

8 Terrestrial and Inter-tidal Ecology and Ornithology

8.1 Introduction

1 This chapter considers the potential effects of the proposed Onshore Works for the Neart na Gaoithe offshore wind farm ('Onshore Works') on ecology, including avian ecology (birds). It considers potential effects on designated sites, habitats and protected and notable species. The ecology assessment was undertaken by LUC with the exception of the ornithological assessment, which was undertaken by Natural Research (Projects) Ltd (NRP).

2 The chapter is informed by bat activity surveys which were undertaken by Technical & Safety Services (T&SS) and by an Arboricultural Implications Assessment and Arboricultural Method Statement undertaken by Bosky Trees.

8.1.1 Spatial Extent of Assessment

3 The 'Onshore Works' has been used to describe all of the construction works that will take place within the Application Boundary (see **Figure 8.1**). The Onshore Works includes a cable corridor and is 12.3 km in length (62 ha including the beach) stretching inland from the coast and broadly aligned along a northeast to southwest axis. It incorporates the proposed development footprint (e.g., the cable trench, temporary construction compound and substation) and all associated infrastructure, plus an allowance for vehicle movements, working areas and 10 m for micro-siting.

4 A wider ecology study area was also surveyed which was approximately 200 m either side of the preliminary alignment of the Onshore Works area (**Figure 8.1**). In a small number of areas, the Onshore Works is closer than 200 m to the study area boundary, resulting from alterations to the Cable Corridor alignment during the EIA process. In addition, a small part of the Onshore Works fell outwith the area initially surveyed for birds. However, the area, which is an area of intensive farmland, was surveyed separately at a later date. The study area is well known by the survey team and does not include any designated sites or any known important ornithological features. In all instances survey data coverage was sufficient to account for the assessment of any potential direct or indirect ecological and ornithological effects. In respect of the coast, the study area extended landward from the Mean Low Water Springs as depicted on the 1:50,000 OS base map.

5 In respect of a number of faunal receptors, the study area was further extended in relation to best practice survey guidance:

- great crested newt *Triturus cristatus* (GCN): all waterbodies were considered within 500 m of the Onshore Works; and
- otter *Lutra lutra* and water vole *Arvicola amphibious*: all watercourses within 250 m of the Onshore Works were considered.

6 Where a general area is indicated, a six-figure grid reference is given (accuracy +/-100 m) and where a more specific location is discussed, an eight-figure reference is provided (accuracy +/- 10 m).

8.1.2 General Description of Study Area

7 The study area is a linear corridor approximately 12.3 km in length. The corridor stretches from the coast near Thorntonloch, west to the Innerwick junction of the A1. It then follows a south-westerly path and terminates in the valley of the Tay Burn between Friardykes Dod and Bransly Hill.

8 The study area incorporates a range of land uses and, as a consequence, a variety of different habitat types. At the eastern end, dune grassland and sand dune habitats are of fairly restricted extent and fringe the coastline. Further inland, between the coastal area and Woodhall, the study area incorporates fairly flat terrain, mostly <150 m AOD, dominated by large arable fields with occasional hedgerows, conifer shelter belts, small streams and patches of scrub, and rough grassland road verges. The A1, a dual carriageway running east-west, bisects the study area between Thorntonloch and the Innerwick Junction. South-west of the Innerwick Junction, between Thurston Manor and Woodhall, there is a concentration of relatively small patches of broad-leaved woodland (mostly <6 ha in size). These woodlands are typically found along roads, with the predominant surrounding land use being arable farmland.

9 West from Woodhall, the study area overlaps the Crystal Rig Wind Farm site and its associated access. Here the elevation of the land within the study area increases to 200-350 m AOD. Cattle pasture, upland grassland and mire habitats prevail in this area. West of Woodhall, within the steep-sided valley of the Boonslie Burn, broad-leaved semi-natural woodland occurs.

10 Built developments within the study area are limited to caravan sites and a small number of houses and farmsteads which are typically situated adjacent to roads. Innerwick is the nearest settlement.

8.1.3 Effects Assessed in Full

11 Potential effects on the following have been assessed in full:

- intertidal habitats;
- designated nature conservation sites;
- habitats;
- badger;
- bats;
- great crested newt;
- otter;
- reptiles;
- water vole; and
- birds.

8.1.4 Effects Scoped Out

12 On the basis of the desk based and survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, the following topic areas have been 'scoped out':

- bee orchid: the Scoping Opinion requests that effects on the population of bee orchid *Ophrys apifera* close to Linkshead Farm (NT 7548, 7362) are considered. This population was also recorded by LUC during the Phase 1 Habitat Survey. It has been scoped out from this assessment because it is located outside the Application Boundary and no effect is predicted;
- fish: the Onshore Works have been designed to avoid watercourse crossings wherever possible. Trenchless construction techniques¹ and stringent pollution prevention techniques will be employed to avoid effects to watercourses with fish interest. As a consequence, effects on fish have been 'scoped out' from this assessment.

13 On the basis of the work undertaken to date, the professional judgement of the ornithology team and experience from other similar projects, it is considered that the following effects can be scoped out:

- a permanent reduction in breeding or wintering bird populations due to the operational stage of the Onshore Works;
- direct and indirect effects on designated sites of ornithological interest; and
- collision risks to flying birds.

8.2 Guidance and Legislation

14 National Planning Policy and Advice are important material considerations in the determination of planning applications. The following policy and advice documents are relevant to the Onshore Works with respect to ecology:

- Planning Advice Note 60: Planning for Natural Heritage 2000 (PAN 60) (Scottish Executive, 2000);
- Scottish Planning Policy (Scottish Government, 2010)
- UK Biodiversity Action Plan (BAP);
- Birds of Conservation Concern (BOCC) 3 Red List (Eaton *et al.*, 2009).

¹ Trenchless construction techniques are described in **ES Chapter 5: Project Description** and include, for example, Horizontal Directional Drilling (HDD).

- 15 The following key pieces of nature conservation legislation are relevant to this assessment:
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive);
 - Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds (Birds Directive);
 - The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (Habitats Regulations);
 - The Wildlife and Natural Environment (Scotland) Act 2011;
 - The Wildlife and Countryside Act 1981 (as amended);
 - The Nature Conservation (Scotland) Act 2004 (as amended);
 - The Protection of Badgers Act 1992 (as amended).
- 16 Local planning policy relating to nature conservation is set out in **Chapter 6: Legislation and Planning Policy**.
- 17 The ecological and ornithological assessment was carried out in accordance with the following guidance documents:
- The Institute of Ecology and Environmental Management (IEEM) (2006). Guidelines for Ecological Impact Assessment in the United Kingdom ;
 - Scottish Executive (2001). Interim Guidance on European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements.
- 18 Specific guidance documents relating to species and species groups are set out in the relevant sections under Field Survey below.

8.3 Data Sources

- 19 The following data have been used in the compilation of this assessment:
- Pre-existing biological records within 1 km of the preliminary route alignment from The Wildlife Information Centre for the Lothians and the Borders (WICLB) (WICLB, 2011)²;
 - Publically available Scottish Natural Heritage (SNH) Geographical Information System (GIS) information for designated sites within 1 km;
 - Historical records of birds of high conservation value compiled by the Scottish Ornithologist Club (SOC) in Scottish Bird Reports (SOC website database);
 - Ordnance Survey (OS) mapping;
 - Aerial photography.

8.4 Engagement

- 20 **Table 8.1** summarises consultation carried out as part of the assessment process. This includes a summary of relevant comments raised in the Scoping Opinion.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Scottish Natural Heritage (SNH)	Phone conversation between LUC and the Operations Officer (Forth) on 18 th January 2012.	Woodhall Dean Site of Special Scientific Interest (SSSI) – Given the proximity of the SSSI to the Onshore Works, SNH expect careful consideration of potential effects, particularly with regard to hydrology/pollution and	Potential effects on this receptor are considered in this chapter.

² Lothians Bat Group, Lothian and the Borders Badger Group and Lothian Amphibian and Reptile Group were also contacted but notified LUC that any data held for the study area was captured within the WICLB dataset.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		robust mitigation where appropriate.	
SNH	Email correspondence between Technical & Safety Services (T&SS) and LUC and the Operations Officer (Planning – Lothians) on 15 th August 2011.	Noted that September late for bat emergence surveys but content that activity survey data may be collected. If roosts are to be directly affected then surveys during the core bat maternity season will need to be carried out.	The scheme has been designed to avoid direct effects on bat roosts.
East Lothian Council	Scoping Response	Consider local biodiversity sites. Encourage enhancement of habitats along the route. Protect population of bee orchid along road verge at Linskhead Farm. Consider potential indirect effects on Woodhall Dean SSSI. Consider potential effects of maintenance on badger and otter. In line with guidance from the Scottish Environment Protection Agency (SEPA), a National Vegetation Classification (NVC) map must be provided indicating the location of Ground Water Dependent Terrestrial Ecosystems (GWDTEs). Impacts must be fully considered for GWDTEs.	Local biodiversity sites and ecological enhancement measures (e.g. planting around substation) are considered in this chapter. No adverse effect on the bee orchid population is predicted. Potential indirect effects on Woodhall Dean SSSI are considered in this chapter. Potential effects on badger and otter during operation are considered in this chapter. GWDTEs are considered in this chapter.
SNH	Scoping Opinion	The cable landing site at Thorntonloch is approximately 8 km from St Abb's Head to Fast Castle Special Protection Area (SPA) and 9 km from Firth of Forth SPA. SNH do not anticipate a likely significant effect upon these SPAs. However there is insufficient information to make a robust conclusion.	Letter from NRP to SNH (01 August 2012). Provided opinion, supported by breeding season survey results, including those for seabirds, and records of human disturbance, that there was no prospect of a likely significant effect on the breeding season interests of the two SPAs.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		SNH advised that further information about the use of Thorntonloch Beach by seabirds (in relation to the SPAs), alongside other information such as baseline levels of disturbance to seabirds (from walkers etc) is provided.	
SNH	Email correspondence between SNH and NRP, 13 – 14 August, and telephone conversation 14 August 2012.	Agreed with case made in NRP letter of 01 August 2012, regarding no possibility of likely significant effect on breeding SPA interests. Raised additional possibility of non-breeding interests of the Firth of Forth SPA using Thorntonloch Beach. Considered it unlikely that non-breeding interests from Firth of Forth SPA would use the beach, and so did not anticipate a likely significant effect, but sought further information on this aspect.	Further information supplied in correspondence on the likelihood of non-breeding SPA interests using Thorntonloch Beach. Conclusion was that SNH’s anticipation was correct and that there was no prospect of Firth of Forth SPA non-breeding interests using the beach that could remotely constitute a likely significant effect.
SNH	Letter to NRP (15 August 2012)	Agreed, on the basis of previous correspondence that, under the Habitats Regulations, there was no likely significant effect on the interests of the two SPAs noted in the Scoping Opinion, on either breeding or non-breeding components. Therefore, there was no requirement for an Appropriate Assessment under the Habitats Regulations.	Possible adverse effects on the conservation objectives of St Abb’s Head to Fast Castle SPA and the Firth of Forth SPA, under the Habitats Regulations, are not considered further in this chapter.

Table 8.1: Consultation Responses

8.5 Assessment Methodology

21 Ecological Impact Assessment (EiA) is based on a number of factors, primarily consideration of the value of the receptor assessed and the anticipated nature and extent of each effect. IEEM has produced guidelines to assist with ecological evaluation and impact assessment, which have been used as a guide in this assessment. These guidelines have no legal standing and are not a substitute for professional judgement and interpretation, particularly where the ecological value of a site and/or effect magnitude are not clear, or are borderline.

8.5.1 Valuation of Receptors

22 The sensitivity or value of ecological receptors is normally ascertained according to specific ‘biodiversity benefits’ that they provide to the environment, people or wider society. These benefits can include the conservation of genetic diversity, people’s enjoyment or understanding of biodiversity, or the health benefits of biodiversity. A summary of an approach to valuing ecological receptors in Scotland can be found in **Table 8.2**. This shows how ecological value or the level of ecological sensitivity can be derived using a combination of statutory measures (legally protected sites and species) and non-statutory but widely accepted measures within the industry, such as the presence of notable and BAP-listed habitats and species. Use can also be made of the Ratcliffe assessment criteria for the selection of sites with nature conservation value (Ratcliffe, 1977). All these criteria can vary at different geographical scales.

Level of value or Sensitivity	Examples
International	An internationally designated site or candidate site (SPA ³ , pSPA ⁴ , SAC ⁵ , cSAC ⁶ , pSAC ⁷ , Ramsar site ⁸ , Biogenetic Reserve) or an area which SNH has determined meets the published selection criteria for such designations, irrespective of whether or not it has yet been notified. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat essential to maintain the viability of that ecological resource. Any regularly occurring population of an internationally important species, i.e., those listed in Annex II or IV of the Habitats Directive, or Annex I of the Birds Directive.
National	A nationally designated site (SSSI ⁹ , NNR ¹⁰ , Nature Conservation MPA ¹¹) or a discrete area which SNH has determined meets the published selection criteria for national designation irrespective of whether or not it has yet been notified. A viable area of a Priority Habitat identified in the UK Biodiversity Action Plan (BAP) ¹² , or smaller areas of such habitat which are essential to maintain the viability of that ecological resource. An Ancient Woodland Inventory ¹³ site as defined by SNH (GIS data). An Important Hedgerow as defined by the Hedgerow Regulations 1997 (the regulations

³ Special Protection Area designated in accordance with Article 4 of the Birds Directive. Designated for rare and vulnerable birds (as listed on Annex I of the Birds Directive), and for regularly occurring migratory species.
⁴ Proposed Special Protection Area which has been approved by the UK Government but is in the process of being fully classified.
⁵ Special Area of Conservation designated under the Habitats Directive. The habitats and species listed are those considered to be most in need of conservation at a European level (excluding birds).
⁶ Candidate Special Area of Conservation.
⁷ Possible Special Area of Conservation.
⁸ Wetlands of international importance designated under the Ramsar Convention.
⁹ Site of Special Scientific Interest designated under UK law as being the best examples of the UK’s flora, fauna, geological or physiographical features.
¹⁰ National Nature Reserve designated under UK law as containing the best examples of natural or semi-natural ecosystems in Britain
¹¹ Nature Conservation Marine Protected Area designated under the Marine (Scotland) Act 2010 to conserve marine flora, fauna and geological features.
¹² The BAP identifies targets for improving and protecting biodiversity in an area to meet the UK’s commitments under the Rio Convention
¹³ Ancient Woodland comprises sites shown as woodland on all available map sources from 1750 onwards and/or as semi-natural woodland on ‘The Military Survey of Scotland – Roy maps’ (c.1750). Ancient woodland sites that have retained the native tree and shrub cover that has not been planted, although it may have been managed by coppicing or felling and allowed to regenerate naturally, and Ancient Replanted Woodland ARW: ancient woodland sites where the original native tree cover has been felled and replaced by planting, usually with conifers and usually this century. SNH’s classification is based on the estimated age of an AWI woodland, however, it does not confer greater conservation status on any one category (SNH, undated).

Level of value or Sensitivity	Examples
	do not apply in Scotland but are of relevance in ecological valuation terms). A regularly occurring population of a nationally important species e.g., a priority species listed in the UK BAP and/or Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 and/or breeding birds listed on the Red or Amber List of species of conservation concern. A regularly occurring and viable population of a Red Data Book species (i.e., those occurring in 15 or less 10 km ² of the UK).
Council	Viable areas of key habitat identified in council area BAPs or smaller areas of such habitats essential to maintain the viability of that ecological resource. Any regularly occurring, locally significant population of a species listed as being nationally scarce (occurring in 16 to 100 10 km ² in the UK) or in a council area BAP on account of its rarity or localisation. Non-statutory designated wildlife sites (e.g., Scottish Wildlife Trust Nature Reserves or Wildlife Sites ¹⁴).
District	Sites/features that are scarce at the district (sub-Council) scale or which appreciably enrich the district habitat resource.
Neighbourhood	Commonplace and widespread semi-natural habitats, e.g., scrub, poor semi-improved grassland, coniferous plantation woodland, intensive arable farmland etc.
Less than Neighbourhood	Habitats of little or no ecological value, e.g., amenity grassland or hard standing.

Table 8.2: Approach to Valuing Ecological Receptors in Scotland

8.5.2 Effect Magnitude

- 23 Effect magnitude refers to changes in the extent and integrity of an ecological receptor (see table below). There are many definitions of ecological integrity, but the term is used here in accordance with the definition adopted by IEEM whereby integrity of a site is defined as “the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified” (Scottish Executive 2000).
- 24 Effect magnitude seeks to characterise the degree of change in an ecological receptor. It takes into consideration the fact that different sources of change can result in permanent or temporary effects and that different effects have different probabilities of occurring. The magnitude of effects is also dependent on the timing and/or frequency of occurrence, and whether they are reversible. These factors are all components of ecological effect magnitude.
- 25 For the purposes of EclA, effect magnitude can be classified as high, medium, low, or neutral as summarised in **Table 8.3** below. Effects may be adverse (detrimental) or positive (beneficial). Unless otherwise stated, effects are considered to be adverse.

¹⁴ Site of Nature Conservation Importance: locally important sites of nature conservation adopted by local authorities for planning purposes.

Effect magnitude	Description
High	High effects include those that result in large-scale, permanent changes in an ecological receptor, and likely to change its ecological integrity. These effects are therefore likely to result in overall changes in the conservation status of a species population or habitat type at the location(s) under consideration.
Medium	Medium effects may include moderate-scale permanent changes in an ecological receptor, or larger-scale temporary changes, but the integrity of the feature is not affected. This may mean that there are temporary changes in the conservation status of a species-population or habitat type at the location(s) under consideration, but these are unlikely to be long-term.
Low	Low effects include those that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These effects are unlikely to result in overall changes in the conservation status of a species population or habitat type at the location(s) under consideration, but do not exclude the possibility that mitigation or enhancement will be required.
Neutral	There is no perceptible change in the ecological receptor.

Table 8.3: Categorisation of Effect Magnitude

8.5.3 Effect Significance

- 26 Effect significance is derived from the combination of ecological value (sensitivity) and effect magnitude (see **Table 8.4**), which may be adverse or positive. Ecological receptors with effects of moderate or major significance will be priorities for mitigation and/or enhancement. In some cases, such as protected species, there may also be a legal obligation to provide such mitigation. Effects judged to be of major or moderate significance are considered to be ‘significant effects’ in the context of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (EIA Regulations). The matrix is not to be used without consideration of context; as stated above, professional judgement is also required in determining ecological significance.

