wind farms. Additionally, subsea and underground cabling and the onshore substation will not affect aviation operations. In conclusion, it is identified that the proposed infrastructure will not pose a physical obstruction to routine aviation operations in the area and consequently the Transmission Infrastructure (TI) will not pose any negative obstruction effect on aviation activities.
- 12.1.15.7 In addition, the static nature of both the OfTI and OnTI will have no effect on the identified Aviation Stakeholders Primary Surveillance Radar (PSR) systems. PSR systems can distinguish between moving and static targets: the echoes received from a moving target change in electrical phase between pulses; the Doppler shift. Signal processing techniques within such systems will differentiate between moving and static targets, with the static targets not shown on Air Navigation Service Provider displays.

12.1.15.8 Without mitigation significant effects from the wind farms are predicted on:

- NERL Allanshill Primary Surveillance Radar (PSR) supporting Civil Air Traffic Control (ATC) and en-route operations;
- MoD Air Surveillance and Control Systems (ASACS) – Buchan Air Defence Radar (ADR) supporting UK Air Defence operations and training;
- MoD ATC – Lossiemouth PSR used to provide navigational services to aircraft inbound to and outbound from the airfield, to military aircraft operating over the Moray Firth;
- Helicopter Approach Procedures to offshore platforms; and
- Minimum Safe Altitude which is the lowest altitude set in areas to ensure separation between aircraft and known obstacles.

12.1.15.9 No additional combined effects from the whole Project are predicted.

Summary

12.1.15.10 Table 12.1-15 below summarises the results of whole Project assessment. The results presented in the table reflect Project effects prior to mitigation being implemented.

Table 12.1-15 Military and Civil Aviation Pre Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Radar Clutter and Shielding	NERL Allanshill PSR	Not Significant	Not Significant	Not Significant
	ASACS Buchan ADR	Not Significant	Not Significant	Not Significant
	RAF Lossiemouth PSR	Not Significant	Not Significant	Not Significant
Alteration of Minimum Safe Altitude (MSA)	Wick Airport	Not Significant	Not Significant	Not Significant
Physical Obstruction	HMR X-Ray	Significant Construction infrastructure may present a physical obstruction hazard	Not Significant	Significant
	Offshore Installations	Significant Construction infrastructure may present a physical obstruction hazard to aircraft operating in the area of the three developments.	Not Significant	Significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Alteration of MSA	Minimum Safe Altitude	Significant Construction infrastructure may present a physical obstruction hazard to aircraft operating in the area of the three developments.	Not Significant	Significant
Operation				
Radar Clutter and Shielding	NERL Allanshill PSR	Significant PSR systems can be affected by the presence of wind turbines. These turbines can degrade the efficiency of the air traffic control radar service being provided in the region of the three proposed wind farm sites.	Not Significant	Significant
	ASACS Buchan ADR	Significant Turbines in coverage of the Buchan PSR could shield the radar from genuine aircraft targets and/or hide genuine aircraft targets from the ASACS controller. Any of these effects would affect the controller's ability to provide a safe service to aircraft and use the radar data to monitor the UK air picture.	Not Significant	Significant
	RAF Lossiemouth PSR	Significant PSR systems can be affected by the presence of wind turbines. These turbines can degrade the efficiency of the air traffic control radar service being provided in the region of the three proposed wind farm sites.	Not Significant	Significant

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Alteration of Minimum Safe Altitude (MSA)	Wick Airport	Not Significant	Not Significant	Not Significant
Physical Obstruction	HMR X-Ray	Not Significant While there may be an effect due to the inability to use HMR X-Ray in icing conditions due to the presence of turbines, an overland HMR is already used and would be available	Not Significant	Not Significant
	Offshore Installations	Significant Analysis in Technical Appendix 5.3 B (worst case scenario – Wick meteorological data) indicates that, with no mitigations applied, the net effect of the three proposed developments would be to prevent approximately eight flights per annum to the Beatrice field, over and above the six flights prevented by existing constraints. (Total flights per annum - approximately 260 flights).	Not Significant	Significant
Alteration of MSA	Minimum Safe Altitude	Significant Construction infrastructure may present a physical obstruction hazard to aircraft operating in the area of the three developments.	Not Significant	Significant

Proposed Mitigation and Residual Impacts

12.1.15.11 Table 12.1-16 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 8.3 and 11.3 (Military and Civil Aviation). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-16 Military and Civil Aviation Residual Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Radar Clutter and Shielding	NERL Allanshill PSR	Not significant	Not significant	Not significant
	ASACS Buchan ADR	Not significant	Not significant	Not significant
	RAF Lossiemouth PSR	Not significant	Not significant	Not significant
Alteration of Minimum Safe Altitude (MSA)	Wick Airport	Not significant	Not significant	Not significant
Physical Obstruction	HMR X-Ray	Not significant	Not significant	Not significant
	Offshore Installations	Not significant	Not significant	Not significant
Alteration of MSA	Minimum Safe Altitude	Not significant	Not significant	Not significant
Operation				
Radar Clutter and Shielding	NERL Allanshill PSR	Not significant	Not significant	Not significant
	ASACS Buchan ADR	Not significant	Not significant	Not significant
	RAF Lossiemouth PSR	Not significant	Not significant	Not significant
Alteration of Minimum Safe Altitude (MSA)	Wick Airport	Not significant	Not significant	Not significant
Physical Obstruction	HMR X-Ray	Not significant	Not significant	Not significant
	Offshore Installations	Not significant	Not significant	Not significant
Alteration of MSA	Minimum Safe Altitude	Not significant	Not significant	Not significant

12.1.16 Seascape, Landscape and Visual Receptors Impact Assessment

12.1.16.1 The Seascape, Landscape and Visual Impact Assessment (SLVIA) has been undertaken to determine the likely significant effects of the Telford, Stevenson and MacColl wind farms together with the offshore transmission infrastructure on the study area (Figure 5.4-1, Volume 7) during construction, operation and decommissioning. The assessment is based on the 'worst case' Rochdale Envelope scenario (Scenario 4 C, as described in Chapter 8.4: Seascape, Landscape and Visual Receptors, which has the largest turbine height (7 MW, 204 m blade tip) at the densest 5D x 7D spacing throughout the Telford, Stevenson and MacColl sites. Furthermore, it assumes that the substructure design will be a jacket type and that eight offshore substation platforms (OSP) will be

distributed within or close to the wind farm sites with an OSP close to the site boundaries nearest Caithness and Moray. Following construction, the OSPs will be the only visible aspect of the OfTI, and the onshore substation(s) located near Peterhead Power Station will be the only visible aspects of the OnTI.

- 12.1.16.2 The assessment assumes clear weather and optimum viewing conditions. Met Office visibility frequency data suggests that the area benefits from good visibility conditions, but that visibility frequency drops sharply at longer distances, such that visibility over 25 km occurs for a limited amount of time. The prevailing visibility and weather conditions combine to reduce the duration and significance of effects of the three proposed wind farm sites to relatively limited periods where views of the three proposed wind farm sites are available. 'Excellent' visibility will be required to see the three proposed wind farm sites from the Moray and Aberdeenshire coastline, at distances over 40 km, which occurs infrequently.
- 12.1.16.3 The effects of the OnTI are assessed in Chapter 11.4 (Seascape, Landscape and Visual Receptors). Given the distance between the three proposed wind farm sites and visible OfTI aspects (assessed together in Chapter 8.4, and with the OnTI in Chapter 11.4), there are no additional or exacerbated effects predicted on any receptors from the whole Project. The whole Project assessment is therefore as detailed in Tables 8.4-4 to 8.4-9 (Chapter 8.4: Seascape, Landscape and Visual Receptors) and the OnTI aspects are addressed in Chapter 11.4 (SLVIA). The likely effects are also summarised below.
- 12.1.16.4 The effect of the three proposed wind farm sites and OfTI is assessed as **not significant** on landscape / seascape character. Two national seascape units are located within the study area, covering the North Aberdeenshire / Moray Coast and the East Caithness and Sutherland coast, which are both assessed as having a medium-low sensitivity to change. The seascape / landscape assessment has identified that the magnitude of change of the proposed development will be medium, and not significant, on the Coastal Character Areas (CCAs) between Wick and Berriedale; low, and not significant, on the CCAs to the north of Wick; and medium-low, and not significant, on the CCAs to the south of Berriedale. The landscape elements of these CCAs will not be physically altered; changes arise principally through visibility, which may indirectly change the way in which the pattern of elements is perceived. The proposed development will introduce distant offshore wind farm development as a characteristic element on the open sea skyline of these CCAs, but the existing key characteristics of these CCAs will continue to provide their defining characteristics. The effects of the three proposed wind farm sites and OfTI is assessed as **not significant** on the landscape designations within the study area, including Gardens and Designed Landscapes (GDs) and proposed Special Landscape Areas (pSLAs) all of which are located over 34 km from the three proposed wind farm sites.
- 12.1.16.5 The viewpoint assessment has identified **significant effects** on seven viewpoints located in the closest section of Caithness between Wick and Dunbeath. These viewpoints are located at distances of 22 to 34 km from the three proposed wind farm sites. In good visibility conditions, the threshold at which significant effects diminish is assessed in the region of 30 to 35 km, depending on the specific characteristics of the view. Significant visual effects arise from the closest locations of the Caithness coast as a result of the three proposed wind farm sites and OfTI appearing to occupy a significant portion of the sea skyline, where it forms a wide horizontal feature in relation to the seascape in the view, in combination with the vertical effect of the turbines being notable due to the