		Magnitude of Effect			
		High	Medium	Low	Neutral
Value/sensitivity of ecological receptor	International	Major	Major	Moderate	Negligible
	National	Major	Moderate	Moderate	Negligible
	Council	Moderate	Moderate	Minor	Negligible
	District	Moderate	Minor	Minor	Negligible
	Neighbourhood	Minor	Minor	Negligible	Negligible
	<Neighbourhood	Minor	Negligible	Negligible	Negligible

Table 8.4: Matrix for Considering Significance of Ecological Effects

8.5.4 Cumulative and In Combination Assessment Approach

27 The EIA Regulations state that types of effects identified “*should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects.*” It is also important to consider the possible effects that the Onshore Works may have in combination with existing, consented or other proposed developments or activities.

28 As specified in **ES Chapter 3: EIA Methodology and Approach**, there are three possible types of cumulative effects which have been considered in the EIA of the Onshore Works across all topic areas. The adopted, three stage approach is set out below:

1. *Cumulative Effects Arising with Other Schemes:* Although not specifically relevant to grid connection works, reference has been made to the online advice from the Scottish Government on Onshore Wind Turbines. The guidance advises that likely cumulative effects are defined as the predicted effects that the Onshore Works may have in combination with other developments of a similar or related nature which are at application stage, consented, under construction or operational.

East Lothian Council confirmed within their Scoping Opinion that, at that time, there were only two schemes nearby that need to be given consideration in light of the potential for cumulative effects. These include Aikengall II Wind Farm and Crystal Rig III Wind Farm. These are both proposed extensions to existing wind farms and have been (or will be) submitted to East Lothian Council.

Since the time of issue of the Scoping Opinion, a third scheme has been identified that needs to be considered in the cumulative assessment. This is an SPT scheme to connect Neart na Gaoithe to the National Grid from the substation at Crystal Rig.

2. *Effects Arising from the Onshore Construction Works:* Effects have been assessed in relation to the potential for onshore construction works to lead to significant inter-related effects on a single receptor.
3. *Effects of the Onshore Construction Works In Combination with Offshore Construction:* The potential for cumulative effects arising from the onshore construction works in combination with offshore construction. These effects are most likely to arise when offshore and Onshore Works take place concurrently i.e. works associated with landing the offshore cable.

8.6 Baseline Description

8.6.1 Intertidal Habitats

8.6.1.1 Field Survey Results

29 The survey area encompassed the region from the splash/lichen zone (supralittoral) to the sublittoral fringe, within an area extending 250 m either side of the proposed cable route landfall at Thorntonloch.

30 The area is characterised by sandy beach, together with several outcrops of cobbles and boulders. Extensive areas of bedrock were also noted north of the survey area and a freshwater stream flowed across the centre of the beach.

31 The sandy habitats on the mid and lower shore were generally rippled or duned, further reflecting the exposed nature of the site. These habitats were either devoid of fauna (LS.LSa.MoSa Barren or amphipod-dominated mobile sand shores) or hosted faunal communities typical of mobile clean sandy habitats hosting relatively poor faunal communities LS.LSa.MoSa.AmSco (Amphipods and *Scolecipis* spp. in littoral medium-fine sand), AmSco.Eur (*Eurydice pulchra* in littoral mobile sand), and AmSco.Sco (*Scolecipis* spp. in littoral mobile sand). These mid and lower shore habitats were interrupted by bedrock areas supporting the biotopes LR.FLR.Eph.EntPor (*Porphyra purpurea* and *Enteromorpha* spp. on sand-scoured mid or lower eulittoral rock) and LR.MLR.BF.Rho (*Rhodothamniella floridula* on sand-scoured lower eulittoral rock), the distribution of which seemed to reflect the degree of sand scour within the survey area, with the former occurring in areas subjected to a higher degree of sand scouring.

32 The sandy biotopes outlined above are common on the east coast of Scotland and their importance is associated with providing suitable habitat for little terns, sandwich terns and common terns which favour sand and shingle for nesting. Common terns also nest on bare scrapes in drift line seaweeds or on shell banks. Sandwich terns breed on coastal sand or shingle beaches, frequently in association with other terns or gull species. Invertebrates attracted to

seaweed on the strandline provide an important food source for birds and juvenile fish (MarLIN, 2011). Ornithology in the inter-tidal area is discussed in **Section 8.6.11**.

33 The upper shore comprised dry afaunal sand, characteristic of the biotope LS.LSa.MoSa.BarSa (Barren littoral coarse sand), which is typical of exposed shores, subject to high sediment dynamics and drainage which prevents the establishment of macrofaunal communities. Areas of littoral coarse sediment (LS.LCS) were present south of the stream bordering the landward extent of the upper shore and the lower shore at the southernmost extent of the survey area. These coarse sediments included pebbles, gravel, cobbles and small boulders within coarse sand and were generally devoid of macrofauna.

34 The transition from the upper shore intertidal environment to that of a more terrestrial nature is relatively abrupt, in part due sea defences.

8.6.1.2 Valuation of Intertidal Habitats

35 The littoral biotopes LR.FLR.RkpG, LR.FLR.Eph.EntPor and LR.MLR.BF.Rho and the infralittoral IR.MIR.KR.Ldig are contained within Annex I feature: reef (JNCC, 2010). The littoral rock features (**LR.FLR**) are also UK BAP priority habitats (JNCC, 2010). The biotopes LR.FLR.Rkp.G and IR.MIR.KR.Ldig are widespread at national level and their importance is associated with providing habitat for crustaceans (e.g., the copepod *Tigriopus fulvus*), and shelter for fish fry, which migrate into these habitats on occasion (MarLIN, 2011). In addition, the lumpsucker *Cyclopterus lumpus* lays its eggs in the infralittoral biotope (MarLIN, 2011).

36 The importance of the biotopes LR.MLR.BF.Rho and Eph.EntPor is their association with providing a food source to fish and crustaceans, migrating into the intertidal zone to feed as the tide rises. Shore birds also feed on the rocky shores because of the rich fauna available under macroalgae canopies. Algal patches may also act as nursery grounds for various species (e.g., Littorinids). The ephemeral green algae *Ulva intestinalis* provides shelter for the copepod, *T. brevicornis*, and chironomid larva *Halocladius fucicola* (MarLIN, 2011). In addition, *Ulva* spp. and associated epiphytes provide a major food source for the fauna of high rockpools (e.g., gastropods *Melarhapha neritoides* and *Littorina saxatilis*). Green algae also provide an important food source for grazing teal, widgeon, shelduck and dark-bellied Brent geese.

8.6.2 Designated Nature Conservation Sites

8.6.2.1 Statutory Designated Sites

37 There are no internationally designated SAC, SPA or Ramsar sites within 1 km of the Onshore Works. Two SSSIs were identified within approximately 1 km of the Onshore Works (**Figure 8.2**):

- Barns Ness Coast SSSI is located approximately 0.5 km north of the A1, at the eastern end of the Onshore Works. It is notified for both geological and biological features. The site contains a succession of the Lower Carboniferous limestone which is rich in fossils. In terms of its biological value, the site contains a variety of coastal habitats including saltmarsh, sand dune and shingle, which are considered to be uncommon in the Lothian area. These habitats support a diverse array of flowering plants in addition to an important assemblage of birds, butterflies, day-flying moths and other invertebrates.
- Woodhall Dean SSSI spans the valley sides of the Dry Burn, Woodhall Burn and associated tributaries, approximately 0.2 km northwest of the Onshore Works at Weatherly. It is notified for upland oak woodland, being the largest area of this habitat type in East Lothian. This site supports a particularly large number of vascular plant species, several of which are rare or uncommon in the area, as well as a large number of mosses and liverworts.

8.6.2.2 Non-Statutory Designated Sites

38 Six non-statutory designated sites are located within approximately 1 km of the Onshore Works. This includes Listed Wildlife Sites notified by East Lothian Council, and Scottish Wildlife Trust (SWT) sites. They are described in **Table 8.5** and mapped in **Figure 8.2**.

8.6.2.3 Ancient Woodland Inventory Sites

39 Numerous Ancient Woodland Inventory (AWI) sites are located within 1 km of the Onshore Works. These are mapped in **Figure 8.2**. Key concentrations of AWI woodland within the study area are located at Thurston Manor and within Woodhall Dean SSSI.

- 40 Several AWI woodlands are partly within, or in close proximity to, the Application Boundary at the following seven locations:
- a linear strip of plantation conifer woodland at NT67477136;
 - the northeast edge of High Wood at NT 68847204;
 - woodland and grassland at the edge of Tripslaw Hill Plantation at NT 69227229 – grassland areas marked as AWI sites are presumed to be a mapping error with the AWI data at this location;
 - a narrow strip of broad-leaved semi-natural woodland named Whittley Strip at NT69337322;
 - a narrow strip of broad-leaved semi-natural woodland named Birky Bog Plantation at NT69737332;
 - a narrow, linear strip of broad-leaved semi-natural woodland perpendicular to a road at NT70627349;
 - broad-leaved semi-natural woodland southeast of Smithy Row at NT71457368.
- 41 An eighth site, was found to be an area of marshy grassland, at NT68597193. This is therefore assumed to be a mapping error within the Inventory and therefore it will not be discussed further in relation to ancient woodland.

Site Name	Level of Ecological Value	Designation Type	Approx. distance and location from Onshore Works	Reason for designation
Bothwell Water	Council	Listed Wildlife Site	0.9 km west.	River with variety of habitats on banks.
Dry Burn	Council	Listed Wildlife Site	Site flows parallel to much of the Onshore Works. It is 0.4 km at its nearest point. Overlaps Woodhall Dean SSSI.	River with variety of habitats on banks.
Thornton Burn	Council	Listed Wildlife Site	A section of the Thornton Burn LWS, approximately 100 m in length, is located within the Application Boundary.	River with variety of habitats on banks.
Brunt Valley	Council	SWT Wildlife Site	0.6 km north by Whittley Strip.	Variety of habitats, rich flora and fauna.
Thornton Glen	Council	SWT Wildlife Site	At the closest point 0.2 km south at Thorntonloch Holdings.	Varied woodland, rich ground flora.
Aikengall Glen	Council	Proposed SWT Wildlife Site	0.9 km south, in the vicinity of Elmscleugh.	Valley important for butterflies.

Table 8.5: Non-Statutory Designated Sites provided by WICLB

8.6.3 Habitats and Plant Species

8.6.3.1 Methodology

- 42 Biological records from WICLB were reviewed for notable plant or bryophyte species within 1 km of the study area.

- 43 A Phase 1 Habitat Survey of the entire study area was undertaken following the Joint Nature Conservation Committee methodology (JNCC, 2010). Phase 1 Habitat Survey is a nationally recognised methodology for classifying habitat. The Phase 1 Habitat Survey was undertaken by experienced surveyors over four days during the week of 6 June 2011, under optimal weather conditions. Plant nomenclature followed Stace (2010) and bryophyte nomenclature followed Atherton *et al.* (2010).
- 44 Habitats were marked on a 1:10,000 base map, with a Minimum Mappable Unit (MMU) of 20 m x 20 m (0.04 ha), except where specific features marked on the base map allowed more precise mapping. Where the variation of vegetation types was intricate and it was not possible to reliably map individual habitat parcel boundaries, a mosaic was mapped including two or more Phase 1 habitat types. Species lists were recorded using the DAFOR scale¹⁵ to denote species abundance at specific points. Target notes were used to describe habitats, features of interest and incidental records of protected or notable species.
- 45 A National Vegetation Classification (NVC) survey (Rodwell, 1991 *et seq.*) was undertaken targeting habitats of particular nature conservation interest, and potential GWDTEs within the Onshore Works and a 100 m buffer. The NVC is a more detailed classification system than Phase 1 Habitat Survey and can help to distinguish between habitats of higher conservation priority. The NVC survey of habitats of potential interest was undertaken between 1- 3 August 2011 by experienced surveyors. Phase 1 habitat types targeted for survey included blanket bog, coastal habitats, heathland, marshy grassland and broad-leaved woodland. Areas of semi-improved and improved grassland were also targeted to provide information regarding their restoration potential. Other habitats (e.g., tall ruderal, continuous bracken or amenity grassland) were not NVC surveyed as sufficient detail was available within Phase 1 Habitat Survey targets notes to evaluate their nature conservation value.
- 46 The NVC survey broadly followed the method described by Rodwell (2006). Vegetation communities were classified in accordance with keys and floristic tables published in the five NVC volumes (Rodwell, 1991 *et seq.*). Other reference sources were also used to assist in the identification of different NVC communities (Averis *et al.*, 2004; Cooper, 1998). Quadrat sampling was undertaken to support field observation. A quadrat size of 2 x 2 m (5 x 5 m for woodland ground flora) was used and percentage cover of species within the quadrat was assessed according to the Domin scale¹⁶ (Mueller-Dombois and Ellenberg, 1974). Where possible, classification to NVC sub-community level was undertaken. However, in a few instances the vegetation was such that it could not be readily assigned sub-community level.

8.6.3.2 Desk Study Results

8.6.3.3 Results of Phase 1 Habitat Survey and NVC Survey

- 47 Habitats within the study area are shown in **Figures 8.3 and 8.4** and a summary description of those habitat types falling within the Onshore Works Area is provided below. **Appendix 8.1** provides a more detailed description of Phase 1 and NVC habitat types. Detailed target notes are provided in **Appendix 8.2**. NVC quadrat data is provided in **Appendix 8.3**.

8.6.3.3.1 Woodland and Scrub

- 48 Broad-leaved semi-natural woodland accounted for 16.01 ha (1.9 %) of the study area. The majority of this habitat was located in the central part of the site, between Thurston and Woodhall, where it typically occurred as linear strips along roads and arable fields. In the west of the study area, an area of broad-leaved semi-natural woodland within the valley of the Boonslie Shank represented a small portion of a more extensive woodland blocks comprising Woodhall Dean SSSI.
- 49 The majority of broad-leaved semi-natural woodland within the study area comprised ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus*, with occasional oaks *Quercus robur* and *Q.petrea* and silver birch *Betula pendula*. Shrub layer species typically included frequent wych elm *Ulmus glabra* and sycamore and ash saplings, with occasional hawthorn *Crataegus monogyna*, holly *Ilex aquifolium* and yew *Taxus baccata*. The ground flora was typically lush and relatively species-rich including ancient woodland indicator species (Rose, 2006) such as sanicle

¹⁵ DAFOR = Dominant, Abundant, Frequent, Occasional and Rare.

¹⁶ Domin scale = 1 (< 4% few individuals); 2 (< 4% several individuals); 3 (< 4% many individuals); 4 (4-10 %); 5 (11-25 %); 6 (26-33 %); 7 (34-50%); 8 (51-75 %); 9 (76-90 %); 10 (91-100 %) (Mueller-Dombois and Ellenberg, 1974)

Sanicula europaea, woodruff *Galium odoratum*, dog's mercury *Mercurialis perennis* and wild garlic *Allium ursinum*, and a well-developed fern and moss component.

- 50 A single stand of relatively species-poor broad-leaved, semi-natural woodland dominated by a narrow-leaved willow *Salix* sp. with an understorey of abundant chickweed *Stellaria media*, common nettle and hemlock water-dropwort *Oenanthe crocata* was recorded in the valley of the Thornton Burn, near the A1.
- 51 In terms of NVC, the majority of broad-leaved semi-natural woodland stands within the study area were classified as W9a *Fraxinus-excelsior-Sorbus aucuparia-Mercurialis perennis* typical sub-community although in certain instances classification was ambiguous as certain sub-communities of the W8 community share similar ground flora and shrub layer species with W9. In addition, certain woodland stands showed signs of eutrophication with locally abundant nettle and cleavers thus obscuring NVC classification.
- 52 Two areas of mixed plantation woodland totalling 1.64 ha (0.2 %), occurred within the study area. Around Thurston Manor this woodland type contained a shrub layer and ground flora which was similar to adjoining areas of broad-leaved semi-natural woodland, although with frequent planted beech *Fagus sylvatica*, Sitka spruce *Picea sitchensis*, pine *Pinus* sp. and European larch *Larix decidua*.
- 53 Broad-leaved plantation woodland in the study area (4.4 ha/0.5 %) comprised several relatively small woods where the canopy was dominated by even aged stands of mature to semi-mature sycamore and/or beech with occasional ash. Near to Temple Mains, the dense canopy of this habitat had shaded out the ground flora, but an area to the north of Falsely Hill supported a more open canopy and a grassy ground flora with frequent creeping soft-grass *Holcus mollis* and red fescue *Festuca rubra*, and other neutral grassland herb species, mosses and ferns.
- 54 Dense scrub communities accounted for a relatively small proportion of the study area (7.64 ha / 0.9 %). At the eastern end of the study area, small patches of dense scrub dominated by hawthorn, rose *Rosa* sp. and gorse occurred along small streams, road embankments and the at edges of arable fields. In the west of the study area, scrub habitats included dense patches of gorse on steep slopes to the north of High Wood, and, although not affected by the proposals, there were notable small stands of mature juniper *Juniperus communis* ssp. *communis* scrub (<MMU) amongst areas of acid grassland in the valley of the Boonslie Shank.

8.6.3.3.2 Grassland

- 55 Improved grassland was the most extensive grassland habitat recorded within the study area (140 ha / 16.7 %). This habitat was predominantly located to the southwest of Woodhall, where cattle and/or sheep grazing had created a short, relatively species-poor sward. Perennial rye-grass *Lolium perenne* was typically the dominant species, with crested dog's-tail *Cynosurus cristatus* and white clover *Trifolium repens*, common mouse-ear *Cerastium fontanum* and creeping buttercup *Ranunculus repens*, along with several other herbaceous associates all at low abundance. In places where animal dung or disturbance was noted, common nettle, creeping thistle *Cirsium arvense* and/or spear thistle *Cirsium vulgare* also occurred. In terms of the NVC, this habitat was generally referable to MG6a *Lolium perenne* – *Cynosurus cristatus* grassland, typical sub-community which is typically species-poor and reflects agricultural improvement.
- 56 Poor semi-improved grassland comprised 12.9 ha (1.5 %) of the study area. Relatively large areas of this habitat were recorded to the south of Weatherly, to the west of the proposed Onshore Works at Thorter Cleugh Burn, and to the southeast of the Crystal Rig Wind Farm substation. This habitat was similar in composition to improved grassland habitats within the study area but with an increased diversity of grass and herb species including sweet vernal-grass *Anthoxanthum odoratum*, common sorrel *Rumex acetosa* and pignut *Conopodium majus*. In terms of the NVC, this habitat was classified as MG6b *Lolium perenne* – *Cynosurus cristatus* grassland, *Anthoxanthum odoratum* sub-community.
- 57 Semi-improved neutral grassland accounted for 21.6 ha (2.6 %) of the study area. Much of this habitat was located along road verges in the central and eastern parts of the study area and at the edges of arable fields. This habitat generally comprised the NVC type MG1 *Arrhenatherum elatius* grassland and was typically dense, tussocky vegetation dominated by false oat-grass with cock's-foot and red fescue. Areas of this habitat along mowed road verges tended to be the MG1a *Festuca rubra* sub-community, incorporating a range of herbaceous species such as yarrow *Achillea millefolium*, bird's-foot trefoil *Lotus corniculatus*, ribwort plantain *Plantago lanceolata*, dandelion *Taraxacum officinale* agg., white clover *Trifolium repens* and meadow vetchling *Lathyrus pratensis*. Where

mowing was less frequent, tall herbs such as cow parsley *Anthriscus sylvestris* and hogweed *Heracelum sphondylium* were often abundant, and locally abundant sweet cicely *Myrrhis odorata*.