absence of any intervening features or landform between the viewpoints on the coastal edge and the development located in open sea. The assessment assumes clear weather and optimum viewing conditions. This means that effects that are assessed to be significant may be not significant under different, less clear conditions. The viewpoint assessment has identified that the effect of the three proposed wind farm sites will be not significant on the remaining viewpoints in Caithness to the north of Wick and to the south of Berriedale. In these views, the three proposed wind farm sites and OfTI will be more distant from the coast and located on the skyline within a part of the broad, open sea views. Generally set apart from the visible landform of the coast, the three proposed wind farm sites and OfTI will form a single, distinct feature in their own right on the skyline, surrounded by open sea.

- 12.1.16.6 The majority of the study area for the OnTI (Figure 5.4-8, Volume 7), will be affected only temporarily by the changes arising during construction of the onshore export cable, however, there may also be limited long term effects that arise as a result of the operation of the substation(s) and where losses of vegetation such as trees and hedgerows cannot be mitigated. Effects of the OnTI will be further addressed in the subsequent Town & Country Planning application to Aberdeenshire Council.

12.1.17 Archaeology and Visual Receptors Impact Assessment

Construction & Decommissioning

Offshore

Net Reduction of Seabed Area

- 12.1.17.1 The loss of cultural heritage assets of low - high sensitivity which are located within the footprint of the offshore wind farms and offshore transmission infrastructure will result in impacts of up to major significance when assessed together as part of the whole Project.

Temporary Seabed Disturbances and Re-Distribution of Fine Sediments

- 12.1.17.2 There is the potential for alterations in sediment transport regimes to have an indirect effect on cultural heritage assets identified in the assessment. The effects of the three proposed wind farms on tidal and sediment transport regimes have been assessed and will fall within the range of natural variability. Therefore any indirect effects on cultural heritage assets are considered to be not significant. The effects of the export cable burial is of a magnitude potentially in excess of the natural range of variability. However, the effects will be localised and temporary. The indirect effect on assets is therefore considered to be of minor significance. In sum, the effects of the Project as a whole will not be of greater than **minor significance**.

Onshore

Physical Effects

- 12.1.17.3 Assets of prehistoric or Early Historic date are likely to be of local or regional importance and hence of low to medium sensitivity to physical effects. Given the size of the construction footprint and the general small size of such assets, it may be assumed that they will either be removed completely or substantially damaged where they lie within the construction footprint. Depending on the

sensitivity of the asset affected, this will result in an adverse effect of up to **major significance**. Assets of later date are likely to be of local or lesser importance and hence of low or negligible sensitivity. A substantial part of any such asset is likely to be removed, resulting in an effect of medium or major magnitude. Should this occur the effect is likely to be of **minor significance**.

Operation

Offshore

Physical Effects

12.1.17.4 Offshore maintenance activity (For example: involving vessel anchoring) may result in physical effects on cultural heritage assets. Assets that may be impacted include several of high sensitivity and therefore the potential effect will be of up to **major significance**.

Changes in Hydrodynamics and Sedimentary Regime

12.1.17.5 The potential for indirect effects of the three proposed wind farms and transmission infrastructure on cultural heritage assets through change in hydrodynamics and alterations in sedimentary regimes is **not** considered to be **significant**, since any changes will fall within the natural range of variability.

Effects on Setting of Onshore Receptors

12.1.17.6 Potential indirect 'setting' effects of the offshore structures (wind turbines, met mast and OSPs) on a number of onshore cultural heritage assets are assessed. Project effects are all assessed as being **not significant**, or **no effect** is predicted.

Onshore

Effects on Setting of Onshore Receptors

12.1.17.7 The location of the substation(s) has yet to be fixed, but an option area to the west of Boddam is being considered. Existing modern development will screen the substation(s) from relevant designated assets in Boddam and consequently there is no potential for significant setting effects.

Summary

12.1.17.8 Table 12.1-17 below summarises the results of whole Project assessment. The results presented in the table reflect Project impacts prior to mitigation being implemented.

Table 12.1-17 Archaeology Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Net Reduction of Seabed Area	Recorded offshore assets (e.g. known wrecks)	Major adverse	Major adverse	Major adverse
	Offshore sites of medium/high archaeological potential (based on geophysical survey data)	Moderate-major adverse	Moderate-major adverse	Moderate-major adverse
	Unrecorded offshore cultural assets	Unknown – up to major adverse	Unknown – up to major adverse	Unknown – up to major adverse
Temporary Seabed Disturbances and Re-Distribution of Fine Sediments	All offshore cultural heritage assets	Negligible	Negligible	Negligible
Physical Effects on Onshore Assets	Onshore cultural heritage assets	N / A	Up to major adverse	Up to major adverse
Operation				
Physical Effects	All offshore cultural heritage assets	Unknown – up to major adverse	Unknown – up to major adverse	Unknown – up to major adverse
Changes in Hydrodynamics and Sedimentary Regime	All offshore cultural heritage assets	Negligible	Negligible	Negligible
Effects on Setting of Onshore Receptors	Onshore cultural heritage assets	Negligible	No effect	Negligible

Proposed Mitigation and Residual Impacts

12.1.17.9 Table 12.1-18 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 8.5 and 11.5 (Archaeology and Visual Receptors). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-18 Archaeology Residual Impact Assessment Summary

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Net Reduction of Seabed Area	Recorded offshore assets (e.g. known wrecks)	Negligible	Negligible	Negligible
	Offshore sites of medium/high archaeological potential (based on geophysical survey data)	Negligible	Negligible	Negligible
	Unrecorded offshore assets	Negligible	Negligible	Negligible
Temporary Seabed Disturbances and Re-Distribution of Fine Sediments	All offshore cultural heritage assets	Negligible	Negligible	Negligible
Physical Effects on Onshore Assets	Onshore cultural heritage assets	N / A	No effect	No effect
Operation				
Physical Effects	All offshore cultural heritage assets	Negligible	Negligible	Negligible
Changes in Hydrodynamics and Sedimentary Regime	All offshore cultural heritage assets	Negligible	Negligible	Negligible
Effects on Setting of Onshore Receptors	Onshore cultural heritage assets	Negligible	No effect	Negligible

12.1.18 Socio-economics, Recreation and Tourism Impact Assessment

Construction & Decommissioning

Employment

- 12.1.18.1 Employment has been estimated by dividing the anticipated expenditure by the ratio of output to employment, for each of the categories of expenditure, using the ratios that best fit the type of activity. Separate assessments have been carried out for the three proposed wind farms and for the TI based on the projected spending associated with the projects (wind farms and TI). Table 12.1-19 below summarises the whole Project employment effects for the Base Case scenario.

Table 12.1-19 Employment Effects in Job Years (Base Case)

	Offshore Wind Farms		Transmission Infrastructure		Whole Project	
	Study Area	Scotland (including Study Area)	Study Area	Scotland (including Study Area)	Study Area	Scotland (including Study Area)
Construction	1,000	3,800	600	1,000	1,600	4,800

12.1.18.2 Despite the additive employment effects shown above, the overall effect significance will continue to remain **major positive**.

GVA

12.1.18.3 Gross Value Added (GVA) represents the difference between the value of goods and services produced and the cost of raw materials, from which is paid wages, salaries and profits.

12.1.18.4 Table 12.1-20 below presents the predicted GVA effects for the whole Project based on the projections made for the three proposed wind farms and TI.

Table 12.1-20 Construction Phase GVA Effects in £ Millions (2011 prices) for Base Case Scenario

	Offshore Wind Farms		Transmission Infrastructure		Whole Project	
	Study Area	Scotland (including Study Area)	Study Area	Scotland (including Study Area)	Study Area	Scotland (including Study Area)
Construction	70	245	43	67	113	312

12.1.18.5 Despite the additive GVA effects shown above, the overall effect significance will remain **major positive**.

Leisure Tourism

12.1.18.6 The effects of construction on tourism would result from changes in amenity through the modification of seascapes and the visual effect during construction. The second source of effect is the sensitivity of visitors attracted to watch the marine wildlife. This group will be sensitive to changes that reduce the opportunities to do this. This assessment is directly linked with the outputs of the Seascape, Landscape and Visual Receptors and Marine Mammals assessments.

12.1.18.7 The Seascape, Landscape and Visual impact assessment for the three proposed wind farms has been undertaken taking into account the OSPs (the only permanent OfTI structure that would be visible from onshore viewpoints). Therefore, additive effects are not relevant for the leisure tourism effects that draw its conclusions based on this assessment.

12.1.18.8 With regards to wildlife watching (bottlenose dolphins), no significant additive effects are predicted given the significantly smaller number piling activities, associated with the installation of the substructures for the TI when compared with the wind farms (as discussed in the marine mammals whole Project assessment previously).

- 12.1.18.9 The whole Project effect on leisure tourism is predicted to be of **minor, negative significance** as assessed for the three proposed wind farms.

Business Tourism

- 12.1.18.10 During the construction phase there is scope for increases in business tourism, particularly where there is new investment made within the study area. The sensitivity of business tourism within the study area will vary across the geography with some service providers' activities strongly affected (For example: hotels with facilities suitable for businesses that are located close to where there is new manufacturing, construction of installation activity is based). For other parts of the study area the effect may be much weaker.

- 12.1.18.11 No significant additive or synergetic effects are predicted on business tourism as the effects for the TI are considered negligible. The whole Project effect on business tourism is predicted to be of **minor, positive significance** as assessed for the three proposed wind farms (Chapter 8.6: Socio-Economics, Recreation and Tourism).

Surfing and Sea Kayaking

- 12.1.18.12 An effect on surfing would occur if the construction work from the three proposed wind farms and OfTI affected the quality of the waves or had a significant visual effect and if those participating in the activity were sensitive to these changes. As mentioned in Chapters 6.1 and 9.1 (Hydrodynamics: Wave Climate and Tidal Regime), the effects on the wave climate are likely to be negligible for the three wind farms and for the OfTI. Therefore, no significant additive effects are predicted. **Negligible effects** are also predicted on sea kayaking from the construction of the three proposed wind farms and OfTI.

Walking

- 12.1.18.13 No additive effects are predicted on walking from the construction of the three proposed wind farms and OfTI as described in the Seascape, Landscape and Visual assessment for the whole Project as described above. The onshore construction activities for the OnTI are restricted to the onshore export cable route and therefore no additive or synergistic effects are considered.

Operation

Employment and GVA

- 12.1.18.14 The employment effects relate to the jobs associated with the operations and maintenance of the three proposed wind farms and TI. As mentioned in Chapter 11.6 (Socio-Economics, Recreation and Tourism), it is difficult to separate the jobs associated with maintaining the three proposed wind farms and the infrastructure and therefore the estimate for operations and maintenance employment and GVA for the TI have been included in the assessment of Offshore Generating Station (Chapter 8.6: Socio-Economics, Recreation and Tourism). Therefore, no additive effects to those detailed for the three proposed wind farms are considered to exist when the TI is also considered as the combined effect has already been assessed.

Leisure Tourism

12.1.18.15 The Seascape, Landscape and Visual impact assessment for the three proposed wind farms has been undertaken taking into account effects from the OSPs (the only permanent offshore structure that would be visible from onshore viewpoints). Therefore, additive effects are not relevant for the leisure tourism effects that draw its conclusions based on this assessment.

Business Tourism

12.1.18.16 During the operating phase there is less scope for increases in business tourism relative to the construction phase. Even so, the effect is likely to be positive rather than negative, given possible requirements for accommodation located close to the operations and maintenance facilities. During operation any related business tourism associated with the three proposed wind farms and TI would be modest and therefore assessed as **negligible**.

Surfing and Sea Kayaking

12.1.18.17 No significant effects are predicted on the wave quality from the three proposed wind farms and OfTI and therefore the effects on surfing and sea kayaking are predicted to be **negligible**.

Walking

12.1.18.18 The effects of recreational walking for the whole Project are associated with the assessment of the Seascape, Landscape and Visual impact assessment. No significant additive effects are predicted given the limited visual effects from the presence of the OSPs in the context of the three proposed wind farms (Chapter 8.4 Seascape, Landscape and Visual Receptors).

Summary

12.1.18.19 Table 12.1-21 below summarises the results of whole Project assessment. The results presented in the table reflect Project effects prior to mitigation being implemented.

Table 12.1-21 Socio-Economics, Tourism and Recreation Pre-Mitigation Impact Assessment Summary

Receptor	Effect Significance		Whole Project
	Offshore Wind Farms	Transmission Infrastructure	
Construction			
Employment	Major (+)	Major (+)	Major (+)
GVA	Major (+)	Major (+)	Major (+)
Leisure Tourism	Minor (-)	Negligible	Minor (-)
Business Tourism	Minor (+)	Negligible	Minor (+)
Surfing, Sea-Kayaking	Negligible	Minor (-)	Minor (-)
Walking	Negligible	Minor (-)	Minor (-)

Receptor	Effect Significance		Whole Project
	Offshore Wind Farms	Transmission Infrastructure	
Operation			
Employment	Major (+)	Minor (+)	Major (+)
GVA	Major (+)	Minor (+)	Major (+)
Leisure Tourism	Minor (-)	Negligible	Minor (-)
Business Tourism	Negligible	Negligible	Minor (+)
Surfing, Sea-Kayaking	Minor (-)	Negligible	Minor (-)
Walking	Minor (-)	Negligible	Minor (-)
Decommissioning			
Employment	Major (+)	Minor (+)	Major (+)
GVA	Major (+)	Minor (+)	Major (+)
Leisure Tourism	Minor (-)	Negligible	Minor (-)
Business Tourism	Negligible	Negligible	Negligible
Surfing, Sea-Kayaking	Negligible	Minor (-)	Minor (-)
Walking	Negligible	Minor (-)	Minor (-)

Proposed Mitigation and Residual Effects

12.1.18.20 As there are no significant negative effects identified in the assessment, there are no mitigation measures and the residual effects are as the assessment conclusions (as shown in Table 12.1-21 above).

12.1.19 Traffic and Transport Impact Assessment

12.1.19.1 Assessment of likely significant effects on traffic and transport has been undertaken in relation to the installation, operation and decommissioning of the onshore transmission infrastructure between the Fraserburgh Beach landfall and the onshore substation(s) location. Traffic and transport associated with the offshore wind farm installation, operation and decommissioning, while expected to be low, will be assessed by the relevant port authority once a port(s) is selected, and is not assessed in this ES.

12.1.19.2 The effects on traffic and transport that were assessed for the OnTI are listed below, and all effects were assessed to be of negligible significance once mitigation is taken into account:

- Increase in HGV movements;
- Impact on road safety;
- Vehicle delays due to increase in traffic;
- Pedestrian severance, delay and intimidation; and
- Degradation of highway structure.

12.1.20 Other Human Activities Impact Assessment

Construction & Decommissioning

Effects on Other Offshore Wind Farms

- 12.1.20.1 Project programmes indicate that it is possible that the BOWL and MORL projects would be constructed concurrently, though the pre-determined buffer between the two developments and ongoing sharing of information on planned Project activities would limit the potential for interaction between the sites and it considered unlikely that one developer would hinder the other. **No significant effect** is predicted to result from the Project as a whole.

Effects on Military Practice and Exercise Areas

- 12.1.20.2 Portions of the proposed Telford and MacColl wind farm sites and portions of the offshore transmission infrastructure lie within danger area D809 (South), which is used by the RAF for a variety of practice flying and firing exercises. There is the potential that the physical presence of vessels involved in construction could lead to temporary disruption or exclusion of military activity within D809. However, during consultation the Ministry of Defence (MoD) has not highlighted any concerns with regard to D809 and therefore both the sensitivity of the receptor and the magnitude of the combined effects are considered **negligible**.

Effects on Oil Operations and Structures

- 12.1.20.3 There is no existing or proposed oil infrastructure within the proposed wind farm sites. The MORL Project will not interfere in any way with existing oil infrastructure; and **no significant effect** is predicted from the Project as a whole.
- 12.1.20.4 Oil and gas licence blocks overlapping with areas of the wind farm sites and offshore transmission infrastructure have been awarded to several operators. Operators are yet to explore the potential of the licence blocks and their exploration plans are currently unknown. It is possible that the licence holders may wish to undertake seismic surveys within their licence blocks; if this is the case, survey activity would be excluded from construction locations (and the associated 500 m rolling safety zone) within the wind farm sites. With a low sensitivity (assuming there is a degree of flexibility in terms of when seismic survey is undertaken and a variety of survey techniques that may be employed) and negligible magnitude (exclusion would be temporary), the likely effect is considered to be of **minor adverse significance**.