- 58 At the edges of arable fields, semi-improved neutral grassland tended to comprise the MG1b *Urtica dioica* sub-community. This was typically characterised by a similar suite of species to MG1a but with frequent nettle and cleavers, probably as a result of nutrient enrichment from adjacent agricultural farming practices. In the east of the study area, small areas of the MG1e *Centaurea nigra* sub-community occurred along road embankments of the A1 and on sloping ground south of Thorntonloch. This community was relatively species-rich including black knapweed *Centaurea nigra*, germander speedwell *Veronica chaemydrys* and yellow oat-grass *Trisetum flavescens*.
- 59 In the west of the study area, semi-improved neutral grassland on damp ground to the northeast of Friardykes Dod and close to the Crystal Rig Wind Farm substation was the NVC type MG9 *Holcus lanatus* - *Deschampsia cespitosa*. This habitat was typically dominated by tufted hair-grass *Deschampsia cespitosa* with frequent Yorkshire fog *Holcus lanatus* and soft rush *Juncus effusus*. A single, small patch of this habitat type was also recorded around a pond within Birky Bog Plantation in the central part of the study area.
- 60 Unimproved acid grassland (24.2 ha / 2.9 %) was restricted to the upland parts of the study area. In the vicinity of the Thorter Cleugh Burn these grasslands were co-dominated by sheep's fescue *Festuca ovina* and common bent *Agrostis capillaris* with heath bedstraw and a dense moss layer including frequent *Hylocomium splendens*. This habitat was representative of the NVC type U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland.
- 61 Areas of unimproved acid grassland on the western flank of Bransly Hill and west of the Crystal Rig Substation comprised a grazed, relatively species-poor sward dominated by mat-grass *Nardus stricta* with occasional heath rush *Juncus squarrosus* and tormentil *Potentilla erecta*. This habitat represented the NVC type U5 *Nardus stricta* – *Galium saxatile* grassland.
- 62 A single, relatively small area of unimproved acid grassland to the northwest of Falsely Hill comprised a short, rabbit grazed sward dominated by sheep's fescue, with occasional heath bedstraw, sheep's-sorrel *Rumex acetosella* and mouse-ear hawkweed *Pilosella officinarum*. This area represented the NVC type U1 *Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella* grassland.
- 63 Semi-improved acid grassland within the study area (7.8 ha/ 1.0 %) was located to the northeast of the Thorter Cleugh Burn and included occasional species typical of the U4 acid grassland described above, with perennial rye-grass and crested dog's-tail.
- 64 Marshy grassland accounted for 36.20 ha (4.3 %) of the study area and was concentrated in low-lying valley bottoms and lower valley slopes between Finley How and Weatherly and in the valley bottom of the Weatherly Burn, Thorter Cleugh and Boonslie Shank, as well as east of the Crystal Rig Wind Farm substation, in the valley of the Tay Burn. Signs of grazing by cattle and poaching were commonplace, and the rush-dominated sward was mainly <50 cm in height. Typically, this habitat was dominated by either soft rush or sharp-flowered *Juncus acutiflorus*, and in many instances this was relatively species-rich, with herb species such as sorrel, marsh bedstraw *Galium palustre*, marsh thistle *Cirsium palustre*, lady's smock *Cardamine pratensis*, ragged robin *Lychnis flo-cuculi*, marsh violet *Viola palustre*, tufted forget-me-not *Myosotis laxa* and the moss *Calliargonella cuspidata*. This vegetation type was classified as M23 *Juncus effusus/acutiflorus* – *Galium palustre* rush pasture community. Both M23a *Juncus acutiflorus* sub-community, dominated by sharp-flowered rush with greater tall herb diversity, and M23b *Juncus effusus* sub-community, dominated by soft rush and with a lower herb diversity, were recorded, often in close association with one another. An additional type of marshy grassland, dominated by soft rush was also recorded, which was not easily referenced to the NVC. This habitat is referred to as "*Juncus effusus* vegetation" in the subsequent assessment of GWDTEs.
- 65 Marshy grassland/blanket bog mosaic, with and without acid flushes, was located to the north of the Crystal Rig Wind Farm substation, and comprised 3.18 ha (0.1 %) of the study area. This habitat mosaic was formed of small alternating areas dominated by either soft rush, hare's-tail cottongrass *Eriophorum vaginatum* or bottle sedge *Carex rostrata*. Abundant *Sphagnum fallax* and *S. palustre* (bog mosses) formed a constant carpet throughout the ground layer.

8.6.3.3.3 Tall Herb and Fern

- 66 Continuous bracken was locally abundant in the western part of the study area (8.75 ha/ 1 %). This vegetation was dominated by tall stands (c.1.0 m in height) of bracken *Pteridium aquilinum* over acid grassland vegetation.

67 Areas of tall ruderal habitat were restricted in extent (1.58 ha/ 0.2%) and generally comprised stands of common nettle or rosebay willowherb *Chamaerion angustifolium* on road embankments.

8.6.3.3.4 Heath

68 Within the study area, small areas of dry heath, totalling 2.03 ha (0.2%), were recorded on steep slopes in the valley of the Boonslie Burn, and immediately southwest of the Crystal Rig Wind Farm substation, in a mosaic with acid grassland (0.9 ha, 0.1%). Heather and bilberry *Vaccinium myrtillus* were frequently co-dominant with mat-grass, wavy hair-grass, heath rush and bracken. This habitat represented the NVC type H12 *Calluna vulgaris-Vaccinium myrtillus* heath. The inaccessible nature of this habitat prevented detailed survey and thus further classification to sub-community level.

8.6.3.3.5 Mire and Bog

69 Five patches of blanket bog vegetation (0.65 ha/ <0.1% of study area) occurred to the north of the Crystal Rig Wind Farm substation. The northernmost of these supported hare’s-tail cotton grass, heather and a deep moss layer comprising of frequent *Sphagnum papillosum*, *S. magellanicum* and *S. capillifolium* along with pleurocarpous mosses such as *Hylocomium splendens*, and herbs such as round-leaved sundew *Drosera rotundifolia*. This area represented the NVC type M18a *Erica tetralix - Sphagnum papillosum* raised and blanket mire, *S. magellanicum - Andromeda polifolia* sub-community (blanket bog). The four remaining patches of blanket bog were classified as the NVC type M19 *Calluna vulgaris - Eriophorum vaginatum* blanket mire. This latter community vegetation was generally co-dominated by hare’s-tail cottongrass and heather, with a fairly sparse moss layer.

70 Wet modified bog was recorded to the north and northeast of the Crystal Rig Wind Farm substation, totalling 4.87 ha (0.6%) of the study area. This habitat had an approximate sward height of 40 cm and was dominated by hare’s-tail cottongrass with purple moor-grass, heather and wavy-hair grass. A relatively diverse moss layer included *Plagiothecium undulatum*, *Polytrichum commune* and *Sphagnum fallax*. This habitat most closely resembled the NVC type M20b *Eriophorum vaginatum* blanket and raised mire, *Calluna vulgaris - Cladonia* sub-community.

71 A linear strip of wet modified bog/acid flush mosaic (0.39 ha/ <0.1%) was located along the eastern edge of the access track to the north of the Crystal Rig Wind Farm, comprising water-logged vegetation dominated by hare’s-tail cottongrass in close association with small areas (less than MMU) of bottle sedge dominated vegetation with *Sphagnum fallax* and *S. palustre*. This habitat formed an intermediate between NVC types M20 (as described above) and M4 *Carex rostrata - Sphagnum recurvum* mire.

8.6.3.3.6 Open Water

72 One area of standing water, an artificial pond (c. 400 m²), was identified within the study area within Birky Bog Plantation. The pond was well vegetated with marginal species such as soft rush and meadow sweet *Filipendula ulmaria* growing frequently around its margins, and frequent broad-leaved pondweed *Potamogeton natans* and water milfoil *Myriophyllum* sp. within the waterbody.

73 A number of streams were identified within the study area and were classified as running water.

8.6.3.3.7 Coastal Habitats

74 Open dune/coastal grassland mosaic forming 0.64 ha (<0.1%) of the study area was recorded between Thornton Burn and the private house known as Thornly. The vegetation here was characterised by a mosaic between Lyme grass *Lymus arenarius*, and marram grass, with areas of bare sand and short, rabbit grazed grassland dominated by red fescue. Occasional herb species recorded across both dune and grassland habitats in this area included sea campion *Silene uniflora*, sea mayweed *Tripleurospermum maritimum*, ribwort plantain and lady’s bedstraw, common restharrow *Ononis repens* and sand sedge *Carex arenaria*. Occasional coarse weedy species included cock’s-foot, creeping thistle, and common ragwort *Senecio jacobaea* and the horticultural species red hot poker *Kniphofia* sp., and were likely to have been introduced by dumping of garden compost. No NVC type was ascribed to this vegetation as it was considered to be heavily modified.

8.6.3.3.8 Other Habitats

75 Arable farmland comprised just over half of the study area (439.05 ha/ 52.3%) and was confined to the area east of Woodhall. Wheat, and to a lesser extent barley, were the dominant arable crops, with little or no set-aside or uncultivated land. Arable weed communities were frequently noted amongst the arable crop and across the thin

strip of bare earth at field edges. Typical species included scentless mayweed *Tripleurospermum inodorum*, common fumitory *Fumaria officianalis*, bugloss *Anchusa arvensis*, goosefoot *Chenopodium* sp., parsley-piert *Aphanes arvensis*, common poppy *Papaver rhoeas*, and long-headed poppy *P. dubium*.

76 A total of 1,258 m of hedgerow were recorded in the study area, all located east of Woodhall. These hedgerows were approximately 1.5 m-2 m high, defunct (not stock-proof) and displayed signs of being subject to an intensive cutting regime. Most were species-poor and dominated by hawthorn, with rose *Rosa* sp. Gorse, elder, holly and elm were occasionally recorded. Single hedgerows dominated by beech and garden privet *Ligustrum ovalifolium* were recorded in association with private houses. The basal flora of hedges typically comprised tall ruderal vegetation such as common nettle and rank grassland.

77 Ephemeral/short perennial vegetation was a relatively uncommon habitat (2.17 ha/0.3%) and was typically associated with areas where soils had been recently disturbed. This included the banks of the Dry Burn near the A1 and an arable field corner south of Thornton Burn. Typically, this habitat contained bare earth, with common nettle, poppies, teasel *Dipsacus fullonum*, weld *Reseda luteola*, creeping thistle, colt’s-foot *Tussilago farfara*, black medick *Medicago lupulina* and broad-leaved dock *Rumex obtusifolius*. There were also small areas mapped as bare ground (totalling 1.63 ha, 0.2%), and hardstanding (primarily existing roads) (33.98 ha, 4%).

8.6.3.3.9 Rare or Notable Plant Species

78 Aside from ancient woodland indicator species which are discussed above, no notable or rare plant species were recorded within the Application Boundary.

8.6.3.3.10 Non-Native Invasive Plant Species

79 Himalyan balsam was frequently recorded along a small stream approximately 80 m to the south of the Onshore Works at NT 729747.

8.6.3.3.11 Other Habitats Recorded in the Study Area not Affected by the Onshore Works

80 There were a number of additional habitat types mapped within the study area during the Phase 1 Habitat Survey and NVC Survey that will not be affected by the Onshore Works. These included coniferous plantation woodland, parkland, scattered trees, recently felled plantation woodland, mixed semi-natural woodland, small areas (<MMU) of calcareous grassland (CG10), wet heath and wet heath/acid grassland mosaic, open dunes, dune grassland and amenity grasslands. These unaffected habitats total 64.81 ha (7.17% of the study area), over half of which comprised the beach (18.5 ha) and areas which could not be surveyed (16.7 ha), such as private gardens and railways. A further description of these habitats can be found in **Appendix 8.1 Detailed Description of Habitats within Study Area.**

8.6.3.4 Results of GWDTE Appraisal

81 A summary of the GWDTEs recorded within 100 m of the Onshore Works is provided in **Table 8.6** below. The table summarises GWDTEs based on whether the relevant NVC communities occurred in isolation, or as a mosaic with other non-GWDTE NVC communities. The soft rush *Juncus effusus* vegetation for which it was not possible to allocate a NVC community is presented separately.

82 In total, 34.61 ha of habitat containing GWDTEs was recorded within 100 m of the Onshore Works. Of this, 8.39 ha was considered to be associated with riparian habitats and not wholly groundwater fed; these habitats are not considered any further in the impact assessment for GWDTEs. Including the *Juncus effusus* vegetation, 23.59 ha of this total area was considered to be truly GWDTE, either in part or wholly so.

83 Marshy grasslands (M23 and M9) comprise the vast majority of the GWDTEs within the 100 m buffer.

NVC type	Partial or entirely GWDTE	Total ha	Riparian	Partly Riparian/ Partly GWDTE	GWDTE
M15 - U4 - U5	partially	0.94	0.00	0.00	0.94
M19 M23	partially	1.50	0.00	0.00	1.50

NVC type	Partial or entirely GWDTE	Total ha	Riparian	Partly Riparian/ Partly GWDTE	GWDTE
M23a - U2 - U5	partially	5.83	0.00	0.00	5.83
M4 - M20 - M23a	partially	0.51	0.00	0.00	0.51
M4 - M23- U4b	partially	1.74	0.00	1.74	0.00
M23b - MG6b	partially	0.97	0.00	0.00	0.97
Totals for Partial GWDTEs		11.48	0.00	1.74	9.74
<i>Juncus effusus</i> vegetation	potentially	7.45	0.00	0.00	7.45
M16	yes	1.45	0.00	0.00	1.45
M23a	yes	9.40	7.05	0.90	1.45
M23a - M23b	yes	1.20	0.05	0.00	1.14
M23b	yes	1.34	0.24	0.00	1.10
MG9	yes	2.30	1.05	0.00	1.26
Totals for GWDTEs		15.69	8.39	0.90	6.40
Grand Total		34.61	8.39	2.64	23.59

Table 8.6: Summary of GWDTEs within 100 m of the Onshore Works

8.6.4 Valuation of Habitats

84 Using the ecological criteria for establishing the level of value of a receptor (see Table 8.2), the value of all habitat types within the Study Area are summarised in Table 8.7.

Habitat	Area (ha) within Study Area (% of Study Area)	Level of Ecological Value	GWDTE	Description
Arable	439.05 (52.3%)	Neighbourhood	No	Intensive arable land forms low grade habitat but owing to its large extent within the study area and potential to support arable weeds is valued at neighbourhood value.
Bare ground	1.63 (0.2%)	Neighbourhood	No	Low grade, commonplace habitat.
Blanket	0.65 (<0.1 %)	Council	No	Listed on Annex I of the Habitats Directive

Habitat	Area (ha) within Study Area (% of Study Area)	Level of Ecological Value	GWDTE	Description
bog				and a UK BAP Priority. Within the study area, it is largely degraded, comprising small, isolated patches surrounded by other lower value habitats. This habitat is likely to have formerly been more widespread in the western study area but owing to land use change it has declined. Remaining patches represent remnants which have avoided modification rather than blocks of coherent habitat and are therefore unlikely to contribute to the ecological integrity of blanket bog and other mire communities in the wider area. Therefore, not of International or National value.
Wet modified bog	4.87 (0.6 %)	District	No	Occurs in small, isolated patches. Evidence of recent disturbance indicating that it was formerly part of a more extensive block of mire vegetation. Partly overlaps with several UK BAP priority type. Adds diversity to mosaic of different habitat types.
Wet modified blanket bog / Acid Flush mosaic	0.39 (< 0.1 %)	District	No	Occurs in small, isolated patches. Evidence of recent disturbance indicating that it was formerly part of a more extensive block of mire vegetation. Partly overlaps with several UK BAP priority type. Adds diversity to mosaic of different habitat types.
Continuous bracken	8.75 (1.0 %)	Neighbourhood	No	Common and widespread.
Ephemeral / short perennial	2.17 (<0.3 %)	Neighbourhood	No	Common and widespread.
Improved grassland	140.02 (16.7 %)	Neighbourhood	No	Common and widespread.
Marshy grassland	36.20 (4.3 %)	National (M23) to Neighbourhood (MG9)	Yes	NVC types M23a and M23b vegetation qualify as a UK BAP Priority (Purple Moor-grass and Rush Pasture). NVC type MG9 vegetation and <i>Juncus effusus</i> dominated acidophilous vegetation (no NVC type) are common and widespread habitats.
Marshy grassland / Blanket bog	2.68 (0.1 %)	District	Partly (marshy grassland)	Occurs in one area to the northwest of the substation in small, isolated patches. Evidence of recent disturbance perhaps indicating that it was formerly part of a

Habitat	Area (ha) within Study Area (% of Study Area)	Level of Ecological Value	GWDTE	Description
mosaic			nd)	more extensive block of mire vegetation. Partly overlaps with several UK BAP Priority types but not fully. Adds diversity to mosaic of different habitat types.
Marshy grassland / Acid Flush / Blanket bog mosaic	0.5 (0.1 %)	District	Partly (marshy grassland)	Occurs in small, isolated patches. Evidence of recent disturbance indicating that it was formerly part of a more extensive block of mire vegetation. Partly overlaps with several UK BAP Priority types but not fully. Adds diversity to mosaic of different habitat types.
Semi-improved, acid grassland	7.81 (1.0 %)	Neighbourhood	No	Common and widespread and extensive evidence of agricultural improvement.
Poor semi-improved grassland	12.94 (1.5 %)	Neighbourhood	Partly	Common and widespread with evidence of agricultural improvement.
Semi-improved, neutral grassland, with and without scattered scrub	21.56 (2.6 %)	Neighbourhood	Partly	Both NVC types MG1 and MG9 are common and widespread habitats.
Semi-improved neutral grassland / Marshy grassland mosaic	2.17 (0.3 %)	Neighbourhood	Yes	A single area of this habitat was recorded comprising NVC type M23b in an intricate mosaic with NVC type MG6b. This association is relatively widespread in the uplands and did not contain any notable plant species.
Unimproved acid grassland	24.17 (2.9 %)	Neighbourhood	No	Both U4a and U5 NVC types are common and widespread in the uplands.
Hardstanding	33.98 (4.0 %)	<Neighbourhood	No	Negligible nature conservation value.
Dry heath	2.03 (0.2 %)	National	No	NVC type H12 is a UK BAP Priority type (Upland Heathland).
Dry heath / Acid Grassland mosaic	0.87 (0.1 %)	District	No	NVC type H12 is a UK BAP Priority type (Upland Heathland). Acid grassland is common and widespread. This habitat was mainly noted in areas which had been