Health and Safety Risk Due to Unexploded Ordnance

- 12.1.20.5 There is potential for UXO associated with historic and current military activity to be encountered on the seabed in the area of the wind farms and offshore transmission infrastructure. During construction, activities which will have contact with the seabed run the risk of disturbing UXO with potentially damaging and dangerous effects to both employees and equipment. As human life is at risk, receptor sensitivity is considered to be high. Effect magnitude is considered to be medium and the effect is of potentially **major adverse significance**. MORL are committed to a suite of standard industry measures to minimise risk from UXO, including a pre-construction UXO seabed survey, and the residual effect is therefore **not significant**.

Damage to Subsea Cables

- 12.1.20.6 The proposed wind farm sites do not overlap with any existing or proposed subsea cables and as such no effect is predicted. The proposed MORL export cables will need to cross an existing SHEFA-2 telecommunications cable, which may be damaged by installation activities. Damage to subsea cables is expensive to repair and can cause disruption to international telecommunications. As a result, the sensitivity of the receptor is considered to be high. The magnitude of the effect will be medium, given that the SHEFA cable will have to be crossed. The unmitigated effect is therefore considered to be of **moderate adverse significance**.

Operation

Effects on Other Offshore Wind Farms

- 12.1.20.7 Activity associated with the operation of the three wind farm sites and offshore transmission infrastructure will be significantly reduced relative to the construction / decommissioning phases. Monitoring and maintenance vessels will require access, with any exceptional maintenance activity likely to have a temporary 500 m exclusion zone imposed around the relevant structure. With a pre-determined buffer between the MORL and BOWL wind farm sites of at least 600 m, it is theoretically possible for there to be an overlap between a temporary exclusion zone close to the proposed MORL boundary with one close to the adjacent BOWL boundary, and vice versa. The potential for two such maintenance events occurring concurrently is considered extremely unlikely and in light of established and ongoing coordination of works by MORL and BOWL, **no significant effect** is predicted.

Effects on Military Practice and Exercise Areas

- 12.1.20.8 Although two of the proposed wind farm sites and portions of the offshore transmission infrastructure overlap with a military PEXA, no concerns have been raised by the MoD during consultation with MORL. **No significant effect** is anticipated.

Effects on Oil Operations and Structures

- 12.1.20.9 As explained above, the intentions of current oil and gas block licence holders are currently unknown. Should licence holders seek to commence block exploration once the wind farms are operational, it is expected that activities such as seismic survey will be spatially restricted by the presence of turbines with safety zones and inter-array cabling. With a medium sensitivity and magnitude, the potential effect is deemed to be of **moderate adverse significance**. Should licence holders seek to commence block exploration once the offshore transmission infrastructure is operational, it is expected that activities such as seismic survey will be spatially restricted over a relatively small area by the presence of OSPs and export cabling. With a low sensitivity and magnitude, the potential effect is deemed to be of **minor adverse significance**.

Health and Safety Risk Due to Unexploded Ordnance

- 12.1.20.10 The natural processes of the sea, including tidal action, seabed conditions, movement of sand waves, wave action and bad weather all contribute to the movement of objects on the seabed. Human activities such as seabed trawling,

will also contribute to the movement of objects, and as such, there is a risk of UXO moving into the MORL wind farm sites and transmission infrastructure footprint. This will have implications for maintenance and repair activities but the risk is expected to be limited as UXO will have previously been identified during pre-construction surveys. Therefore, **no significant effect** is predicted.

Damage to Subsea Cables

12.1.20.11 The proposed wind farm sites do not overlap with any existing or proposed subsea cables and as such no significant effect is predicted.

12.1.20.12 During the operational phase, there is the potential for disturbance to subsea cables from maintenance activities, such as OSP foundation and cable repair work which could entail the use of jack-up vessels and the deployment of anchors. It is expected that any such activity will be subject to the same principles and agreements as established under construction. The likelihood for damage to existing cables during such maintenance work is therefore remote and consequently the magnitude of effect is considered to be low. Damage to submarine cables is expensive to repair and can cause disruption to telecommunications and therefore, the value and sensitivity will be high. As a result the potential effect will be of a **minor adverse significance**.

Summary

12.1.20.13 Table 12.1-22 below summarises the results of whole Project assessment. The results presented in the table reflect Project impacts prior to mitigation being implemented.

Table 12.1-22 Other Human Activities Pre-Mitigation Impact Assessment Summary

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Effects on Other Offshore Wind Farms	Offshore wind farm developers	Not significant	Not significant	Not significant
Effects on Military Practice and Exercise Areas	Military users	Not significant	Not significant	Not significant
Effects on Planned Oil Operations and Structures	Oil operators	Minor adverse	Not significant	Minor adverse
Damage to Subsea Cables	Subsea cable operators	N / A	Moderate adverse	Moderate adverse
Health and Safety Risk Due to Unexploded Ordnance	Offshore personnel	Major adverse	Major adverse	Major adverse

Effect	Receptor	Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Operation				
Effects on Other Offshore Wind Farms	Offshore wind farm developers	Not significant	Not significant	Not significant
Effects on Military Practice and Exercise Areas	Military users	Not significant	Not significant	Not significant
Effects on Planned Oil Operations and Structures	Oil operators	Moderate adverse	Minor adverse	Moderate adverse
Damage to Subsea Cables	Subsea cable operators	N / A	Minor adverse	Minor adverse
Health and Safety Risk Due to Unexploded Ordnance	Offshore personnel	Not significant	Not significant	Not significant

Proposed Mitigation and Residual Impacts

12.1.20.14 Table 12.1-23 below presents the predicted significance of residual effects associated with each component of the Project and the whole Project. The residual effects are those remaining following the implementation of mitigation measures presented in Chapters 8.7 and 11.8 (Other Human Activities). No additional mitigation measures are proposed to reduce whole Project effects.

Table 12.1-23 Other Human Activities Residual Impact Assessment Summary

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Construction & Decommissioning				
Effects on Other Offshore Wind Farms	Offshore wind farm developers	Not significant	Not significant	Not significant
Effects on Military Practice and Exercise Areas	Military users	Not significant	Not significant	Not significant
Effects on Planned Oil Operations and Structures	Oil operators	Minor adverse	Not significant	Minor adverse
Damage to Subsea Cables	Subsea cable operators	N / A	Not significant	Not significant

Effect	Receptor	Residual Effect Significance		Whole Project
		Offshore Wind Farms	Transmission Infrastructure	
Health and Safety Risk Due to Unexploded Ordnance	Offshore personnel	Not significant	Not significant	Not significant
Operation				
Effects on Other Offshore Wind Farms	Offshore wind farm developers	Not significant	Not significant	Not significant
Effects on Military Practice and Exercise Areas	Military users	Not significant	Not significant	Not significant
Effects on Planned Oil Operations and Structures	Oil operators	Moderate adverse	Minor adverse	Moderate adverse
Damage to Subsea Cables	Subsea cable operators	N / A	Not significant	Not significant
Health and Safety Risk Due to Unexploded Ordnance	Offshore personnel	Not significant	Not significant	Not significant

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12.2 Habitats Regulations Appraisal Summary

12.2.1 Introduction

- 12.2.1.1 This chapter summarises the information provided by MORL in support of HRA for the proposed Telford, Stevenson and MacColl offshore wind farms and the associated transmission infrastructure (TI). It considers the potential for the offshore generating stations (OGSs), offshore transmission infrastructure (OfTI) and onshore transmission infrastructure (OnTI) to have a significant effect on relevant sites of international nature conservation importance (Special Areas of Conservation [SACs] and Special Protection Areas [SPAs]) therefore providing the necessary information to enable the Competent Authority to carry out an Appropriate Assessment under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended) and the Offshore Marine Conservation (Natural Habitats & c.) Regulations 2007 (as amended). The Competent Authority for the Section 36 applications and marine licences for the wind farm sites and the OfTI is Marine Scotland, whilst the Competent Authority for the planning application for the OnTI is Aberdeenshire Council. Further information may be submitted to update this HRA summary in support of the planning application once the location and layout of the onshore substation(s) and the positioning of the export cable within the export cable route have been confirmed. It also provides the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH), as Statutory Nature Conservation Agencies (SNCAs), with the necessary information to offer advice on these matters to the Competent Authority.
- 12.2.1.2 MORL's approach to HRA is presented in Chapter 1.3 (Environmental Impact Assessment) of this ES and information on the designated sites considered is presented in Chapter 4.1 (Designated Sites). Designated sites relevant to HRA have been identified through the formal scoping process and subsequent consultation with regulatory authorities. A series of surveys and studies have been undertaken to inform both EIA and HRA. The potential for a significant effect to occur as a result of the Project (alone, in its component parts and as a whole, and in-combination with other projects and activities) has been assessed and the results of assessment are presented in the relevant chapters (e.g. effects on SACs with migratory fish designated features are considered in the Fish and Shellfish Ecology chapters, and effects on SPAs and their designated bird species are considered in the Ornithology chapters). Potential direct, indirect and cumulative effects are assessed against the integrity of the sites, which is based on their maintenance of Conservation Objectives (as obtained from the SNH sitelink website). This chapter is therefore intended simply to collate and summarise the residual outputs of more detailed assessments that are contained elsewhere within this ES.
- 12.2.1.3 This chapter summarises information that is presented in the following chapters (which are in turn supported by a number of technical appendices):
- Chapters 7.2, 10.2 and 14.2 (Fish and Shellfish Ecology) and Technical Appendices 4.3 A and 4.3 B;
 - Chapters 7.3, 10.3 and 14.3 (Marine Mammals) and Technical Appendix 7.2 G;
 - Chapters 7.4, 10.4 and 14.4 (Ornithology) and Technical Appendix 4.5 A; and
 - Chapters 10.6 and 14.6 (Terrestrial Ecology) and Technical Appendix 4.7 A.
- 12.2.1.4 The assessment of potential effects on designated sites has been undertaken by suitably qualified organisations / individuals, as shown in Table 12.2-1 below.

Table 12.2-1 Designated Site Assessment Contributors

Discipline	Company	Name / Qualification	Position
Ornithology	Natural Power	Dr. Chris Pendlebury (BSc, PhD)	Principal Ecologist
Marine Mammals	Natural Power	Dr. Nancy McLean (BSc, PhD)	Senior Development Manager
		Dr. Sarah Canning (BSc, PhD)	Marine Mammal Ecologist
	University of Aberdeen	Professor Paul Thompson (BSc, PhD, fellow of the Royal Society of Edinburgh)	Chair in Zoology
	Sea Mammal Research Unit Ltd / Scottish Oceans Institute	Dr. Gordon Hastie (BSc, PhD)	Senior Research Scientist
Fish and Shellfish	Brown and May Marine	Sara Xoubanova (BSc, MSc)	Marine Environmental Consultant

12.2.2 European Sites Potentially Affected by the Project

12.2.2.1 The potential for significant effects to arise has been assessed for those designated sites listed in Table 12.2-2 below.

Table 12.2-2 Designated Sites Considered in HRA

ES Topic	Designated sites subject to HRA
Fish and Shellfish Ecology	<ul style="list-style-type: none"> • Berriedale & Langwell Waters SAC • River Evelix SAC • River Moriston SAC • River Oykel SAC • River Spey • River Thurso SAC
Marine Mammals	<ul style="list-style-type: none"> • Moray Firth SAC • Dornoch Firth and Morrich More SAC

ES Topic	Designated sites subject to HRA
Ornithology	<ul style="list-style-type: none"> • East Caithness Cliffs SPA • North Caithness Cliffs SPA • Troup, Pennan and Lion's Heads SPA • Pentland Firth Islands SPA • Hoy SPA • Loch of Strathbeg SPA¹ • Copinsay SPA • Auskerry SPA • Rousay SPA • Calf of Eday SPA • West Westray SPA • Papa Westray SPA • Sule Skerry and Sule Stack SPA • Fair Isle SPA • North Rona and Sula Sgier SPA • Firth of Forth Islands SPA • Noss SPA • Hermaness, Saxa Vord and Vala Field SPA • St Kilda SPA • Rum SPA
Terrestrial Ecology	<ul style="list-style-type: none"> • Loch of Strathbeg SPA¹

12.2.2.2 In 12.2.3 below, the Project effects on relevant sites of international nature conservation importance (SACs and SPAs) are assessed. Cumulative effects with other projects and activities are presented in 12.2.4.

12.2.3 Assessment of Project Effects

Fish and Shellfish Ecology

12.2.3.1 The assessment of the effects of the three wind farms on each SAC considers the effects of the Project for each qualifying species on:

1. Deterioration of the habitats of the qualifying species;
2. Significant disturbance to the qualifying species;
3. Changes in the distribution of the species within the site; and
4. Changes in the distribution and extent of habitats supporting the species.

12.2.3.2 In addition, in the particular case of Atlantic salmon and freshwater pearl mussel SAC populations, the following criteria have also been taken into account for assessment:

5. Changes to the population of the species, including range of genetic types of salmon as a viable component of the site; and
6. Changes to the distribution of freshwater pearl mussel host species and to the structure, function and supporting processes of habitats supporting fresh water pearl mussel host species.

¹ Note that effects on the Loch of Strathbeg SPA are assessed under two ES disciplines. Effects associated with the 'offshore' components of the Project are considered under 'Ornithology' whilst effects associated with the 'onshore' component of the Project are considered under 'Terrestrial Ecology'.

12.2.3.3 Table 12.2-3 to Table 12.2-8 below summarise the findings of the assessment. Standard EIA terminology is used to define the significance of the effect.

12.2.3.4 The detailed information used to support the assessment can be found in the following locations:

- Chapters 7.2 and 10.2 (Fish and Shellfish Ecology); and
- Technical Appendices 4.3 A and 4.3 B (Fish and Shellfish Ecology & Salmon, Sea Trout and Fisheries Technical Reports respectively).

Table 12.2-3 Summary of Assessment of Effects on Berriedale & Langwell Waters SAC

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Atlantic Salmon	1	No effect	Negligible-minor significance
	2	Minor significance	Minor significance
	3	No effect	No effect
	4	No effect	Negligible-minor significance
	5	Minor significance	Negligible-minor significance

Summary of effects on SAC:

- The Project is located at a considerable distance from salmon SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project. Deterioration of non-SAC marine habitats utilised by Atlantic salmon could however occur as a result of effects on benthic habitats and changes in fishing activity;
- Atlantic salmon outside of the SAC boundaries may be subject to disturbance as a result of increased suspended sediment concentrations, sediment re-deposition, construction and operational noise, and electromagnetic field (EMF) emissions, with overall effects considered not significant; and
- Changes to the distribution and population of the species within / associated with the SAC are not expected.

Table 12.2-4 Summary of Assessment of Effects on River Evelix SAC

Designated Feature(s)	Criterion (1 to 4 & 6, see list above)	Construction & Decommissioning	Operation
Freshwater Pearl Mussel	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	6	No effect	No effect

Summary of effects on SAC:

- The Project is located at a considerable distance from freshwater pearl mussel SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project; and
- Given the distribution of freshwater pearl mussel (restricted to the freshwater habitat) there will be no direct disturbance of the species or changes in their distribution and population within the SAC.

Table 12.2-5 Summary of Assessment of Effects on River Moriston SAC

Designated Feature(s)	Criterion (1 to 6, see list above)	Construction & Decommissioning	Operation
Freshwater Pearl Mussel	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	6	No effect	No effect
Atlantic Salmon	1	No effect	Negligible-minor significance
	2	Minor significance	Minor significance
	3	No effect	No effect
	4	No effect	Negligible-minor significance
	5	Minor significance	Negligible-minor significance
<p>Summary of effects on SAC:</p> <ul style="list-style-type: none"> The Project is located at a considerable distance from salmon SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project. Deterioration of non-SAC marine habitats utilised by Atlantic salmon could however occur as a result of effects on benthic habitats and changes in fishing activity; Atlantic salmon outside of the SAC boundaries may be subject to disturbance as a result of increased suspended sediment concentrations, sediment re-deposition, construction and operational noise, and EMF emissions, with overall effects considered not significant; Changes to the distribution and population of the Atlantic salmon within / associated with the SAC are not expected; The Project is located at a considerable distance from freshwater pearl mussel SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project; and Given the distribution of freshwater pearl mussel (restricted to the freshwater habitat) there will be no direct disturbance of the species or changes in their distribution and population within the SAC. 			