Habitat	Area (ha) within Study Area (% of Study Area)	Level of Ecological Value	GWDTE	Description
				disturbed. This vegetation was rarely of BAP quality (lacked species diversity).
Open dune / coastal grassland mosaic	0.64 (0.1%)	Neighbourhood	No	This habitat overlaps with several UK BAP Priority types but was heavily disturbed and with limited scope for restoration as it was largely confined behind a sea wall.
Other [rock] exposure	0.08 (<0.1 %)	District	No	Phase 1 Habitat Survey code denotes a rocky stream bed. Although no notable riparian vegetation was recorded at this location, this habitat would be included as a BAP Priority (Burns and Rivers).
Scrub (dense and scattered)	7.64 (0.9 %)	Neighbourhood	No	Common and widespread.
Tall ruderal	1.58 (0.2 %)	Neighbourhood	No	Common and widespread.
Broad-leaved semi-natural woodland	16.01 (1.9 %)	Neighbourhood (willow woodland at Thornton Burn) to National (UK BAP Priority stands)	No	Certain patches were not rich in ancient woodland indicator species and showed signs of eutrophication and/or invasive species. However, they were still relative species-rich and naturalistic habitats in an otherwise intensively farmed landscape and were valued as being of District importance. All areas classified as NVC type W9 may be classified as a UK BAP Priority Habitat type (Upland Mixed Ashwoods) or a Local BAP Priority Habitat type (Upland Oak/Ash Woodland) depending on species-richness and structural diversity.
Broad-leaved plantation woodland	4.4 (0.5 %)	District	No	Appreciably enrich the District habitat resource.
Mixed plantation Woodland	1.64 (0.2 %)	District	No	Appreciably enrich the District habitat resource.
Standing water	0.05 (<0.1%)	District	No	Appreciably enrich the District habitat resource.
TOTAL	777.74 (92.6%)			
Hedgerow	1,258 m	Council	No	Hedgerows represent a viable area of key habitat identified in council area BAPs and are essential to maintain the viability of this ecological resource. The hedgerows

Habitat	Area (ha) within Study Area (% of Study Area)	Level of Ecological Value	GWDTE	Description
				recorded do not generally represent 'Important Hedgerows' as defined by the Hedgerow Regulations 1997 (the regulations are not applicable in Scotland but of relevance in ecological valuation terms). Hedges to be affected by the Onshore Works were all considered to be of relatively low nature conservation value as no protected, notable or diverse ground flora assemblages were recorded, all were regularly cut and arable cultivation typically occurred within 1 m of its base. The majority of the hedges were narrow, poor in shrub species and defunct.
Running water	12,669 m	National	No	The watercourses onsite are generally small, but are important as habitats in their own right and for the ecological connectivity which they provide and their position within wider hydro-ecological systems.
Other non-affected habitats	64.81ha (7.2%)	Various	Various	Includes amenity grassland, buildings, coniferous plantation woodland and recently felled coniferous plantation, dune grassland, various marshy grassland/acid grassland mosaics, mixed semi-natural woodland. Also open dunes, parkland habitats, scattered trees and scrub, and wet heaths (with and without acid grassland mosaics). This total area also includes the beach and areas which could not be surveyed (e.g. private gardens and railways).

Table 8.7: Ecological Value of Phase 1 Habitats

8.6.5 Badger

8.6.5.1 Legislation and Policy

- 85 Badger and its setts are protected in the UK by the Protection of Badgers Act 1992 (as amended) and strengthened by the Wildlife and Natural Environment (Scotland) Act 2011. This makes it illegal to wilfully kill, injure or take a badger or attempt to do so, cruelly ill-treat a badger, interfere with a sett by damaging it or any part of it, destroying it, obstructing access to it or disturbing a badger while it is occupying a sett.
- 86 SNH is responsible for issuing licences under the Protection of Badgers Act 1992 (as amended) for the purpose of development. As a general rule of thumb, it is considered that any development within 30 m of a badger sett entrance could result in disturbance and the need for a licence should be reviewed.

8.6.5.2 Methodology

8.6.5.2.1 Desk Study

- 87 Data supplied by WICLB for the study area plus an approximate 1 km buffer were reviewed for badger records. No additional data was available from the Lothian and the Borders Badger Group (LBBG) for this search area.

8.6.5.2.2 Field Survey

- 88 A badger survey was carried out by experienced surveyors across four man days during July 2011. The survey methodology described by Harris *et al.* (1989) was adopted to identify badger signs, including paths, prints, latrines, hair and shelters. The survey mainly focussed on suitable badger habitats within the study area which included woodland, grassland, hedgerows and road verges. All identified badger signs were noted and their location was recorded using a hand-held GPS. Survey findings were subsequently digitised using GIS.
- 89 A small number of areas of dense hawthorn, gorse and bramble scrub could not be accessed directly owing to the density of the vegetation. In these instances, surveyors paid particular attention to the edges of the scrub to record if any latrines, paths or other field signs were present indicating that a sett may be present within the scrub.

8.6.5.3 Results

- 90 Badger survey findings are detailed in the confidential annex provided only to SNH and East Lothian Council due to animal protection issues. A summary of the results is presented below.

8.6.5.3.1 Desk Study

- 91 WICLB provided twenty records of badger dating between 1976-2002 within approximately 1 km of the study area.

8.6.5.3.2 Field Survey

- 92 Four active outlier setts were recorded within the study area. None of these however were within the Onshore Works area.
- 93 Signs of badger were relatively scarce in the study area given that suitable badger habitats were frequent across the landscape (e.g., broad-leaved woodland and hedgerows).

8.6.6 Bats

8.6.6.1 Introduction

- 94 All British bats are protected by the Conservation (Natural Habitats, &c.) Regulations 1994. This legislation makes it an offence to:
- capture, harass, injure or kill a bat;
 - obstruct access to, damage or destroy a breeding or other resting place of a bat;
 - disturb bats in such a way as is likely to affect their distribution or abundance; or
 - disturb bats in such a way as is likely to impair their ability to survive or breed.
- 95 Each of these actions is considered to be an offence whether the action is deliberate or reckless, except in the case of damaging or destroying a breeding site or resting place which is a strict liability offence. A licence is required for all developments which will affect areas known to contain bat roosts.
- 96 Bats use different structures, especially trees, at different times of the year for roosting purposes and it is possible to find bats in trees throughout the year. As bats tend to re-use the same places to breed and shelter (roost sites), legal opinion is that the roost is protected whether or not the bats are present at the time.
- 97 Apart from roost sites, bats require feeding sites and flyways (which allow them to navigate between roost and feeding sites) to survive. Bats use linear landscape features such as tree lines and stream and river valleys as flyways. Loss of integrity of these features by gaps of approximately 30 m can make them unusable for navigation, and can lead to detrimental effects on local bat populations.

8.6.6.2 Methodology

- 98 The bat assessment was undertaken in three stages as agreed with SNH¹⁷:
- biological records were reviewed by LUC to gain an understanding of which species may be present within the study area;
 - LUC commissioned T&SS to carry out an assessment of bat habitat within the study area to identify the relative value of different habitats/habitat features (T&SS, 2011a);
 - bat activity and emergence surveys were undertaken by T&SS (T&SS, 2011b), targeting habitat areas which were identified as being of value to bats with potential to be affected directly or indirectly by the Onshore Works.
- 99 The full T&SS reports are included as **Appendix 8.4 Bat Activity Surveys**.

8.6.6.2.1 Desk Study and Habitat Assessment

- 100 Data supplied by WICLB and the National Biodiversity Network, covering an approximate 1 km buffer around the study area, were reviewed for bat records.
- 101 An assessment was made of all habitats within a 100 m buffer either side of the Onshore Works for their potential value to bats for roosting, hibernating, foraging and commuting (T&SS, 2011a). The assessment was undertaken in July 2011, based on available guidance on assessing bat habitats (BCT, 2007a; Entwistle *et al.*, 2001; English Nature, 2004). Each habitat feature was assessed as being high, medium or low in respect of its value to bats (see **Table 8.8**).

Value of bat habitat	Roosting and hibernating features	Foraging and commuting features
High	Buildings with roof spaces and external features accessible to bats. Other built structures with spaces for roosting or hibernating (e.g., bridges). Trees with features which may support a bat roost (e.g., cavities, fissure, flaking bark).	Woodland with mature trees, an open structure or areas of accessible woodland edge. Semi-natural grassland and scrub. River corridors, ponds and wetlands. Hedgerows linking one or more roosting or foraging features.
Medium	Buildings, structures or trees with less potential for bat access.	Woodland with a closed structure. Improved grassland. Defunct hedgerows. Small streams.
Low	Newly or recently renovated buildings, with few access points for bats. Young/semi-mature trees with no potential for bat roosting.	Habitats with little potential to support bat foraging or commuting, such as immature woodland, amenity grassland, arable field and areas of hardstanding.

Table 8.8: Description of Bat Habitat Assessment classes (based on T&SS, 2011a)

8.6.6.2.2 Field Survey

- 102 The habitat assessment identified a number of features within the study area which were considered to have high or medium potential to support bat roosting, commuting or foraging. Bat activity and emergence/re-entry surveys targeted high or medium features with potential to be directly or indirectly affected by the Onshore Works. Low potential features and those which were distant from the Onshore Works (i.e., highly unlikely to be affected) were not surveyed further.
- 103 Three locations were selected for further survey: Features 17, 18 and 23 (see **Figure 8.5**). Dates, timings and weather conditions for all surveys are presented in **Appendix 8.4 Bat Activity Surveys**.

¹⁷ Email correspondence between T&SS and Scottish Natural Heritage Operations Officer (Planning – Lothians), 16th August 2011.

- 104 Dusk/dawn surveys were undertaken at Features 17, 18 and 23 which were identified by the habitat assessment as having high roosting potential for bats and which had the potential to be directly affected by the Onshore Works. Best practice guidance was followed for bat activity and emergence surveys (BCT, 2007a; JNCC, 2004). Recordings of bat activity were made with an Anabat SD1 and surveyors were positioned to observe activity for a period of 1.5 to 2 hours after sunset/before sunrise on six occasions between 3 - 25 September 2011. Whilst September is sub-optimal for identifying bat maternity roosts, information on bat activity and habitat use suitable for assessing effects can still be gained. This approach was agreed with SNH.
- 105 Digital recordings of bat echolocation calls from dusk/dawn surveys were subsequently analysed using Bat Sound v4.1 (Pettersen 2011). Recordings were compared with available literature on the identification of bat calls and archive recordings held by T&SS.

8.6.6.3 Results

8.6.6.3.1 Desk Study and Habitat Assessment

- 106 WICLB data included a single bat record relating to a common pipistrelle *Pipistrellus pipistrellus* from the 10 x 10 km grid square NT77, which encompasses most of the eastern half of the study area.
- 107 A number of features were classified as being of high or medium value for bat roosting, foraging or commuting within the study area. However, only three such features have potential to be directly or indirectly affected by the Onshore Works. These were selected for further survey (**Table 8.9**).

8.6.6.3.2 Field Survey

- 108 No evidence was found of bat roosting in any areas targeted for activity/emergence survey. Three confirmed bat species and one bat which could only be identified to genus level were recorded foraging and commuting within the areas surveyed:
- common pipistrelle;
 - soprano pipistrelle *Pipistrellus pygmaeus*;
 - noctule *Nyctalus noctula*;
 - a bat of the *Myotis* genus which could not be identified to species level.
- 109 Regular bat foraging activity and a smaller amount of commuting were recorded at features 17 and 23. In contrast, Feature 18 had a small amount of bat activity. The results of the bat activity and emergence surveys are included in **Table 8.9**.

Habitat feature surveyed (see Figure 8.6)	Bat habitat assessment and proximity to the Onshore Works	Proximity to Onshore Works	Dusk re-entry survey	Dawn survey 1	Dawn survey 2
17 Whittley Strip	Broad-leaved, semi-natural woodland with several mature trees which may have potential to support roosting bats. Habitat links to Features 18 and 23.	Within 25 m of the Onshore Works.	Foraging activity was recorded and observed c. 20 minutes after sunset of soprano pipistrelle <i>Pipistrellus pygmaeus</i> , with small numbers of common pipistrelle <i>Pipistrellus pipistrellus</i> c. 30 minutes later.	Foraging activity was observed c. 36 mins before sunrise. Soprano pipistrelle with a single <i>Myotis</i> genus bat pass. No swarming observed.	A small number of bat passes up to c. 35 mins. before sunrise. Predominantly soprano pipistrelle with two common pipistrelle and one <i>Myotis</i> species. No swarming observed.

Habitat feature surveyed (see Figure 8.6)	Bat habitat assessment and proximity to the Onshore Works	Proximity to Onshore Works	Dusk re-entry survey	Dawn survey 1	Dawn survey 2
			No emergence observed.		
18 Birky Bog Plantation	Broad-leaved, semi-natural woodland with low roosting potential but high potential to support bat commuting and foraging. Habitat links to Feature 17.	Within the Onshore Works.	Little activity. Small number (six) of bat passes from some 30 minutes after sunset. All observed as foraging bats coming from and returning to south. No emergence observed.	No activity.	No activity.
23 Woodland strip to the northwest of Thurston Mains	Broad-leaved, semi-natural woodland with low roosting potential but high potential to support bat commuting and foraging. Habitat links to Feature 17 and 18.	Within the Onshore Works.	Foraging and commuting activity observed and recorded from some 26 minutes after sunset. Predominantly soprano pipistrelle with some common pipistrelle later. No emergence observed.	Foraging and commuting activity until some 31 minutes before sunrise, predominantly soprano pipistrelle with some common pipistrelle and single <i>Myotis</i> genus bat and noctule <i>Nyctalus noctula</i> . No swarming observed.	Small amount of foraging until some 51 minutes before sunrise. All soprano pipistrelle. No swarming observed.

Table 8.9: Habitat Features selected for further survey following Bat Habitat Assessment

8.6.7 Great Crested Newt

8.6.7.1 Introduction

110 GCN is a European Protected Species listed on Schedule 2 of The Conservation (Natural Habitats, &c.) Regulations 1994. In summary, it is an offence to:

- deliberately or recklessly capture, injure or kill a GCN;
- deliberately or recklessly disturb a GCN in a way that is likely to impair breeding, survival, reproduction or hibernation or affect local distribution or abundance; and
- damage or destroy a breeding site or resting place of a GCN.

111 GCN is also listed on the UK BAP and East Lothian BAP.

112 It is generally accepted that GCN are known to roam 500 m from a breeding site where suitable habitat exists, therefore, potential effects should be assessed within this radius.

8.6.7.2 Methodology

8.6.7.2.1 Desk Study

113 In April 2011, all waterbodies within 500 m of the site were identified using aerial photography and 1:25,000 Ordnance Survey maps. Historical biological records for GCN were reviewed. Following the Phase 1 Habitat Survey in May 2011, two further waterbodies were identified.

8.6.7.2.2 Habitat Assessment

114 The Habitat Suitability Index (HSI) approach (Oldham et al., 2000) can be used to guide survey effort and subsequent mitigation or enhancement for GCN aquatic habitats. The HSI incorporates ten parameters of habitat quality, including location within the UK in respect of known GCN distribution, water area, permanence, quality and shading, and presence of predators. All waterbodies within 500 m of the study area were visited in April 2011, with the exception of Waterbodies 10 and 11 which were visited in June 2011 during the Phase 1 Habitat Survey. The HSI score was calculated for each waterbody identified during the desk study. ARG (2010) have produced a categorisation of potential GCN aquatic habitat based on HSI scores: poor (< 0.5); below average (0.5 to 0.59); average (0.6 to 0.69); good (0.7 to 0.79); and excellent (> 0.8). This system was used to qualitatively describe each pond listed

8.6.7.2.3 Field Survey

115 Waterbodies 7, 9 and 11 were surveyed in line with best practice survey guidance (English Nature, 2001) to identify presence and/or likely absence of GCN. Surveys of Waterbodies 7 and 9 were carried out by T&SS on the nights of 16, 17 and 18, and 22, 23 and 24 May 2011. Survey of Waterbody 11 was carried out by LUC on the nights of 17 and 18 April and 11 and 16 May 2012. All surveys included the core period of GCN activity. Three methods of survey, including egg searching, torching and bottle trapping, were used to detect GCN, and four survey visits were employed to detect presence/likely absence.

8.6.7.3 Results

8.6.7.3.1 Desk Study

116 All waterbodies are mapped in **Figure 8.6** with OS grid references provided in **Appendix 8.5**.

117 No historical records of GCN were supplied by WICLB.

8.6.7.3.2 Habitat Assessment

118 The habitat assessment is presented in **Table 8.10** with a summary of the HSI data. Raw data for the HSI assessment are presented in **Appendix 8.5**.

Waterbody	HSI Score	HSI Category	Summary of HSI and connectivity to Onshore Works
1. Pond west of Torness Power Station (NT 73673 75430)	0.50	Below average	Pond contains poor quality, brackish water and is separated from the Onshore Works by >500 m and a major road.
2. Two small lagoons on landfill site (NT 72421 75378)	0.43	Poor	Artificial lined lagoon with no vegetation and surrounded by expanses of poor terrestrial GCN habitat. The final alignment of the Onshore Works are >500 m away and separated by expanses of arable farmland.