Table 12.2-6 Summary of Assessment of Effects on River Oykel SAC

Designated Feature(s)	Criterion (1 to 6, see list above)	Construction & Decommissioning	Operation
Freshwater Pearl Mussel	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	6	No effect	No effect
Atlantic Salmon	1	No effect	Negligible-minor significance
	2	Minor significance	Minor significance
	3	No effect	No effect
	4	No effect	Negligible-minor significance
	5	Minor significance	Negligible-minor significance

Designated Feature(s)	Criterion (1 to 6, see list above)	Construction & Decommissioning	Operation
Summary of effects on SAC:			
<ul style="list-style-type: none"> The Project is located at a considerable distance from salmon SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project. Deterioration of non-SAC marine habitats utilised by Atlantic salmon could however occur as a result of effects on benthic habitats and changes in fishing activity; Atlantic salmon outside of the SAC boundaries may be subject to disturbance as a result of increased suspended sediment concentrations, sediment re-deposition, construction and operational noise, and EMF emissions, with overall effects considered not significant; Changes to the distribution and population of the Atlantic salmon within / associated with the SAC are not expected; The Project is located at a considerable distance from freshwater pearl mussel SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project; and Given the distribution of freshwater pearl mussel (restricted to the freshwater habitat) there will be no direct disturbance of the species of changes in their distribution and population within the SAC. 			

Table 12.2-7 Summary of Assessment of Effects on River Spey SAC

Designated Feature(s)	Criterion (1 to 6, see list above)	Construction & Decommissioning	Operation
Freshwater Pearl Mussel	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	6	No effect	No effect
Atlantic Salmon	1	No effect	Negligible-minor significance
	2	Minor significance	Minor significance
	3	No effect	No effect
	4	No effect	Negligible-minor significance
	5	Minor significance	Negligible-minor significance
Sea Lamprey	1	No effect	Minor significance
	2	Minor significance	Minor significance
	3	No effect	No effect
	4	No effect	Minor significance
Summary of effects on SAC:			
<ul style="list-style-type: none"> The Project is located at a considerable distance from salmon and sea lamprey SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project. Deterioration of non-SAC marine habitats utilised by Atlantic salmon and sea lamprey could however occur as a result of effects on benthic habitats and changes in fishing activity; Atlantic salmon and sea lamprey outside of the SAC boundaries may be subject to disturbance as a result of increased suspended sediment concentrations, sediment re-deposition, construction and operational noise, and EMF emissions, with overall effects considered not significant; Changes to the distribution and population of Atlantic salmon and sea lamprey within / associated with the SAC are not expected; The Project is located at a considerable distance from freshwater pearl mussel SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project; and Given the distribution of freshwater pearl mussel (restricted to the freshwater habitat) there will be no direct disturbance of the species of changes in their distribution and population within the SAC. 			

Table 12.2-8 Summary of Assessment of Effects on River Thurso SAC

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Atlantic Salmon	1	No effect	Negligible-minor significance
	2	Minor significance	Minor significance
	3	No effect	No effect
	4	No effect	Negligible-minor significance
	5	Minor significance	Negligible-minor significance

Summary of effects on SAC:

- The Project is located at a considerable distance from salmon SACs. SAC habitat will not be subject to any direct deterioration as a result of the Project. Deterioration of non-SAC marine habitats utilised by Atlantic salmon could however occur as a result of effects on benthic habitats and changes in fishing activity;
- Atlantic salmon outside of the SAC boundaries may be subject to disturbance as a result of increased suspended sediment concentrations, sediment re-deposition, construction and operational noise, and EMF emissions, with overall effects considered not significant; and
- Changes to the distribution and population of the species within / associated with the SAC are not expected.

Marine Mammals

12.2.3.5 The assessment of the effects of the Project on each SAC considers the effects of the Project, for each qualifying species, on:

1. Changes in the distribution or extent of the habitats supporting the species;
2. Changes in the structure, function and supporting processes of habitats supporting the species;
3. Significant disturbance to the qualifying species;
4. Changes in the distribution of the species within the site; and
5. The species being maintained as a viable component of the site in the long-term, and therefore the integrity of the site.

12.2.3.6 Table 12.2-9 and Table 12.2-10 below summarise the findings of the assessment. Terminology used is based on that suggested by the Intergovernmental Panel on Climate Change (IPCC) to define the significance of the effect.

12.2.3.7 The detailed information used to support the assessment can be found in the following locations:

- Chapters 7.3 and 10.3 (Marine Mammals); and
- Technical Appendix 7.2 G (Habitats Regulations Appraisal: Marine Mammals).

Table 12.2-9 Summary of Assessment of Effects on Moray Firth SAC

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Bottlenose Dolphin	1	Not significant	Not significant
	2	Not significant	Not significant
	3	Minor significance	Not significant
	4	Minor significance	Not significant
	5	Minor significance	Not significant

Summary of effects on SAC:

- The proposed Project does not overlap with the SAC. Bottlenose dolphins are primarily encountered within the coastal regions of the Firth and thus not expected to occur within the wind farm area;
- The primary disturbance to bottlenose dolphins from the proposed developments is considered to be increased underwater noise from piling during the construction phase;
- It is considered that any disturbance from piling noise on the bottlenose dolphin population will be likely but temporary in nature (i.e. only for the duration of the piling activities) and of minor significance in the long term;
- It is considered that changes in species distribution are unlikely and if they were to occur, would be temporary in nature (i.e. only for the duration of piling activities). The overall impact of piling noise on species distribution is considered to be of minor significance in the long term; and
- It is predicted that the long-term viability of the bottlenose dolphin population is robust and the potential effects from piling noise on the population as a viable component of the SAC are unlikely and of minor significance.

Table 12.2-10 Summary of Assessment of Effects on Dornoch Firth and Morrich More SAC

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Harbour Seal	1	Not significant	Not significant
	2	Not significant	Not significant
	3	Major significance (short term); Minor significance (long term)	Not significant
	4	Minor significance	Not significant
	5	Minor significance	Not significant

Summary of effects on SAC:

- The proposed Project does not overlap with the SAC, but do represent part of the harbour seal foraging range;
- Changes to habitat distribution and structure (either within the SAC or in preferred foraging areas within the Moray Firth) as a result of impacts on benthic habitats and fish species are considered to be unlikely and not significant for the Dornoch Firth and Morrich More SAC;
- The primary disturbance to harbour seals from the proposed developments is considered to be increased noise from piling during the construction phase;
- Given the distance between the proposed developments and haul-out sites within the SAC (> 50 km), disturbance to seals hauled-out are considered to be unlikely; and
- It is considered that harbour seals are likely experience major significant disturbance while foraging during the piling operations. This impact is not expected to extend for prolonged periods once piling temporarily ceased. The effects of this disturbance are considered to be temporary (i.e. the duration of piling activities) and of minor significance to the population long term.

Ornithology

12.2.3.8 Conservation objectives for Scottish SPAs are generic, and so the assessment of the effects of the Project on each SPA considers the effects of development, for each qualifying species, on:

1. Changes in the distribution or extent of the habitats supporting the species;
2. Changes in the structure, function and supporting processes of habitats supporting the species;
3. Significant disturbance to the qualifying species;
4. Changes in the distribution of the species within the sites; and
5. The species being maintained as a viable component of the sites in the long-term, and therefore the integrity of the sites.

12.2.3.9 Table 12.2-11 to Table 12.2-30 below summarises the findings of the assessment. Standard EIA terminology is used to define the significance of the effect.

12.2.3.10 The detailed information used to support the assessment can be found in the following locations:

- Chapters 7.4 and 10.4 (Ornithology); and
- Technical Appendix 4.5 A (Ornithology).

Table 12.2-11 Summary of Assessment of Effects on East Caithness Cliffs SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Shag	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Cormorant	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Peregrine	1	No effect	No effect
	2	No effect	No effect
	3	No effect	Negligible
	4	No effect	No effect
	5	No effect	No effect
Kittiwake	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Herring Gull	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Great Black-Backed Gull	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Guillemot	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Razorbill	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Puffin	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project ranges from negligible – minor significance for most SPA species with herring gull up to moderate; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-12 Summary of Assessment of Effects on North Caithness Cliffs SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Peregrine	1	No effect	No effect
	2	No effect	No effect
	3	No effect	Negligible significance
	4	No effect	No effect
	5	No effect	No effect
Kittiwake	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Guillemot	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Razorbill	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Puffin	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> • The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; • The risk of disturbance associated with the Project ranges from negligible – minor significance for all SPA species; and • The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-13 Summary of Assessment of Effects on Troup, Pennan and Lion's Head SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Kittiwake	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Herring Gull	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Guillemot	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Razorbill	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-14 Summary of Assessment of Effects on Pentland Firth Islands SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Arctic Tern	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by Arctic tern, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-15 Summary of Assessment of Effects on Hoy SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Great Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Arctic Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
 kittiwake	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Great Black-Backed Gull	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Guillemot	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Puffin	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-16 Summary of Assessment of Effects on Copinsay SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Kittiwake	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-17 Summary of Assessment of Effects on Loch of Strathbeg SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Pink-Footed Goose	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	5	No effect	Minor significance
Whooper Swan	1	No effect	No effect
	2	No effect	No effect
	3	No effect	No effect
	4	No effect	No effect
	5	No effect	Minor significance
Summary of effects on SPA:			
<ul style="list-style-type: none"> The proposed Project is predicted to have an effect of minor significance on the viability of the SPA species, based upon maximum collision rates. 			

Table 12.2-18 Summary of Assessment of Effects on Auskerry SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Arctic Tern	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Summary of effects on SPA:			
<ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by Arctic tern, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-19 Summary of Assessment of Effects on Calf of Eday SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by fulmar, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of fulmar within the SPA and no effect on the viability of SPA species. 			

Table 12.2-20 Summary of Assessment of Effects on Rousay SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Arctic Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Arctic Tern	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-21 Summary of Assessment of Effects West of Westray SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Fulmar	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Arctic Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Arctic Tern	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> • The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; • The risk of disturbance associated with the Project is of minor significance for all SPA species; and • The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-22 Summary of Assessment of Effects on Papa Westray SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Arctic Tern	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by Arctic tern, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-23 Summary of Assessment of Effects on Sule Skerry and Sule Stack SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Gannet	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by gannet, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of gannet within the SPA and no effect on the viability of SPA species. 			

Table 12.2-24 Summary of Assessment of Effects on Fair Isle SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Gannet	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
Arctic Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Arctic Tern	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-25 Summary of Assessment of Effects on North Rona and Sula Sgier SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Gannet	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by gannet, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; The Project will not have any effect upon the distribution of gannet within the SPA and no effect on the viability of SPA species. 			

Table 12.2-26 Summary of Assessment of Effects on Noss SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Gannet	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Great Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-27 Summary of Assessment of Effects on Firth of Forth Islands SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Gannet	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by gannet, and their prey species. Effects of minor significance; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of gannet within the SPA and no effect on the viability of SPA species. 			

Table 12.2-28 Summary of Assessment of Effects on Hermaness, Saxa Vord and Vala Field SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Gannet	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	Minor significance	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Great Skua	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by SPA species, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance for all SPA species; and The Project will not have any effect upon the distribution of species within the SPA and no effect on the viability of SPA species. 			

Table 12.2-29 Summary of Assessment of Effects on Rum SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Manx Shearwater	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by Manx shearwater, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of Manx shearwater within the SPA and no effect on the viability of SPA species. 			

Table 12.2-30 Summary of Assessment of Effects on St Kilda SPA

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Manx Shearwater	1	No effect	Negligible - minor significance
	2	Minor significance	Minor significance
	3	No effect	Minor significance
	4	No effect	No effect
	5	No effect	No effect

Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> The proposed Project has the potential to impact habitats used by Manx shearwater, and their prey species. Effects of minor significance are predicted; The risk of disturbance associated with the Project is of minor significance; and The Project will not have any effect upon the distribution of Manx shearwater within the SPA and no effect on the viability of SPA species. 			

Terrestrial Ecology

- 12.2.3.11 The assessment of the effects of the Project on each designated site considers the effects of the Project, for each qualifying feature, on:
- Changes in the population / distribution / extent of the qualifying species / habitats;
 - Changes in the distribution and extent of habitats supporting qualifying species;
 - Changes in the structure, function and supporting processes of qualifying habitats and habitats supporting qualifying species;
 - Significant disturbance to the qualifying habitats / species; and
 - Changes in the distribution of typical species as components of qualifying habitats.
- 12.2.3.12 Table 12.2-31 below summarise the findings of the assessment. Standard EIA terminology is used to define the significance of the effect.
- 12.2.3.13 The detailed information used to support the assessment can be found in the following locations:
- Chapter 10.6 (Terrestrial Ecology); and
 - Technical Appendix 4.7 A (Terrestrial Ecology Technical Report).

Table 12.2-31 Summary of Assessment of Effects on Loch of Strathbeg SPA

Relevant Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Pink-Footed Goose	1	Negligible significance	Negligible significance
	2	Negligible significance	Negligible significance
	3	Negligible significance	Negligible significance
	4	Negligible significance	Negligible significance
	5	Negligible significance	Negligible significance
Greylag Goose	1	Negligible significance	Negligible significance
	2	Negligible significance	Negligible significance
	3	Negligible significance	Negligible significance
	4	Negligible significance	Negligible significance

Relevant Designated Feature(s)	Criterion (1 to 5, see list above)	Construction & Decommissioning	Operation
Greylag Goose (continued)	5	Negligible significance	Negligible significance
Summary of effects on SPA:			
<ul style="list-style-type: none"> The proposed Project is predicted to have effects of negligible significance on the SPA species. 			

12.2.4 Assessment of Cumulative Effects

12.2.4.1 HRA must consider whether the Project is likely to have a significant effect on designated sites, either alone (assessment results presented in 12.2.2.2 above) or in combination with other projects and activities (presented here in 12.2.4).

12.2.4.2 The MORL ES has assessed cumulative effects on designated sites in the following chapters, and assessment results are summarised below:

- Chapter 14.2 (Fish and Shellfish Ecology);
- Chapter 14.3 (Marine Mammal);
- Chapter 14.4 (Ornithology); and
- Chapter 14.6 (Terrestrial Ecology).

Fish and Shellfish Ecology

12.2.4.3 Assessment of cumulative effects on six relevant designated sites has been undertaken. The effect of the Project in-combination with the following projects and activities has been considered:

- Proposed Beatrice Offshore Wind Farm (BOWL); and
- Proposed European Offshore Wind Deployment Centre (EOWDC).

12.2.4.4 Assessment is against the Conservation Objectives criteria listed in paragraph 12.2.3.1 and 12.2.3.2 above. Results are summarised in Table 12.2-32 to Table 12.2-37 below.

Table 12.2-32 Cumulative Effects on Berriedale & Langwell Waters SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Atlantic Salmon	1	Negligible-minor significance	Minor significance	No difference
	2	Minor significance	Minor significance	
	3	No effect	Minor significance	
	4	Negligible-minor significance	Minor significance	
	5	Negligible-minor significance	Minor significance	

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Summary of effects on SAC:				
<ul style="list-style-type: none"> Potential significant effects associated with disturbance of migrating salmon from piling noise, and potentially significant resulting changes in species distribution within the SAC. However, all residual effects are assessed as minor significance. 				

Table 12.2-33 Cumulative Effects on River Evelix SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Freshwater Pearl Mussel	1	No effect	Not significant	No difference
	2	No effect	Not significant	
	3	No effect	Not significant	
	4	No effect	Not significant	
	6	No effect	Minor significance	
Summary of effects on SAC:				
<ul style="list-style-type: none"> Potential significant indirect effects on freshwater pearl mussel as a result of the effects on their host species (i.e. salmon and sea trout). However, all residual effects are assessed as minor significance. 				

Table 12.2-34 Cumulative Effects on River Moriston SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Freshwater Pearl Mussel	1	No effect	Not significant	No difference
	2	No effect	Not significant	
	3	No effect	Not significant	
	4	No effect	Not significant	
	6	No effect	Minor significance	
Atlantic Salmon	1	Negligible-minor significance	Minor significance	No difference
	2	Minor significance	Minor significance	
	3	No effect	Minor significance	
	4	Negligible-minor significance	Minor significance	
	5	Negligible-minor significance	Minor significance	

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Summary of effects on SAC: <ul style="list-style-type: none"> • Potential significant effects associated with disturbance of migrating salmon from piling noise, and potentially significant resulting changes in species distribution within the SAC; • Potential significant indirect effects on freshwater pearl mussel as a result of the effects on their host species (i.e. salmon and sea trout) as identified above; and • All residual effects are assessed as minor significance. 				

Table 12.2-35 Cumulative Effects on River Oykel SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Freshwater Pearl Mussel	1	No effect	Not significant	No difference
	2	No effect	Not significant	
	3	No effect	Not significant	
	4	No effect	Not significant	
	6	No effect	Minor significance	
Atlantic Salmon	1	Negligible-minor significance	Minor significance	No difference
	2	Minor significance	Minor significance	
	3	No effect	Minor significance	
	4	Negligible-minor significance	Minor significance	
	5	Negligible-minor significance	Minor significance	
Summary of effects on SAC: <ul style="list-style-type: none"> • Potential significant effects associated with disturbance of migrating salmon from piling noise, and potentially significant resulting changes in species distribution within the SAC; • Potential significant indirect effects on freshwater pearl mussel as a result of the effects on their host species (i.e. salmon and sea trout) as identified above; and • All residual effects are assessed as minor significance. 				