Waterbody	HSI Score	HSI Category	Summary of HSI and connectivity to Onshore Works
3. Large lagoon on landfill site (NT 72085 75684)	0.60	Average	Lagoon surrounded by poor terrestrial GCN habitat and with no aquatic vegetation. The final alignment Onshore Works are >500 m away and separated by expanses of arable farmland.
4. Small lake in Thurston Manor Campsite (NT 71009 74665)	0.27	Poor	Wildfowl frequent. Stocked with rainbow trout. Sparse marginal vegetation. The Onshore Works are >500 m from this waterbody and separated from it by fast flowing stream and several roads.
5. Thurston Mains (NT 71225 73044)	No standing water present.	N/A	N/A
6. Woodhall Farm (east pond) (NT 68896 72535)	0.64	Below average	Succession to willow <i>Salix</i> sp. carr and swamp with a small number of puddles of water, each of which was < 5 m ² and was choked with vegetation. May hold some potential for GCN breeding but not possible to bottle trap, torch or net. The area of 50 m ² for Waterbody 6 provided in the HSI assessment (Appendix 8.5) is the approximate cumulative total of all the puddles.
7. Woodhall Farm (west pond) (NT 68668 72492)	0.75	Good	Suitable terrestrial and aquatic habitat. Potential to support breeding GCN.
8. The Dod (NT 68698 72720)	Waterbody not present.	N/A	N/A
9. Pond south of The Brunt (NT 68504 73167)	0.67	Average	Suitable terrestrial and aquatic habitat. Potential to support breeding GCN. >500 m from the final alignment of the Onshore Works.
10. Wildlife pond in Thurston Manor Campsite (NT 7120 7401)	No standing water present.	N/A	N/A
11. Pond in Birky Bog Plantation (NT 6974 7327)	0.65	Average	Suitable terrestrial and aquatic habitat. Potential to support breeding GCN.

Table 8.10: Great Crested Newt Waterbody Habitat Suitability Index

119 Presence/likely absence surveys were carried out at Waterbodies 7, 9 and 11 as they were considered suitable to support GCN.

120 Waterbodies 1, 2, 3 and 4 are not considered further in the EclA as they lacked connectivity to the Onshore Works and/or were located >500 m from the final alignment of the Onshore Works. Waterbodies 5, 8 and 10 were also excluded as they were not found to hold water. Waterbody 6 contained some suitable habitat for GCN, although open water was restricted to numerous small, shallow puddles <5 m² in area and <10 cm in depth and were choked with vegetation. This waterbody could not be bottle trapped, torched or netted for GCN. Nevertheless, however, it is only 15 m away from Waterbody 7 and is connected by suitable GCN foraging and commuting habitat. In addition, Waterbody 7 had a higher HSI score. If GCN were present in Waterbody 7, they would also be expected to be present in Waterbody 6.

8.6.7.3.3 Field Survey

121 No GCN were recorded, and therefore GCN is not considered further in this assessment.

8.6.8 Otter

8.6.8.1 Legislation and Policy

122 The otter *Lutra lutra* is a European Protected Species, protected by the Conservation (Natural Habitats, &c.) Regulations 1994. This legislation makes it an offence to:

- capture, harass, injure or kill an otter;
- obstruct access to, damage or destroy a breeding site or resting place of an otter;
- disturb an otter in such a way as is likely to affect their distribution or abundance; or
- disturb an otter in such a way as is likely to impair their ability to survive or breed.

123 Each of these actions is considered to be an offence whether the action is deliberate or reckless, except in the case of damaging or destroying a breeding site or resting place, which is a strict liability offence i.e. there is no defence for destroying a breeding site or resting place.

124 A licence is required for all developments that will affect otter. Disturbance is defined by SNH as any new impact occurring within a *minimum* of 30 m of an otter shelter (SNH, undated b). This distance is likely to increase for high impact activities such as blasting or track-laying, or in remote locations or where the shelter in question is regarded as being high-status. If breeding is suspected, SNH might request a non-intervention zone of 100 to 200 m or that work be suspended pending further investigation (SNH, undated b).

125 Otter is also listed as a Priority Species in the UK BAP.

8.6.8.2 Methodology

8.6.8.2.1 Desk Study

126 Biological records received from WICLB were reviewed for the presence of otter records within 1 km of the Onshore Works.

8.6.8.2.2 Field Survey

127 All watercourses and waterbodies within 250 m of the Onshore Works were surveyed for evidence of otter by experienced surveyors, over four man days in July 2011. This involved searching for otter signs including faeces (spraints), shelters, feeding remains, slides, prints and tracks. Otter survey was carried out under optimal weather conditions, during periods of normal water levels in watercourses. All signs of otter activity, including confirmed and potential shelters, were noted and their location recorded using a hand-held GPS. Survey findings were subsequently digitised in GIS.

8.6.8.3 Results

8.6.8.3.1 Desk Study

128 No records of otter were identified within 1 km of the Onshore Works.

8.6.8.3.2 Field Survey

- 129 Survey was completed along approximately 13 km of watercourse. The findings are mapped in **Figure 8.7** and summarised in **Appendix 8.6**.
- 130 No otter shelters were recorded within the final alignment of the Onshore Works. The nearest holt was on the Dry Burn over 500 m northwest of the final alignment of the Onshore Works. The holt was situated within an extensive network of cavities between large rocks at the base of the river embankment. Several piles of spraint of varying age were recorded within the holt cavity.
- 131 The Dry Burn also supported several potential otter holts within cavities between large rocks in the river embankment and a dry/disused drainage pipe on the Dry Burn at the western edge of the culvert beneath the A1. The closest of these potential holts was located over 550 m from the Onshore Works. The structure of these potential holts prevented detailed inspection but spraint was frequently recorded in the vicinity of suitable cavities, and the river embankment along this section had the potential to provide otter shelters of varying status ranging from occasional lie-ups to natal holts.
- 132 Three otter lie-ups were recorded on the Boonslie Burn, located between 135 m and 190 m to the west of the Onshore Works. Each of these shelters comprised a dry recess within the riverbank beneath overhanging tree roots. Several spraints were recorded within each lie-up. The Boonslie Burn forms part of the Woodhall Dean SSSI and is likely to provide excellent opportunities for otter movement, foraging, shelter and breeding.
- 133 Three old spraint sites were recorded along the Thornton Burn to the east of the A1. Dense gorse scrub along the northern edge of the Thornton Burn may provide sheltering opportunities for otter. The edge of the gorse scrub was checked and no paths or other field signs were noted. This watercourse is likely to provide an important movement corridor for otter, connecting the wooded inland valleys of the Thornton Burn, Braidwood Burn and Thurston Mains Burn with suitable coastal habitat.
- 134 Two spraint sites, one with fresh spraint, were recorded on the Tay Burn between 300 m and 500 m southeast of the Crystal-Rig Wind Farm substation. This burn is likely to be used for foraging and as a movement corridor.

8.6.9 Reptiles

8.6.9.1 Legislation and Policy

- 135 All three native reptiles in Scotland, adder *Vipera berus*, slow worm *Anguis fragilis* and common lizard *Zootoca vivipara* are protected under the Wildlife and Countryside Act 1981, (as amended) and the Nature Conservation (Scotland) Act 2004 against intentional or reckless killing, injury and sale (or advertising for sale)¹⁸.

8.6.9.2 Methodology

8.6.9.2.1 Desk Study

- 136 Biological records received from WICLB were reviewed for the presence of reptile records within 1 km of the Onshore Works.

8.6.9.2.2 Assessment of Reptile Habitat Suitability

- 137 Adder, slow worm and common lizard are species with similar habitat preferences, requiring habitat that provides cover and food as well as basking opportunities. The common lizard is frequently found in locations with an open aspect and good locations for basking, such as heath and moorland, including wet heaths and bogs, and grasslands with a varied structure where abundant invertebrates provide feeding opportunities. Adder and slow worm are also typical of heathland and grassland areas but tend to remain close to areas of cover or denser vegetation. All three species hibernate in a range of features including piles of rocks, mammal burrows and log piles. Reptile species emerge from hibernation in spring time and are generally active until mid-autumn.
- 138 The reptile habitat assessment sought to identify areas that could provide optimal opportunities for reptile shelter, basking and foraging. Particular focus was given to larger areas of habitat and/or those with good connectivity to suitable reptile habitat in the wider landscape. The habitat assessment considered the entire study area but

¹⁸ There are also recent records of grass snake in southern Scotland (e.g. *British Wildlife* 2011); however, this species is generally considered to be rare or absent in Scotland.

particular attention was paid to habitat overlapping or close to the Onshore Works. The approach used several parameters of habitat quality, including vegetation structure, likely prey abundance, aspect and topography, connectivity, levels of disturbance and the presence of suitable refuges and hibernation sites. The assessment was supplemented by incidental sightings of reptiles made during other faunal and habitat surveys. Whilst it is recognised that this is not a survey of reptile presence or population size, given the nature and extent of potential effects, this was considered to be a pragmatic approach to guide an effect assessment and subsequent mitigation.

8.6.9.3 Results

8.6.9.3.1 Desk Study

- 139 Numerous records of adder were identified from Woodhall Dean SSSI, approximately 400 m to the west of the Onshore Works at Woodhall.
- 140 A common lizard was recorded at NT66566699 during the Phase 1 Habitat Survey, basking at the base of a tussock of rushes *Juncus* sp. within an area of marshy grassland north of the Crystal Rig substation.

8.6.9.3.2 Habitat Assessment

- 141 Suitable reptile habitat within the area of the Onshore Works is mapped in **Figure 8.8**. Short grazed pasture, arable crops, densely shaded woodland and small isolated grassland verges were considered unsuitable for reptiles. Suitable reptile habitat within the area of the Onshore Works was minimal and where it occurred, it was typically of limited extent, recently established and ecologically isolated.
- 142 Areas of notably high suitability for reptiles within the area of the Onshore Works included:
- marshy grassland and heathland habitats associated with the uppermost reaches of the Boonslie Burn;
 - mire, heathland and grassland habitats at the southern extent of the Onshore Works;
 - south facing slopes of the Thorter Cleugh Burn;
 - rough grassland and scattered scrub habitats within the Birky Bog Plantation;
 - rough grassland and scrub habitats close to the junction of the A1 and Innerwick Road.

8.6.10 Water vole

8.6.10.1 Legislation and Policy

- 143 The water vole *Arvicola amphibius* is protected by the Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004. It is an offence to:
- intentionally or recklessly disturb a water vole in its place of shelter, or
 - intentionally or recklessly damage, destroy or obstruct access to its shelter.

- 144 In 2011, both of these Acts were amended by the Wildlife and Natural Environment (Scotland) Act 2011. Sections 18(2)(a) and (b) of that Act amends section 16 (power to grant licences) of the Wildlife and Countryside Act 1981 to enable licensable activities (including the disturbance of water vole and destruction of burrows) to be undertaken providing that the activity authorised by the licence is for any social, economic or environmental purpose; and that there is no other satisfactory solution. Water vole is also a priority species on the UK Biodiversity Action Plan.

- 145 Upland water vole colonies assume greater significance for the conservation of the species because they occur above the level of habitat management activities most detrimental to water vole habitat (e.g. drainage, over-grazing, bank maintenance), and beyond the core activity zone of feral mink, which is the species main predator. The water vole is a relatively habitat-specific species, favouring densely-vegetated, slow or sluggish watercourses or static waterbodies with soft, steep banks, suitable for burrowing. In the UK, water vole distribution extends to at least 600 m AOD, with presence being confined to watercourses with a stream gradient <3%.

8.6.10.2 Methodology

8.6.10.2.1 Desk Study

- 146 Biological records received from WICLB were reviewed for the presence of water vole records within 1 km of the Onshore Works.

8.6.10.2.2 Field Survey

147 It was determined that detailed water vole survey was not required, based on an appraisal of water vole habitat suitability during the Extended Phase 1 Habitat Survey and inspections of watercourses for signs of otter. No signs of water vole were observed during the otter survey. Riparian habitats within the site were largely restricted to heavily shaded, fast flowing, often shallow watercourses which were considered unsuitable for supporting water vole populations. Where small areas of suitable habitat occurred, such as marshy grassland, they were relatively isolated, lacked suitable habitat for burrows and were too small to sustain water vole populations.

8.6.10.3 Results

8.6.10.3.1 Desk Study

148 No records of water vole were identified within 1 km of the Onshore Works.

8.6.10.3.2 Field Survey

149 No evidence of water vole was recorded during the otter surveys. Given the lack of suitable habitat within the Onshore Works area, and absence of field signs for this species, water vole is not considered further in this assessment.

8.6.11 Birds

8.6.11.1 Legislation and Policy

150 It is an offence under Section 1 of the Wildlife and Countryside Act 1981 to intentionally or recklessly kill injure or take any wild bird or to take, damage or destroy the nest of any wild bird while it is in use or being built.

151 The assessment of effects on birds considers potential effects on breeding birds and focuses on species of conservation concern which could potentially be affected by the Onshore Works. Particular attention has been given to species listed on the following:

- Schedule 1 of the Wildlife and Countryside Act 1981 (as amended);
- Annex I of the Birds Directive;
- Birds of Conservation Concern (BOCC) 3 Red List (Eaton *et al.*, 2009);
- UK Biodiversity Action Plan species list;
- Species not listed on any of the above but which are known to be sensitive to disturbance (buzzard, sparrowhawk and kestrel).

8.6.11.2 Methodology

8.6.11.2.1 Desk Study

152 A review was undertaken of historical records of birds of conservation concern obtained from the Scottish Ornithologists' Club (SOC) and their publication 'The Birds of Scotland' was reviewed for information on the current conservation status of species of interest.

8.6.11.2.2 Field Survey

153 Field surveys were undertaken on five occasions between April and July 2011 with one visit undertaken in June 2012 which covered part of the route which was not covered in the 2011 surveys following a change to the proposed route of the Onshore Works. All surveys were undertaken in fine, calm weather. The route corridor comprises four distinct habitats (further details can be found in **Appendix 8.9: Bird Surveys Technical Report**):

- Coastal: mainly sandy beach but also some rocky coast and reef. The coast at Thorntonloch is subject to high levels of human recreational disturbance.
- Arable farmland: intensive agricultural farmland below about 160m AOD which is dominated by intensive wheat production with small areas of Grass ley, potatoes and barley.
- Moorland/extensive pasture: dominates habitats within the survey area between 160 and 334m AOD.
- Woodland: small broad-leaved woodland present in several places along the route corridor.

154 The bird survey methods used for each habitat type differed slightly, but in all cases involved making a series of visits, walking across the area and marking the locations of birds seen or heard on enlarged 1:25,000 OS field maps.

155 Coastal habitats were surveyed by simple observational methods following the British Trust for Ornithology method for Non-Estuarine Shorebird Surveys and standard methods for counting breeding seabirds. Visits were made at low-tide to check for birds feeding in inter-tidal areas and also at high tide to check for roost sites.

156 Arable farmland was surveyed using the Common Bird Census method. Surveys were only conducted in relatively calm, fine conditions to facilitate detection of singing birds.

157 Moorland and extensive pasture habitats were surveyed using the Moorland Bird Survey method. Areas of habitat suitable for black grouse were also examined for signs of this species albeit that the extent of such areas was limited.

158 Woodland areas were examined for nesting raptors and other species of conservation interest. Common woodland species were not surveyed in detail but those seen or heard during the survey were noted

8.6.11.3 Results

8.6.11.3.1 Desk Study

159 Information on the status of fourteen species of conservation concern which are considered in detail was obtained from the Scottish Bird Report (SOC website). Further detail on the 14 species is provided below and in **Appendix 8.9**.

8.6.11.3.2 Field Survey

160 Within the coastal habitats, 17 species of seabird and waders were recorded and the numbers were generally low. There was no evidence of these species breeding within the survey area and nothing to indicate that it is an important feeding or roost site for SPA birds. Full details of the species recorded are provided in **Appendix 8.9**.

161 Within the terrestrial habitats (arable farmland, moorland/extensive pasture and woodland), a total of 40 bird species were recorded, all of which were likely to be breeding locally. **Table 8.11** below details the findings of the survey for 14 species which were recorded during the survey and which are considered to be of most relevance to the assessment in light of their conservation status or sensitivity to potential effects of the Onshore Works.

Species	Conservation Status	Survey Findings
Peregrine	Listed on Annex I of the Birds Directive and on Schedule 1 of the Wildlife and Countryside Act 1981. Scarce breeding species in south-east Scotland.	Peregrine were seen on two occasions in 2011 during the surveys, on both occasions in the vicinity of Torness power station where they are known to nest.
Kestrel	A common breeding species in south-east Scotland.	Kestrel were seen hunting over rough pasture near Crystal Rig on two occasions in 2011. There was no evidence of nesting within the route corridor.
Buzzard	A common breeding species in south-east Scotland.	Buzzards were seen on three survey visits in 2011.
Quail	Listed on Schedule 1 of the Wildlife and Countryside Act 1981 and is a scarce breeding species in south-east Scotland.	Calling quail were recorded on two survey visits in 2011 and it is considered likely that these represent breeding attempts.
Lapwing	Listed on the BOCC Red List and is a UK BAP species but is common in south-east Scotland.	Breeding lapwing were recorded on two survey visits in 2011.
Curlew	Curlew is a UK BAP species but is common in south-east Scotland.	Three pairs were recorded as breeding during the 2011 surveys.
Skylark	Listed on the BOCC Red List and is a UK BAP species but it is common in south-	Six pairs were recorded as breeding during the 2011 surveys. This is considered to be low given

Species	Conservation Status	Survey Findings
	east Scotland.	the extent of available suitable habitat.
Redstart	Listed on the BOCC Amber List. Uncommon breeding summer visitor.	A recently fledged juvenile was seen in an area of suitable breeding habitat and is likely to indicate successful breeding.
Whinchat	Listed on the BOCC Amber List. Uncommon summer visitor.	Whinchat were seen on two occasions during the 2011 surveys.
Tree Sparrow	Listed on the BOCC Red List and is a UK BAP species but is a fairly common breeding species in south-east Scotland.	Pairs (probably breeding) were recorded on two survey visits in 2011.
Linnet	Listed on the BOCC Red List and is a UK BAP species but is a common species in south-east Scotland.	Six breeding pairs recorded during 2011 surveys.
Reed Bunting	UK BAP species but common in south-east Scotland.	Recorded on three survey visits in 2011.
Yellowhammer	Listed on the BOCC Red List and as a UK BAP species but is common in south-east Scotland.	Recorded on three survey visits in 2011.
Black Grouse	Listed on the BOCC Red List and as a UK BAP species.	No sightings or signs recorded and the survey corridor contained very limited suitable habitat for this species.

Table 8.11: Summary of Bird Survey Findings

8.6.12 Valuation of Faunal Receptors

162 Using the ecological criteria for establishing the level of value of a receptor (see **Table 8.2**), the value of all faunal receptors is summarised below in **Table 8.12**.