Table 12.2-36 Cumulative Effects on River Spey SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Freshwater Pearl Mussel	1	No effect	Not significant	No difference
	2	No effect	Not significant	
	3	No effect	Not significant	
	4	No effect	Not significant	
	6	No effect	Minor significance	
Atlantic Salmon	1	Negligible-minor significance	Minor significance	No difference
	2	Minor significance	Minor significance	
	3	No effect	Minor significance	
	4	Negligible-minor significance	Minor significance	
	5	Negligible-minor significance	Minor significance	
Sea Lamprey	1	No effect	Minor significance	No difference
	2	Minor significance	Minor significance	
	3	No effect	Not significant	
	4	No effect	Minor significance	
<p>Summary of effects on SAC:</p> <ul style="list-style-type: none"> • Potential significant effects associated with disturbance of migrating salmon from piling noise, and potentially significant resulting changes in species distribution within the SAC; and • Potential significant indirect effects on freshwater pearl mussel as a result of the effects on their host species (i.e. salmon and sea trout) as identified above; and • All residual effects are assessed as minor significance. 				

Table 12.2-37 Cumulative Effects on River Thurso SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Atlantic Salmon	1	Negligible-minor significance	Minor significance	No difference
	2	Minor significance	Minor significance	
	3	No effect	Minor significance	
	4	Negligible-minor significance	Minor significance	
	5	Negligible-minor significance	Minor significance	

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Summary of effects on SAC:				
<ul style="list-style-type: none"> Potential significant effects associated with disturbance of migrating salmon from piling noise, and potentially significant resulting changes in species distribution within the SAC. However, residual effects are assessed as minor significance. 				

Marine Mammals

12.2.4.5 Detailed quantitative assessment of cumulative effects on two relevant designated sites has been undertaken. The effect of the Project in-combination with the following projects and activities has been considered:

- Proposed Beatrice Offshore Wind Farm.

12.2.4.6 Assessment is against the Conservation Objectives criteria listed in paragraph 12.2.3.5 above. Results are summarised in Table 12.2-38 & Table 12.2-39 below.

Table 12.2-38 Cumulative Effects on Moray Firth SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL)	Sensitivities associated with Telford, Stevenson and MacColl
Bottlenose Dolphin	1	Not significant	Not significant	No difference
	2	Not significant	Not significant	
	3	Minor significance	Moderate significance (medium term); Minor significance (long term)	
	4	Minor significance	Minor significance	
	5	Minor significance	Not significant	
Summary of effects on SAC:				
<ul style="list-style-type: none"> Predicted short-term effects of moderate significance associated with disturbance of bottlenose dolphin from piling noise. However, no long term effect on SAC integrity. 				

Table 12.2-39 Cumulative Effects on Dornoch Firth and Morrich More SAC

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL)	Sensitivities associated with Telford, Stevenson and MacColl
Harbour Seal	1	Not significant	Not significant	No difference
	2	Not significant	Not significant	
	3	Major significance (short term); Minor significance (long term)	Major significance (short term); Minor significance (long term)	
	4	Minor significance	Minor significance	
	5	Minor significance	Minor significance	

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL)	Sensitivities associated with Telford, Stevenson and MacColl
Summary of effects on SAC:				
<ul style="list-style-type: none"> Predicted short-term effects of major significance associated with disturbance of harbour seal from piling noise. However, no long term effect on SAC integrity. 				

Ornithology

12.2.4.7 Detailed assessment of cumulative effects on three relevant designated sites has been undertaken. The effect of the Project in-combination with the following projects and activities has been considered:

- Proposed Beatrice Offshore Wind Farm; and
- Proposed European Offshore Wind Deployment Centre.

12.2.4.8 Assessment is against the Conservation Objectives criteria listed in paragraph 12.2.3.8 above. Results are summarised in Table 12.2-40 to Table 12.2-42 below.

Table 12.2-40 Cumulative Effects on East Caithness Cliffs SPA

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Fulmar	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Shag	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Cormorant	1	No effect	Minor effect; not significant	No difference
	2	No effect		
	3	Negligible		
	4	No effect		
	5	No effect		

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Peregrine	1	No effect	Minor effect; not significant	No difference
	2	No effect		
	3	Negligible		
	4	No effect		
	5	No effect		
Kittiwake	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Herring Gull	1	Negligible to minor	Moderate-major effect; significant	Cumulative impact would still be moderate-major for any combination considered cumulatively with the BOWL wind farm
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Great Black-Backed Gull	1	Negligible to minor	Moderate-major effect; significant	Cumulative impact would still be moderate-major for any combination considered cumulatively with the BOWL wind farm
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Guillemot	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Razorbill	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Puffin	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
<p>Summary of effects on SPA:</p> <ul style="list-style-type: none"> Effect on SPA integrity due to prediction of increased mortality of herring gull and great black-backed gull arising cumulatively with BOWL wind farm. 				

Table 12.2-41 Cumulative Effects on North Caithness Cliffs SPA

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Fulmar	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Peregrine	1	No effect	Minor effect; not significant	No difference.
	2	No effect		
	3	Negligible		
	4	No effect		
	5	No effect		
Kittiwake	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Guillemot	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Razorbill	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Puffin	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Summary of effects on SPA:				
<ul style="list-style-type: none"> No effect on SPA integrity. 				

Table 12.2-42 Cumulative Effects on Troup, Pennan and Lion's Heads SPA

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Fulmar	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Kittiwake	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, BOWL, EOWDC)	Sensitivities associated with Telford, Stevenson and MacColl
Herring Gull	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Guillemot	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Razorbill	1	Negligible to minor	Minor effect; not significant	No difference
	2	Minor		
	3	Minor		
	4	No effect		
	5	No effect		
Summary of effects on SPA: <ul style="list-style-type: none"> No cumulative effect on SPA integrity. 				

Terrestrial Ecology

12.2.4.9 Assessment of cumulative effects on two relevant designated sites has been undertaken. The effect of the Project's onshore components (onshore cable routes and substation[s]) in-combination with the following projects and activities has been considered:

- Existing Peterhead Power Station; and
- Proposed wind farms / individual wind turbines at:
 - Overside and Greenwellheads Farms;
 - St Fergus Moss;
 - Ednie Farms;
 - Redbog Extension;
 - Middleton of Rora;
 - Mains of Inverugie;
 - Keith Inch and Green Hill;
 - Gallows Hill, Inverquhomery; and
 - Aldie Wind Farm.

12.2.4.10 Assessment is against the Conservation Objectives criteria listed in paragraph 12.2.3.11 above. Results are summarised in Table 12.2-43 below.

Table 12.2-43 Cumulative Effects on Loch of Strathbeg SPA

Designated Features	Criteria	MORL Project	Cumulative effect (MORL, Peterhead Power Station, Proposed wind farms/turbines)
Pink-Footed Goose	1	Negligible significance	Negligible significance
	2	Negligible significance	
	3	Negligible significance	
	4	Negligible significance	
	5	Negligible significance	
Greylag Goose	1	Negligible significance	Negligible significance
	2	Negligible significance	
	3	Negligible significance	
	4	Negligible significance	
	5	Negligible significance	
Summary of effects on SPA:			
<ul style="list-style-type: none"> No cumulative effect on SPA integrity. 			

12.2.5 Concluding Statements

12.2.5.1 This ES presents data and impact assessment results that can usefully inform HRA. This chapter has summarised the results of assessment and can draw the following conclusions.

12.2.5.2 Alone, the Project is not predicted to result in any effects upon designated site integrity that warrant Appropriate Assessment.

12.2.5.3 In combination with other projects and activities, the Project is predicted to result in the following effects:

- Potential effect on the integrity of the following SACs as a result of disturbance of migrating Atlantic salmon by underwater piling noise, and associated effects on species distribution:
 - Berriedale and Langwell Waters SAC;
 - River Moriston SAC;
 - River Oykel SAC;
 - River Spey SAC; and
 - River Thurso SAC.
- Potential indirect effect on the integrity of the following SACs as a result of disturbance of freshwater pearl mussel host species by underwater piling noise, and associated effects on host species distribution:

- River Evelix SAC;
 - River Moriston SAC;
 - River Oykel SAC; and
 - River Spey SAC.
 - Potential effect on East Caithness Cliffs SPA integrity due to prediction of increased mortality of herring gull and great black-backed gull arising cumulatively with BOWL wind farm;
 - Potential short term effects on Moray Firth SAC integrity resulting from disturbance of bottlenose dolphin by piling noise. However, no long term effect on SAC integrity; and
 - Potential short term effects on Dornoch Firth and Morrich More SAC integrity resulting from disturbance of harbour seal by piling noise. However, no long term effect on SAC integrity.
- 12.2.5.4 MORL's assessment of effects has been precautionary throughout this ES, and in line with Rochdale Envelope principles, in each instance is based upon realistic worst case Project scenarios.

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