Faunal Receptor	Value	Description
Bats	Council	Although bats are protected by the Habitats Directive, no bat roosts were recorded within the study area and survey evidence has demonstrated that bat activity within the Onshore Works is limited to relatively low numbers of common species using areas of broadleaved woodland which will not be adversely affected. Furthermore, woodland habitat and river corridors outside the Onshore Works are likely to be of much higher value to bat species. Therefore, the area covered by the Onshore Works is likely to be of Council value to bat species.
Badger	District	Badger is relatively common in the wider landscape of East Lothian but evidence of badger within the study area is relatively scarce. No setts were recorded within 50 m of the Onshore Works. The vast majority of the area covered by the Onshore Works including arable and upland habitats is not used by badger. Survey evidence has demonstrated that badger move through the Onshore Works area, particularly utilising linear woodland corridors and therefore the Onshore Works area is considered to be of

Faunal Receptor	Value	Description
		District value for badger.
Otter	District	Although otter is protected by the Habitats Directive, relatively little evidence of otter was found within the study area and no evidence within the Application Boundary. Use by otter of the Onshore Works area is likely to be limited to periodic foraging and is therefore considered to be of District value for the species.
Reptiles	District	Little high quality reptile habitat occurs within the Onshore Works area. In addition, adder, common lizard and slow worm are relatively common and widespread across the region. Therefore, the Onshore Works area is considered to be of District value for reptiles.
Birds	District	The proposed development area provides habitat for a number of UK BAP bird species and one species listed on Schedule 1 of the WCA. However, the breeding bird assemblage within the development site is assessed as being of District value due to the relatively low numbers present.

Table 8.12: Summary of Value of Faunal Receptors

8.6.13 The 'Do Nothing' Scenario

163 Ecological changes are subject to prevailing land use patterns which themselves are affected by social and economic trends. As such it is difficult to predict with certainty what ecological conditions would be like in the study area if the Onshore Works are not carried out. However, assuming the western study area continues to be utilised for cattle pasture and the eastern study area for arable crop cultivation, no foreseeable material changes to ecological conditions are predicted as compared to the baseline. It is possible that further wind farm development may occur in the broad location of the existing Crystal Rig Wind Farm, however, this would be likely to be outside of the study area.

8.6.14 Routeing and Design Considerations

164 Baseline survey information was used to guide the evolving scheme design and, where possible to avoid and/or minimise ecological effects. The following measures were integrated into the design of the Onshore Works:

- direct effects on designated nature conservation sites including AWI sites will be avoided by routeing the Onshore Works away from these features or using trenchless construction techniques to pass the cable underneath such features (the locations where trenchless construction techniques are proposed are listed in the relevant assessment sections below);
- direct effects on watercourses such as Thornton Burn will be avoided by routing the Onshore Works away from these features or using trenchless construction techniques;
- removal of mature trees was avoided where possible, and restricted to a single area of the route in the vicinity of Thornton Burn where a small number of willow trees will be removed (see discussion below under Designated Sites);
- preference was given to routeing the Onshore Works through habitats which were of low or negligible nature conservation value such as hard standing, bare earth, arable farmland and improved grassland;
- habitat features of value to protected species e.g. otter holts and trees or woodland which may support a bat roost were avoided or trenchless construction techniques used to pass the cable under such features.

8.7 Assessment of Construction Effects

165 The assessment of effects is based upon the development description outlined in **Chapter 5: Project Description**. Construction effects on ecological receptors are assessed below and summarised in **Table 8.16**.

166 Potential direct effects of construction include:

- Direct loss of habitat associated with the excavation of the cable trench and construction of associated infrastructure (e.g. a new substation).
- Direct loss or harm of species associated with construction activities.
- Destruction or damage of bird nests resulting from site clearance and construction activities if these begin in the breeding season (typically March-August for most species).

167 Potential indirect effects of construction include:

- Changes to the existing hydrology that could lead to detrimental changes in wetland flora and fauna as a result of increased drainage or dewatering.
- Increased pollution risk associated with accidental spillage of fuels, oils, and increases in silt laden run-off and dust emission.
- Disturbance effects to faunal species.
- Temporary disturbance of breeding birds during construction as a result of noise, artificial light and movement of heavy plant. This disturbance is likely to occur within and near breeding bird territories in habitats within the immediate footprint of the cable route and all working areas and could also adversely affect breeding bird populations occurring within adjacent habitats. There is therefore potential for effects on the audibility of territorial song and hence possible adverse effects on the ability of birds to hold territories and breed successfully. However, this is considered to be a temporary and short term effect given the works involved, with relatively low noise levels produced during the construction works.

8.7.1 Direct Effects

168 Direct effects were calculated by overlaying the Application Boundary (the potential development footprint) with the Phase 1 Habitat Survey/NVC Survey (see **Figures 8.3 and 8.4**) using GIS. The calculations represent the worst case scenario, as the actual footprint of construction works will be less than the full width of the area within the Application Boundary¹⁹.

169 The Onshore Works will lie within a 20 m wide working corridor along the proposed route which will include the area required for excavation of the cable trench, construction of a substation and a temporary construction compound, the working area and the area required for vehicle movements. An additional 10 m width has been included to allow for route micro-siting, giving a total width of 30 m within the Application Boundary (although it is wider in some places).

170 A precautionary approach to habitat loss estimation has been employed whereby the full width within the Application Boundary has been used. It is acknowledged that this represents a worst case scenario as the full width is unlikely to be required.

171 To calculate direct effects on hedgerows it has been assumed that a 3 m section of hedge will need to be removed at each of the hedgerow crossings within the Onshore Works area. This effect will be temporary, with gaps replanted with native shallow rooting species appropriate to the locality.

8.7.2 Indirect Effects

172 **Chapter 12: Hydrology, Flood Risk, Water Resources and Surface Water Quality** addresses potential effects on hydrology. If inadequately controlled, temporary and permanent changes in the pattern, quantity and quality of surface and ground waters can lead to detrimental effects on the overall ecological integrity of wetland habitats, which include bog, wet modified bog, wet and dry heath and marshy grassland.

173 Disruption of the hydrological patterns within water-dependent habitats as a result of built infrastructure is an area lacking empirical research²⁰. As there is no current consensus on the issue, an estimate of indirect effects on water-dependent habitats has been made via the calculation of the area of such habitats within a 25 m buffer around the

¹⁹ Habitat calculations do not include inter-tidal habitats.

²⁰ Most existing data refers to the effects of ditching and ploughing as part of afforestation projects on bog habitats (Anderson *et al.* 2000; Gilman, 1994) and which may or may not be transferable to construction situations. Gilman (1994) suggests that alterations in blanket bog water levels do not extend further than c. 10 m from the nearest forestry drain whereas some estimates quote effects occurring up to 50 m from drains (Natural England, 2010).

infrastructure footprint. It is recognised that this does not account for micro-scale variations in hydrological functioning of habitats and, therefore, may under-estimate effects for some types of habitat and over-estimate effects for others. Nevertheless, this approach allows the identification of areas where indirect effects are predicted to be high.

174 The area of all water dependent habitats (e.g. bogs, marshy grassland and flushes) within a 25 m buffer from the Application Boundary was taken as an estimate of potential indirect effects.

175 Beyond 25 m from the Onshore Works, potential indirect effects upon water dependent habitats are considered unlikely. However, GWDTEs located between 25-100 m were reviewed to identify any habitats which may be more sensitive to indirect effects in compliance with SEPA (2011) guidance.

176 In addition to potential changes in groundwater and surface water flow, there is potential for construction operations to cause pollution of wetland and terrestrial habitats through accidental spillages if inadequately controlled. This may include vehicular fuels and oils as well as the risk of pollution from road surface slurry formed from dust deposition during the laying and use of access tracks. The risk of silt-laden run-off is greatest during periods of heavy rain; for dust emissions it is highest during dry weather.

177 Potential habitat fragmentation effects are discussed at a qualitative level through consideration of the habitat map and the layout of the Onshore Works.

8.7.3 Good Practice Measures

178 Given the current regulatory regime, the assessment of effects on ecological receptors is based on good practice measures for the protection of habitats and species being an integral part of the scheme design. In addition, an Ecological Clerk of Works (ECoW) will oversee construction in the vicinity of ecologically sensitive locations such as woodlands, hedgerows and watercourses. Wherever possible, micro-siting of the cable trench will be undertaken to ensure that good practice measures with regards to ecology are implemented. Hydrological good practice measures are detailed in **Chapter 12: Hydrology, Flood Risk, Water Resources and Surface Water Quality**. Ecological good practice measures are summarised below.

8.7.3.1 Detailed Design Post Consent

179 Access tracks will be designed to maintain or impede drainage through water dependent habitats, such as marshy grassland and mire habitats, where either of these scenarios would be beneficial to habitat quality and the hydrological regime.

180 Following pre-construction checks and mapping of sensitive habitats by an ECOW, cable trench locations will be micro-sited, where necessary, to avoid or minimise any potential adverse effects to protected species or sensitive habitats.

8.7.3.2 Pre-construction Surveys

181 Pre-construction surveys will be carried out for otter and badger to determine whether distributions have changed from those reported here. All watercourses within 250 m of the Onshore Works will be surveyed for signs of otter, and all habitats within 50 m for signs of badger. In the event that either species is recorded, the requirement for a SNH disturbance licence will be reviewed.

182 If works are carried out within or close to the bird breeding season, the ECOW will check the working area for any nests before works commence.

8.7.3.3 Construction Site Management

183 The following ecological protection measures will be detailed in the Construction Environmental Management Plan (CEMP):

- the site induction process for construction personnel which will include a site briefing provided by the ECOW regarding otter, badger, breeding birds and reptiles, and the identification of shelters of these species. The briefing will also emphasise the importance of protection of watercourses and key habitats such as wetland areas;
- general good practice measures for working in and near to watercourses as described in **Chapter 12: Hydrology, Flood Risk, Water Resources and Surface Water Quality**. For example, during construction, filter trenches,

attenuation ponds, diversion and slope drains, check dams and sediment traps, silt fencing and filter trenches will be used to minimise unchecked contaminated run-off. Appropriate artificial drainage will be designed and installed. Detailed drainage designs will require review and approval by a suitably qualified hydrologist and ECoW, and appropriate drainage measures will be installed in advance of major ground breaking works;

- standard sediment and pollution management measures in compliance with SEPA's Pollution Prevention Guidelines;
- the usage of suitable capping material for the access tracks to minimise the potential for run-off of fine material;
- no direct discharge of new roadside drains into streams (or drainage channels leading directly to streams), and the use of specifically designed silt traps where necessary to act as filters;
- secure storage of fuels and other chemicals in line with The Water Environment (Oil Storage) (Scotland) Regulations 2006;
- the use of appropriate wash-out facilities for vehicles and machinery used for concrete pouring;
- the inclusion of ramps in trenches and excavations, and the capping of stored pipes, to prevent entrapment of animals;
- the retention of a sufficient gap in construction fencing to allow mammals such as badgers to pass underneath;
- where it is not possible to undertake construction works outside the bird nesting season, prevention of disturbance of the active nests and dependent young of breeding raptors, waders (lapwing and curlew) and any species listed on Schedule 1 of WCA by setting up an exclusion zone of 300 m radius around the location until the breeding attempt ends, or young move away.
- agreement with the ECoW in advance of locations for storage of excavated arisings to minimise the risk of protected species using stockpiled soil as a shelter;
- if construction work is carried out during the hours of darkness, direction of machinery and floodlights away from watercourses and woodlands to avoid potential disturbance, albeit unlikely, to otter and bat commuting and foraging features. These measures will be subject to advice from the ECoW on the location of sensitive ecological features. Where no features have been identified in close proximity to works, such restrictions may not be required;
- adherence to a site speed limit of 15 mph for all construction traffic (excluding public highways) during the hours of darkness to protect badger and otter;
- re-seeding of temporary construction work areas with a suitable seed mix following completion of construction works, in consultation with SNH and East Lothian Council.

8.7.4 Intertidal Habitats

8.7.4.1 Assessment of Effects

- 184 Disruption to intertidal habitats will occur as a result of cable laying and installation. The corridor will support vehicle traffic, provide adequate space for cable assembly, sufficient space for excavation of the cable trenches as well as sufficient space for the removed sediment. The intertidal cable may, however be installed through directional drilling, which will limit the footprint of any habitat disturbance.
- 185 The magnitude of direct disturbance is assessed to be negligible as it is limited in space (within the cable corridor) and in time (during the construction phase) and it is likely to be similar for all installation techniques.
- 186 The intertidal biotopes recorded at the Thorntonloch are assessed to be of negligible vulnerability to the effects of habitat disturbance associated with cable laying as they are typical of naturally unstable habitats and host animals that have high tolerance and adaptability to this continually disturbed environment (Connor *et al.*, 2004).
- 187 The high growth and reproductive rates of the species characteristic of these biotopes ensures rapid recoverability following cessation of the disturbance.
- 188 The overall effect of direct habitat disturbance from export cable installation (intertidal) is assessed to be **not significant** and this assessment carries low uncertainty.
- 189 Cable installation within the intertidal area is likely to be undertaken during low tide; therefore, the potential for re-suspension of sediment as a result of construction activities and subsequent sediment settlement is very low. The degree of sediment re-suspension likely to occur with the flooding tide is expected to be low because of the coarse nature of the sediment, which will settle back very rapidly. The spatial extent of any sediment settlement is expected to be very localised and short term and the overall magnitude of the effect is considered negligible.

190 The intertidal biotopes recorded at Thorntonloch are considered to have negligible vulnerability to the effects of sediment re-suspension and smothering by 5 cm of sand (MarLIN benchmark), owing to their high tolerance and adaptability to the continual turbulence naturally occurring within this zone from storm events and/or hydrodynamic exposure (tides and wave action). In addition, owing to the ephemeral nature of the floral and faunal organisms typically found in this intertidal zone, recoverability of these biotopes is likely to be very rapid following cessation of disturbance.

191 Overall, the effect of increased suspended settlement concentrations (SSC) and sediment settlement is likely to be not significant and this assessment carries low uncertainty.

8.7.4.2 Mitigation

192 No mitigation is proposed.

8.7.4.3 Residual Effects

193 Residual effects have been identified as of **negligible** significance.

8.7.5 Designated Sites

8.7.5.1 Assessment

194 Construction effects on Designated Sites are summarised in **Table 8.13**.

195 Due to the landfall location of the offshore cable, it is necessary for the Onshore Works to cross the Thornton Burn LWS. In the area in question (NT750741), trenchless construction techniques will be used to cross under the burn to avoid direct effects on the channel or immediate marginal vegetation. However, a small number of willow trees at the periphery of the LWS may need to be cleared to facilitate the working area for the drill and construction of a temporary bridge and footings to allow construction vehicles to cross Thornton Burn (at approximately NT 74947419).

196 The willow trees affected (0.17 ha) represent 50% of the willow woodland in this location, and a small proportion of the Thornton Burn LWS. The trees directly affected represent a small proportion of the woodland habitats within the Thornton Burn LWS and their removal will encourage growth of aquatic marginal plant communities. Following best practice measures integrated within the scheme design, this will result in a low effect magnitude and an effect of minor significance on Thornton Burn LWS.

197 AWI woodland is located within the Application Boundary at the following seven locations:

1. A linear strip of plantation conifer woodland at NT67477136.
2. The northeast edge of High Wood at NT 68847204.
3. Broad-leaved plantation woodland which is part of Tripslaw Hill Plantation and grassland at NT 69227229 – this area is listed as AWI but is mostly grassland (presumed to be a mapping error).
4. A narrow strip of broad-leaved semi-natural woodland named Whittley Strip at co-ordinate NT69337322.
5. A narrow strip of broad-leaved semi-natural woodland named Birky Bog Plantation at co-ordinate NT69737332.
6. A narrow, linear strip of broad-leaved semi-natural woodland perpendicular to the road at NT70627349.
7. Broad-leaved semi-natural woodland southeast of Smithy Row at NT71457368.

198 Potential direct effects on AWI sites, such as habitat loss or damage/destruction of ground flora, will be avoided through the use of trenchless construction techniques and/or micro-siting in each of the above locations. However, a number of potential direct effects remain including damage to trees through root compaction or severance and damage to over-hanging branches. Potential indirect effects include pollution and/or eutrophication of soils (e.g. through use of drilling muds in the trenchless construction techniques process). Given these factors, and the national value attributed to AWI sites, a moderate effect is predicated for AWI sites prior to mitigation.

199 No other designated wildlife sites are situated in close proximity to the Onshore Works. Dry Burn LWS is located 200 m away from the Onshore Works whilst the nearest statutory site is Woodhall Dean SSSI, approximately 150 m away at the closest point. However, the majority of other designated sites are over 0.5 km away. Given these distances, no other direct effects are anticipated.

200 With strict implementation and monitoring of the good practice measures listed above, no indirect effects such as siltation or pollution are envisaged on these designated sites. Given distance and topography, no other indirect effects are envisaged on any other designated nature conservation site.

Designated Site	Level of Ecological Value	Direct Effects (ha and % of Onshore Works)	Indirect effects	Effect Magnitude	Effect Significance pre-Mitigation
Thornton Burn LWS	Council	0.17 (0.3%)	N/A	Low	Minor
AWI sites	National	Root compaction/severance; Damage to over-hanging branches	Pollution and/or eutrophication of soils	Low	Moderate

Table 8.13: Construction Effects on Designated Sites prior to Mitigation

8.7.5.2 Mitigation

201 Direct replacement of broad-leaved willow woodland within Thornton Burn LWS, although not a requirement given the minor significance of the effect, will not be possible. This is because the area to be cleared forms the route for the underground cable which must be kept tree-free to allow for possible future maintenance works. However, removal of trees would be expected to encourage growth of aquatic marginal plant communities in the medium term (by decreasing over-shading). This will provide replacement foraging and sheltering resources for birds and invertebrates.

202 In terms of Ancient Woodland Inventory Sites (AWI) sites, an Arboricultural Implications Assessment and Method Statement for Installation of Underground Cables (**Appendices 8.7 and 8.8**) has been prepared in relation to each of the areas where the Onshore Works directly overlaps or passes in close proximity to an AWI site (listed above). Direct and indirect effects will be avoided by following a series of protective measures which are summarised below (detailed in full in **Appendix 8.8**):

- trenchless construction techniques to a depth of >0.6 m will be employed in any location where the cable needs to pass under an AWI site, thus avoiding effects on tree root systems and ancient woodland ground flora;
- a qualified arborist will visit each of these areas prior to construction and mark out tree root protection zones;
- the tree root protection zones around AWI sites will be fenced off, and construction works prohibited in these areas;
- restrictions will be placed on where and how chemicals and materials may be stored in relation to AWI sites;
- vehicle movements within the tree root protection zones will be prohibited in all but one area centred on NT 7064 7367 where a gateway permits access to a field close to an AWI site. Protective matting will be used in this location to prevent root compaction.

8.7.5.3 Residual Effects

203 With the measures to protect AWI sites implemented, potential effects on AWI sites will be reduced to **neutral** producing a **negligible** effect.

204 Given that the woodland loss at Thornton Burn LWS cannot be directly replaced, the predicted significance of effect on Thornton Burn LWS remains of low magnitude, and therefore of **minor** significance.

205 No significant effects were predicted for other designated sites.

8.7.6 Habitats

8.7.6.1 Assessment

206 Based on the overlay of the Onshore Works area on the habitat maps, **Table 8.14** details effects on habitats during construction, prior to mitigation, and **Table 8.15** provides greater detail regarding GWDTEs.

207 Based on this precautionary approach to habitat loss, it is anticipated that a maximum of 58.8 ha, comprising 27 different habitat types, will be directly affected by construction. In terms of potential indirect effects, a further 5.8 ha of habitats occur within 25 m of the Onshore Works which would be susceptible to indirect effects (mainly wetland habitat types such as bog and marshy grassland).

208 In terms of GWDTEs, there is the potential for up to 15.58 ha of habitat to be affected by the Onshore Works, within 25 m of construction. The vast majority of this comprises partially GWDTE habitats (such as M23 in mosaic with other non-GWDTE habitat), or the *Juncus effusus* vegetation. Only 4.06 ha of full GWDTE habitat effects are anticipated.

Habitat	Level of Ecological Value	Direct Effects (ha and % of Onshore Works)	Indirect effects within 25 m of Onshore Works	GWDTE	Effect Magnitude	Effect Significance
Arable	Neighbourhood	22.3 ha (38.1%)	N/A	No	Medium	Minor
Bare ground	< Neighbourhood	0.15 ha (0.32%)	N/A	No	Low	Negligible
Blanket bog	Council	0.38 ha (0.7%)	0.26ha	No	Low	Minor
Wet modified blanket bog	District	Nil	0.19 ha	No	Low	Minor
Wet modified blanket bog / Acid Flush mosaic	District	0.05 ha (0.1%)	0.34 ha	Partly	Low	Minor
Continuous bracken	Neighbourhood	0.17 ha (0.3%)	N/A	No	Low	Negligible
Ephemeral/ short perennial	Neighbourhood	0.12 ha (0.2%)	N/A	No	Low	Negligible
Improved grassland	Neighbourhood	13.2 ha (22.1%)	N/A	No	Medium	Minor
Marshy grassland	National (M23) to Neighbourhood (MG9)	9.95 ha (17.0 %)	4.12 ha	Yes	Medium	Moderate (M23) to Minor (other marshy grassland types)
Marshy grassland / blanket bog mosaic	District	0.23ha (0.4%)	0.27 ha	Partly	Low	Minor
Marshy grassland / Acid flush / Blanket bog mosaic	District	0.003ha (<0.1%)	0.15 ha	Partly	Low	Minor

Habitat	Level of Ecological Value	Direct Effects (ha and % of Onshore Works)	Indirect effects within 25 m of Onshore Works	GWDTE	Effect Magnitude	Effect Significance
Semi-improved acid grassland	Neighbourhood	0.34 ha (0.6%)	N/A	No	Low	Negligible
Poor semi-improved grassland	Neighbourhood	1.76 ha (3.0%)	N/A	Partly	Medium	Minor
Semi-improved, neutral grassland with or without scattered scrub	Neighbourhood	2.22 ha (3.8%)	0.18 ha of MG9 is within 25 m. Other NVC types are not susceptible to indirect effects.	Partly	Medium	Minor
Semi-improved neutral grassland / Marshy grassland mosaic	Neighbourhood	0.12 ha (0.2%)	0.23 ha	Yes	Low	Negligible
Unimproved acid grassland	Neighbourhood	2.83 ha (4.8%)	N/A	No	Medium	Minor
Hardstanding	< than Neighbourhood	3.67 ha (6.3%)	N/A	No	Low	Negligible
Dry heath	National	0.07 ha (0.1%)	0.07 ha	No	Low	Moderate
Dry heath / Acid grassland mosaic	District	0.04 ha (<0.1%)	0.26 ha	No	Low	Moderate
Not surveyed	N/A	0.24 ha (0.4%)	N/A	N/A	N/A	N/A
Open dune / coastal grassland mosaic	Neighbourhood	0.09 ha (0.2%)	N/A	No	Low	Negligible
Other [rock] exposure	District	0.02 ha (<0.1%)	N/A	No	Low	Negligible
Dense and scattered scrub	Neighbourhood	0.01 ha (<0.1%)	N/A	No	Low	Negligible
Tall ruderal	Neighbourhood	0.07 ha (0.1%)	N/A	No	Low	Negligible
Broad-leaved semi-natural woodland	Neighbourhood (willow woodland at	0.45 ha (0.8%). Actual direct	N/A	No	Low	Negligible

Habitat	Level of Ecological Value	Direct Effects (ha and % of Onshore Works)	Indirect effects within 25 m of Onshore Works	GWDTE	Effect Magnitude	Effect Significance
	Thornton Burn) to National (UK BAP Priority stands)	loss is limited to 0.17 ha (0.3%) of willow woodland at Thornton Loch				
Broad-leaved plantation woodland	District	0.08 ha (0.1%)	N/A	No	Low	Negligible
Mixed plantation woodland	District	0.02 ha (<0.1%) Note that micro-siting and trenchless construction techniques will avoid all effects on this habitat.	N/A	No	Neutral	Negligible
TOTAL		58.8 ha (100.0%)	5.8 ha			
Hedgerow(species poor)	Council	42 m (3.33 % of 1,258 m total)	No	No	Low	Minor
Streams	Council	786.3 m	No	No	Low	Negligible

Table 8.14: Construction Effects on Habitats prior to Mitigation

NVC type	GWDTE	Total ha within 25 m	Partly riparian/ partly GWDTE (ha)	True GWDTE (ha)
M15 - U4 - U5	partially	0.30	0.00	0.30
M19 - M23	partially	0.50	0.00	0.50
M23a - U2 - U5	partially	4.05	0.00	4.05
M23b - MG6b	partially	0.35	0.00	0.35
M4 - M20 -	partially	0.15	0.00	0.15

NVC type	GWDTE	Total ha within 25 m	Partly riparian/ partly GWDTE (ha)	True GWDTE (ha)
M23a				
Totals for partial GWDTEs		5.35	0.00	5.35
<i>Juncus effusus</i> vegetation	potentially	5.25	0.00	5.25
MG9	yes	0.22	0	0
M16	yes	0.00	0.00	0.00
M23a	yes	4.41	0.40	3.87
M23a - M23b	yes	0.00	0.00	0.00
M23b	yes	0.35	0.16	0.19
Totals for full GWDTEs		4.98	0.56	4.06
Grand Total		15.58	0.56	14.66

Table 8.15: Summary of Effects on GWDTEs within 25 m of the Onshore Works

- 209 No effects of high magnitude are anticipated on habitats during the construction phase of the Onshore Works. Medium magnitude effects are predicted for arable farmland, improved grassland, marshy grassland, poor semi-improved grassland, semi-improved neutral grassland, and unimproved acid grassland. For arable farmland and improved grassland, although the hectare of habitat affected is high, these habitats can easily be reinstated, and there will be no permanent change in their integrity. With regards to the latter four habitat types, the area of habitat affected is smaller, but fragmentation effects, and more complex restoration requirements, mean that there is likely to be a temporary change in these habitats at the affected locations.
- 210 All other habitat effects, including those on blanket bog and hedgerows, are considered to be low in magnitude due to the small areas involved, and the low likelihood of permanent changes in the habitats at the affected locations. With respect to the hedgerows, the removal of 3 m sections will be temporary, with gaps re-planted with native shallow rooting species appropriate to the locality.
- 211 **Table 8.15** shows that no effects of major significance are therefore predicted for habitats during the construction phase of the Onshore Works. Moderate effects are predicted for some marshy grassland types (those including M23), dry heath and dry heath/acid grassland mosaic. This effect significance is primarily derived from the biodiversity value of these features rather than a large area of loss. All other habitat effect significances are predicted to be minor (including that for blanket bog, modified bog, and marshy grassland/blanket bog mosaic), or negligible.

8.7.6.2 Mitigation

- 212 In addition to the Good Practice Working measures specified above, micro-siting of the cable trench will be undertaken in the small number of locations where the Onshore Works overlap with blanket bog and M23 marshy grassland habitats (e.g. around the substation location). Accordingly, it will be possible to entirely avoid direct effects on blanket bog. It will not be possible to avoid all direct effects on marshy grassland and dry heath habitats given the Onshore Works alignment. However, micro-siting will ensure that the area affected is minimised for each habitat type. Micro-siting in areas of M23 marshy grassland, dry heath habitats and bog will be agreed in consultation with the ECoW.
- 213 In relation to habitats where minor effects are predicted, micro-siting of the cable trench in consultation with the ECoW will reduce these effects below the worst case scenario presented above for both direct and indirect effects. For example, it will be possible to avoid the majority of effects on semi-improved grassland road verges in the east of the Onshore Works corridor by ensuring the cable is micro-sited within arable farmland.

8.7.6.3 Residual Effects

- 214 Ecological enhancement will be achieved through planting of native scrub in the vicinity of the proposed substation. The habitats in this area are of low ecological value, having been considerably disturbed by previous construction activities. They are therefore unlikely to respond successfully to attempts to restore mire and marshy grassland habitats. Proposals to plant native scrub have been developed in parallel with the requirements for landscape amelioration, as detailed in **Chapter 10: Landscape and Visual Amenity**. Planting proposals are shown in **Figure 10.9** which accompanies **Chapter 10 Landscape and Visual Amenity**. Planting proposals include an equal mix of juniper, hawthorn, blackthorn and rowan in keeping with the ecological character of the wider upland landscape whilst maximising ecological benefit. The proposed planting has been located within areas of previously disturbed habitat to ensure adverse effects to retained grassland and mire habitats are avoided.
- 215 Following implementation of the mitigation detailed above, a **minor** effect is predicted to remain for marshy grassland, dry heath, and dry heath acid grassland mosaic. Effects of **negligible** significance are predicted for all other habitats types.

8.7.7 Badger

- 216 No badger setts, or habitats likely to be of importance to badger, will be affected by the Onshore Works. However, field signs confirm that badger occur within the wider area and are likely to maintain regular movements across the proposed Onshore Works area. Following successful implementation of good practice measures integrated within the scheme design, and given the distance (> 100 m) to the nearest badger sett from the proposed Onshore Works, potential construction effects on badger are predicted to be of neutral magnitude and therefore of **negligible** significance.

8.7.8 Bats

- 217 No buildings or structures will be directly affected by the proposals and no trees in areas classified as having potential to support a bat roost will be affected. Therefore, direct effects on potential bat roosts are highly unlikely.
- 218 The majority of the Onshore Works corridor is confined to low quality foraging habitats for bats including intensive arable farmland and improved grassland. Where the cable route crosses higher value bat foraging habitats such as woodland, trenchless construction techniques will be used to avoid direct effects on these areas. Furthermore, the construction footprint is of relatively limited width and extensive areas of bat foraging habitat occur throughout the wider landscape. The bat species recorded in the area are unlikely to be affected by the changes in habitat caused by small scale hedge gap creation therefore no effect on bat foraging is expected.
- 219 The principal indirect effect on bats during the construction phase is in relation to artificial lighting. Many species of bats are known to avoid heavily illuminated areas (Fure 2006) and may, at worst, abandon a roost if it is subject to artificial illumination (BCT, 2007). However, such effects are considered to be highly unlikely given the fact that the majority of construction will occur during daylight hours and the distance of the works from habitats of value to bats for roosting such as woodland. In addition, given the relatively small footprint of the Onshore Works there will be extensive unlit areas for bats to use in the wider landscape.

220 Both direct and indirect effects on bats are, therefore, considered to be of neutral magnitude and hence of **negligible** significance.

8.7.9 Otter

221 No watercourse or otter shelters will be directly affected by construction. Although field signs suggest that otter utilise the majority of watercourses within the Onshore Works area to some extent, the implementation of the good practice measures outlined above reduce potential direct and indirect effects of disturbance to an otter movement corridor during the installation of the temporary bridge over Thornton Burn LWS. Given that this effect is localised and would affect a relatively small length of watercourse compared with the unaffected otter habitat within the study area, this effect is predicted to be of low magnitude and therefore, of minor significance prior to mitigation.

222 In addition to the best practice working measures specified above the following specific mitigation measures for otter will be employed:

- the temporary bridge at Thornton Burn will be designed to allow passage of otter, including during spate conditions. In accordance with best practice, this may entail inclusion of one or more of sufficient headroom, ledges or additional underpasses further up the bank, as appropriate to the detailed design;
- fencing will not be installed such that it may impede otter movement along or between watercourses.

223 Following implementation of mitigation, residual construction effects on otter are predicted to be of **negligible** significance.

8.7.10 Reptiles

224 The Onshore Works are largely restricted to areas of low suitability for reptiles but the risk of killing and injury of reptiles may occur where construction activities take place within suitable reptile habitats, such as the marshy grassland habitats at the western end of the Onshore Works. Reptiles are likely to be particularly vulnerable during the overwintering period (typically October-March inclusive) when they are less able to move. During their active period reptiles are likely to be able to move into unaffected areas of suitable habitat adjacent to the Onshore Works. Overall, potential construction effects on reptiles are predicted to be of low magnitude and, therefore, of minor significance prior to mitigation

225 In addition to the best practice working measures specified above, gradual habitat clearance will be undertaken in areas of high reptile suitability to encourage reptiles to vacate the construction area. The areas affected will be managed to maintain a closely cropped sward of low suitability for reptiles prior to works commencing. Initial habitat clearance and destruction of potential hibernation features will be supervised by the ECoW and undertaken during warm weather conditions between April and September when reptiles are likely to be active.

226 Following implementation of mitigation, residual construction effects on reptiles are predicted to be of **negligible** significance.

8.7.11 Birds

8.7.11.1 Assessment

227 If site clearance and construction activities begin within the breeding season (typically March-August for most species) this could potentially result in the destruction of and/or damage to nests within the cable route corridor. Due to potential effects upon their favoured breeding habitat and in light of their conservation status or sensitivity to potential effects the species at greatest risk would be species such as yellowhammer, reed bunting, linnets and whinchat. Disturbance at Thorntonloch Beach would be limited, as the beach has no potential nesting habitat. The potential effect on breeding birds along the cable route in terms of potential destruction / damage to nests is predicted to be of low magnitude and minor significance.

228 If works are to take place during the breeding season, temporary disturbance to breeding birds is likely during the construction phase due to noise, artificial light, movement of heavy plant and construction activities such as site clearance and excavation. This disturbance is likely to occur within and near breeding bird territories in habitats within the immediate footprint of the cable route and all working areas and could also adversely affect breeding bird populations occurring within adjacent habitats. Some disturbance is also likely to occur within the working area of Thorntonloch Beach, and could also adversely affect breeding bird populations occurring within adjacent

habitats. However, the coastal habitat in the vicinity of the Onshore Works is of limited value for breeding birds due to heavy human disturbance and unsuitable habitat. Increases in ambient noise levels are likely to occur within and near breeding bird territories in habitats immediately adjacent to the cable route corridor. There is therefore potential for effects on the audibility of territorial song and hence possible adverse effects on the ability of birds to hold territories and breed successfully. However, this is considered to be a temporary and short term effect given the works involved, with relatively low noise levels produced during the construction works. Given the scale and location of the works, it is not considered that there would be any significant effect for nesting peregrine falcon at Torness power station. Overall, the potential effect on breeding birds along the cable route in terms of temporary disturbance is predicted to be of low magnitude and minor significance.

8.7.11.2 Mitigation

229 Potential for destruction and/or damage of nests:

- Site clearance of semi-natural habitats, in particular woodland (in the isolated locations where this required) and scrub and construction activities will begin (and as much of the construction activity as is possible completed) outside of the breeding season (typically March-August for most species). This will avoid contravention of the Wildlife and Countryside Act 1981 (as amended) by preventing destruction and damage of established nests.
- As noted above, if works are carried out within or close to the breeding season, an Ecological Clerk of Works will be present on site to check the working area before works commence.
- If nests are discovered, appropriate mitigation will be implemented to ensure that they are not destroyed before any works commence in that area of the site. This may include observing an appropriate stand-off or imposing exclusion zones between the works and nest(s).
- Ground nesting species may be dissuaded from nesting in construction areas/access routes by removing the surface vegetation from the desired area before the breeding season commences.

230 Temporary disturbance of breeding birds:

- Site clearance of semi-natural habitats, in particular woodland and scrub and construction activities will begin (and as much of the construction activity as possible completed) outside of the breeding season (typically March- August for most species).
- Where works are carried out within or close to the breeding season an Ecological Clerk of Works will be present on site to check the working area before works commence.
- Semi-natural habitats disturbed during works will be reinstated following completion.

8.7.11.3 Residual Effects

231 The potential effect for breeding birds along the cable route in terms of potential destruction / damage of nests following mitigation is predicted to be of neutral magnitude and therefore **negligible** significance.

232 Given the temporary nature of the works, and abundant farmland habitat available in the wider area, it is considered that birds which use the farmland adjacent to the proposed underground cable would be tolerant of being displaced to alternative areas in the short term as a result of temporary disturbance from noise, light etc. It is assumed that any ground nesting species that establish territories and nests adjacent to the works after the onset of the construction phase will be tolerant of construction activities and human presence, however, the working areas will be strictly adhered to, to prevent additional disturbance to nesting birds. Reinstated habitat will take time to develop fully, however, given the small areas involved this would not be expected to have a significant effect on the breeding bird assemblage. The potential effect on breeding birds along and surrounding the cable route in terms of temporary disturbance during construction following mitigation is assessed as neutral magnitude and the significance of effect is assessed as **negligible** significance.

Ecological Receptor	Potential Effects	Effect Pre-Mitigation	Mitigation	Residual Effect significance
Intertidal Habitats	Disturbance to intertidal habitats as a result of cable laying and installation.	Negligible as they are naturally unstable habitats.	No mitigation proposed.	Negligible
Designated sites	<p>Direct loss of habitat at watercourse crossing point within Thornton Burn LWS associated with construction of temporary bridge and trenchless construction technique working area.</p> <p>Direct effects to AWI sites including damage to trees through root compaction or severance and damage to over-hanging branches.</p> <p>Indirect effects to AWI sites including pollution and/or eutrophication of soils.</p> <p>Adverse effects on water quality within Woodhall Dean SSSI, Thornton Burn LWS and Dry Burn LWS resulting from pollution and siltation.</p>	Minor (Thornton Burn LWS) to Moderate (AWI sites)	<p>Use of trenchless construction techniques to minimise habitat loss.</p> <p>Re-turfing/re-seeding post-construction.</p> <p>Implementation of best practice water protection measures.</p> <p>Tree root protection zones marked by arborist and fenced off.</p> <p>Best practice construction methods</p> <p>Restricted vehicle movements in proximity to AWI sites.</p> <p>Use of protective matting where required to prevent root compaction.</p>	Negligible (AWI sites) to Minor (Thornton Burn LWS)
Habitats and flora	<p>Direct loss of blanket bog and M23 marshy grassland habitat.</p> <p>Indirect effects through disruption of hydrological regime and pollution.</p>	<p>Negligible for majority of habitats</p> <p>Minor for; arable; blanket bog; wet modified bog / acid flush; wet modified blanket bog; improved grassland; semi-improved neutral grassland; poor-semi-improved neutral grassland; unimproved acid grassland; marshy grassland/acid flush/blanket bog; marshy grassland (non M23); and hedgerows</p> <p>Moderate for Marshy grassland (M23), dry heath, and dry heath</p>	<p>Micro-siting in areas of sensitive habitat.</p> <p>Replanting hedgerow gaps with native shallow rooting species.</p> <p>Use of trenchless construction techniques to minimise habitat loss</p> <p>Re-turfing/re-seeding post-construction</p> <p>Implementation of best practice water protection measures</p> <p>Tree root protection zones marked by arborist and fenced off</p> <p>Best practice construction methods</p> <p>Restricted vehicle movements in proximity to woodlands</p>	<p>Minor effect for M23 marshy grassland, dry heath, and dry heath / acid grassland mosaic.</p> <p>Negligible effects for all other habitats.</p>

Ecological Receptor	Potential Effects	Effect Pre-Mitigation	Mitigation	Residual Effect significance
		/ acid grassland mosaic	Use of protective matting where required to prevent root compaction to trees	
Badger	<p>Road casualty associated with construction vehicles.</p> <p>Accidental capture within open cable trenches.</p> <p>Limitation of movement from open trenching and construction fencing.</p>	Minor	<p>Best practice working measures.</p> <p>15 mph speed limit within the Onshore Works area.</p> <p>Construction fencing designed to allow badger movement.</p> <p>Covering open trenches or providing 'escape ramps'</p>	Negligible
Bats	<p>Loss of commuting/foraging habitat.</p> <p>Severance of linear habitat features.</p> <p>Disturbance and habitat degradation from artificial lighting.</p>	Minor	<p>Use of trenchless construction techniques to avoid loss of valuable bat habitats (e.g. woodlands).</p> <p>Re-instatement of hedgerows following construction.</p> <p>Best practice lighting measures and working during daylight hours in areas close to habitats of value to bats.</p>	Negligible
Otter	<p>Road casualty associated with construction vehicles.</p> <p>Pollution and/or siltation of watercourses</p> <p>Accidental capture within open cable trenches.</p> <p>Limitation of movement associated with poorly designed bridges, extended culverts and construction fencing.</p>	Minor	<p>Best practice working measures.</p> <p>Culvert extension or replacement will be designed to allow passage of otter.</p> <p>15 mph speed limit within the Onshore Works area.</p> <p>Pollution and sediment run-off control measures.</p> <p>Construction fencing designed to allow otter movement.</p> <p>Covering open trenches or providing 'escape ramps'.</p>	Negligible

Ecological Receptor	Potential Effects	Effect Pre-Mitigation	Mitigation	Residual Effect significance
Reptiles	Killing and injury during construction works.	Minor	Gradual habitat clearance prior to works. Appropriate timing of works.	Negligible
Birds	Potential for destruction or damage of nests.	Minor	Site clearance and construction activities will take place (and as much of the construction activity as possible completed) outside of the breeding season. An ecologist will be present on site to check the working area before works commence. Removal of the surface vegetation before the breeding season commences. Nests discovered during construction will receive appropriate mitigation ensure that they are not destroyed before any works commence in that area of the site.	Negligible
	Temporary disturbance.	Minor	Site clearance and construction activities will take place (and as much of the construction activity as possible completed) outside of the breeding season. The working areas set up at the onset of construction will be strictly adhered to in order to prevent additional disturbance to nesting birds. Habitat disturbed during works will be	Negligible

Ecological Receptor	Potential Effects	Effect Pre-Mitigation	Mitigation	Residual Effect significance
			reinstated following completion.	

Table 8.16: Summary of Construction Effects

8.8 Assessment of Operational Effects

233 Operational effects on ecological receptors are summarised in **Table 8.17**. Operational activities will include:

- annual checks of the cable route on foot;
- inspections of the substation two to four times per month to inspect the switchgear, protection equipment and relay testing, transformer and other equipment as necessary. Each visit will require at least two personnel (in a van or car);
- scheduled maintenance anticipated to comprise two visits per year, requiring up to 10 personnel;

234 In the unlikely event that there is any failure of cables the area around the fault would be excavated and the fault repaired. If the cable cannot be repaired, a new length of cable would be inserted and jointed to replace the failed section. If the cable faults at a location near/beneath sensitive areas such as woodlands, it is anticipated that the faulted cable section would be cut at either end of the duct, removed and replaced to avoid direct effects.

8.8.1 Intertidal Habitats

8.8.1.1 Assessment of Effects

235 The potential ecological effects associated with the operational phase are expected to be minimal as the cable is most likely to be buried in the sediment. Limited physical disturbance may occur during maintenance but this is predicted to be limited in space and time and not pose risks to the intertidal habitats.

8.8.1.2 Mitigation

236 No mitigation is proposed.

8.8.1.3 Residual Effects

237 Residual effects are identified as of **negligible** significance.

8.8.2 Designated Sites

8.8.2.1 Assessment of Effects

238 Operational requirements for cable repairs or maintenance in AWI sites are considered unlikely. However, if the cable faults at a location near/beneath sensitive areas such as woodlands, it is anticipated that the faulted cable section would be cut at either end of the duct, removed and replaced to avoid direct effects.

239 Potential indirect effects on designated sites include pollution and siltation associated with small scale excavation for repairs and maintenance work. However, this is considered unlikely, and, if required, highly localised and of short duration. Therefore, prior to mitigation, operational effects are considered to be of a low magnitude and **moderate** significance at worse.

8.8.2.2 Mitigation

240 The following mitigation measures will be employed to avoid and minimise potential indirect effects on designated sites during operation:

- re-turfing/re-seeding post-works;
- implementation of best practice water protection measures;
- use of tree root protection zones marked by arborist and fenced off;
- best practice construction methods;
- restricted vehicle movements in proximity to AWI sites;

- use of protective matting where required to prevent root compaction close to AWI sites.

8.8.2.3 Residual Effects

241 Following implementation of the mitigation measures listed above, potential effects on designated sites during operation are predicted to be of neutral magnitude and **negligible** significance.

8.8.3 Habitats

8.8.3.1 Assessment of Effects

242 Operational effects on habitats will be restricted to the sporadic requirement for excavation of small lengths of cable if repairs or maintenance are required. Should this occur, habitat effects would be highly localised and temporary. Therefore, operational effects are predicted to be of a low magnitude and **minor** significance at worse.

243 Consideration of effects which may arise from cable heating is provided in **Chapter 13: Soils, Agriculture and Land Use**.

8.8.3.2 Mitigation

244 The following mitigation measures will be employed to avoid and minimise potential adverse effects on habitats during operation:

- re-turfing/re-seeding post-works;
- implementation of best practice water protection measures;
- use of tree root protection zones marked by arborist and fenced off;
- best practice construction methods;
- restricted vehicle movements in proximity to woodlands;
- use of protective matting where required to prevent root compaction close to woodlands.

8.8.3.3 Residual Effects

245 Following implementation of the mitigation measures listed above, potential effects on designated sites during operation are predicted to be of neutral magnitude and **negligible** significance.

8.8.4 Badger and Otter

8.8.4.1 Assessment of Effects

246 Operational works are likely to be restricted to the sporadic requirement for excavation of small lengths of cable if repairs or maintenance are required. Such works would be likely to be highly localised, temporary and of short duration. No badger setts or otter shelters were recorded within 50 m of the Onshore Works, therefore operational effects are unlikely. However, otter and/or badger territories may change during the operational phase of the Onshore Works, and therefore, in line with a precautionary approach, effects of low magnitude and minor significance are predicted prior to mitigation.

8.8.4.2 Mitigation

247 Pre-construction checks for otter and/or badger will be undertaken where operational works will directly affect or occur in proximity to habitats suitable for supporting these species (e.g. riparian habitats, woodlands, scrub, and hedgerows). If direct effects or disturbance to these species are predicted as a result of operational works, SNH would be contacted to discuss the requirement for appropriate mitigation and SNH licensing.

8.8.4.3 Residual Effects

248 Following implementation of mitigation, potential effects on badger and otter are predicted to be of neutral magnitude and **negligible** significance.

8.8.5 Bats

249 There will be no direct operational effects on bats. Potential indirect operational phase effects on bats include night time lighting of the proposed substation at the western end of the Onshore Works corridor. However, the substation is located in an area of low suitability for bat foraging and is devoid of potential bat roosting features. Furthermore, the wider landscape supports an extensive network of unlit, optimal habitat for bat foraging,

movement and roosting. Therefore, this effect is highly unlikely to occur and operational effects on bats are predicted to be of **negligible** significance.

8.8.6 Reptiles

8.8.6.1 Assessment of Effects

250 As above, operational works are likely to be restricted to the sporadic requirement for excavation of small lengths of cable, if repairs or maintenance is required. Such works would be likely to be highly localised, temporary and of short duration. Given the small area of suitable reptile habitat within the Application Boundary, adverse effects to reptiles are unlikely. Nevertheless, excavation in areas of suitable habitat, such as marshy grassland, has the potential to kill or injure reptiles. Therefore, prior to mitigation, effects of low magnitude and minor significance are predicted.

8.8.6.2 Mitigation

251 Operational works, such as excavation, directly affecting areas of suitable reptile habitat will utilise the same mitigation measures employed during construction, including gradual habitat clearance and appropriate timing of works, wherever possible.

8.8.6.3 Residual Effects

252 Following implementation of mitigation, potential effects on reptiles are predicted to be of neutral magnitude and **negligible** significance.

8.8.7 Birds

8.8.7.1 Assessment of Effects

253 No operational effects on birds are predicted as any works are likely to be limited to excavation of small areas of cable and will be temporary. Given that the bird interest is considered to be of district value, operational effects on birds are predicted to be of **negligible** significance.

Ecological Receptor	Potential Effects	Effect pre-Mitigation	Mitigation	Residual Effect significance
Intertidal Habitats	Limited physical disturbance during maintenance activity	Negligible	No mitigation proposed	Negligible
Designated sites	Adverse effects on water quality within Woodhall Dean SSSI, Thornton Burn LWS and Dry Burn LWS resulting from pollution and siltation.	Moderate	Best practice working practices regarding pollution and siltation prevention. Implementation of best practice water protection measures.	Negligible
Habitats and flora	Pollution/siltation of watercourses Direct loss of habitat associated with repairs / maintenance works	Minor	Best practice working practices regarding pollution and siltation prevention. Best practice tree protection. Tree root protection zones marked by arborist and fenced off.	Negligible

Ecological Receptor	Potential Effects	Effect pre-Mitigation	Mitigation	Residual Effect significance
			Restricted vehicle movements in proximity to woodlands. Use of protective matting where required to prevent root compaction.	
Badger	Disturbance	Minor	Pre-construction checks.	Negligible
Bats	None	Negligible	None	Negligible
Otter	Disturbance	Minor	Pre-construction checks.	Negligible
Reptiles	Killing and injury during excavation associated with cable maintenance.	Minor	Gradual habitat clearance in areas of suitable reptile habitat. Appropriate timing of works.	Negligible
Birds	None	Negligible	None	Negligible

Table 8.17: Summary of Operational Effects

8.9 Assessment of Decommissioning

254 The assessment of decommissioning is based upon the removal of the substation, the cable, transition pits and all other related components. The effect of decommissioning on ecological and ornithological receptors is assessed below.

8.9.1 Decommissioning of the Cable, Transition Pits and Other Related Components

8.9.1.1 Terrestrial Ecology and Ornithology

255 The effects of decommissioning of the cable, transition pits and other related components of the Onshore Works on terrestrial ecology and ornithology are not considered to be any worse than those predicted during construction.

256 Decommissioning of the cable has the potential to result in adverse effects on Thornton Burn LWS as a result of pollution, siltation and changes in hydrological regime. Such hydrological events would likely be localised, temporary and of short duration and therefore of low magnitude. Following the implementation of the best practice water protection measures and the mitigation measures specified below, residual effects to Thornton Burn LWS and other designated sites are predicted to be of negligible significance.

257 Mitigation put forward at construction would also be implemented at the decommissioning phase, for example:

- pre-decommissioning checks undertaken by an ecologist to determine if there are any changes to the baseline in respect of protected species and ornithology;
- re-turfing/re-seeding of habitats disturbed/damaged during decommissioning;
- implementation of best practice water protection measures;
- reinstatement of any hedgerows damaged during decommissioning;
- tree root protection zones marked by an arborist and fenced off;

- restricted vehicle movements in proximity to Ancient Woodland Inventory Sites;
- use of protective matting, where required to prevent root compaction;
- site clearance and decommissioning activities will take place (and as much of the decommissioning activity as possible completed) outside of the bird breeding season.

8.9.1.2 Intertidal Ecology

258 The effects of decommissioning of the cable, transition pits and other related components of the Onshore Works on intertidal ecology are not considered to be any worse than those predicted during construction, as it is assumed that works would be undertaken at low tide when the potential for re-suspension of sediment as a result of decommissioning activities and subsequent sediment settlement is expected to be low. Furthermore, the intertidal biotopes recorded at Thorntonloch are considered to have negligible vulnerability to the effects of sediment re-suspension and smothering by 5 cm of sand owing to their high tolerance and adaptability to the continual turbulence naturally occurring within this zone from storm events and/or hydrodynamic exposure (tides and wave action). Recovery of these biotopes is likely to be very rapid following cessation of disturbance.

8.9.2 Decommissioning of the Substation

259 Potential direct effects of decommissioning include:

- Direct loss and/or damage of habitat associated with decommissioning activities (e.g. heavy plant/vehicle movements).
- Direct loss or harm of species associated with decommissioning activities.

260 Potential indirect effects of decommissioning include:

- Changes to the existing hydrology that could lead to detrimental changes in wetland flora and fauna as a result of increased drainage or dewatering.
- Increased pollution risk associated with accidental spillage of fuels, oils, and increases in silt laden run-off and from dust emission.
- Disturbance effects to faunal species.
- Temporary disturbance of breeding birds during decommissioning as a result of noise, artificial light and movement of heavy plant. This disturbance is likely to occur within and near breeding bird territories in habitats within the immediate footprint of the substation and could also adversely affect birds with breeding territories occurring within adjacent habitats, up to a distance of 300 m depending on the species.

8.9.3 Good Practice Measures

261 Those good practice measures specified for the construction phase (see **Section 8.7.3**) will also be implemented during the decommissioning phase where applicable. In addition, heavy plant and vehicle movements will be restricted to existing areas of hardstanding to avoid direct effects upon ecological receptors.

8.9.4 Intertidal Habitats

8.9.4.1 Assessment of Effects

262 Decommissioning of the substation is not predicted to have any effect on intertidal habitats.

8.9.4.2 Mitigation

263 No mitigation is proposed.

8.9.4.3 Residual Effects

264 No adverse residual effects are predicted.

8.9.5 Designated Sites

8.9.5.1 Assessment

265 Woodhall Dean SSSI and Dry Burn LWS are hydrologically connected to the area in the vicinity of the substation. Therefore, potential indirect effects upon these sites may include pollution, siltation and changes in hydrological regime. Such hydrological events would likely be localised, temporary and of short duration and therefore,

decommissioning effects of low magnitude and minor significance are predicted on designated sites prior to mitigation.

8.9.5.2 Mitigation

266 The good practice measures specified above, particularly in relation to water quality, will be employed to avoid and minimise potential adverse effects on designated sites during decommissioning.

8.9.5.3 Residual Effects

267 No adverse residual effects are predicted.

8.9.6 Habitats

8.9.6.1 Assessment of Effects

268 Effects on habitats may include direct loss and damage of native scrub habitat in the immediate vicinity of the substation. Effects are likely to be temporary and of relatively small scale, therefore decommissioning effects are predicted to be of a low magnitude and minor significance prior to mitigation.

8.9.6.2 Mitigation

269 The following mitigation measures will be employed to avoid and minimise potential adverse effects on habitats during decommissioning of the substation:

- re-turfing/re-seeding post-works;
- implementation of best practice water protection measures;
- use of tree root protection zones marked by arborist and fenced off;
- best practice decommissioning methods; and
- restricting vehicle movements to areas of existing hardstanding.

8.9.6.3 Residual Effects

270 Following implementation of the mitigation measures listed above, potential effects on habitats during decommissioning are predicted to be of neutral magnitude and **negligible** significance.

8.9.7 Badger and Otter

8.9.7.1 Assessment of Effects

271 Decommissioning works are likely to be restricted to the vicinity of the substation, where the habitats present are of low value for badger and otter. No badger setts or otter shelters were recorded within 50 m of the Application Boundary in this location, therefore decommissioning effects are unlikely. However, otter and/or badger territories may change during the decommissioning phase of the Onshore Works, and therefore, in line with a precautionary approach, effects of low magnitude and minor significance are predicted prior to mitigation.

8.9.7.2 Mitigation

272 Pre-construction checks for otter and/or badger will be undertaken where decommissioning works will directly affect or occur in proximity to habitats suitable for supporting these species (e.g. scrub habitats in the vicinity of the substation). If direct effects or disturbance to these species are predicted as a result of decommissioning works, SNH would be contacted to discuss the requirement for appropriate mitigation and SNH licensing.

8.9.7.3 Residual Effects

273 Following implementation of mitigation, potential effects on badger and otter are predicted to be of neutral magnitude and **negligible** significance.

8.9.8 Bats

274 There will be no direct decommissioning effects on bats. Potential indirect effects on bats include night time lighting of the proposed substation at the western end of the Onshore Works corridor as the decommissioning works progress. However, the substation is located in an area of low suitability for bat foraging and is devoid of potential bat roosting features. Furthermore, the wider landscape supports an extensive network of unlit, optimal

habitat for bat foraging, movement and roosting. Therefore, this effect is highly unlikely to occur and decommissioning effects on bats are predicted to be of **negligible** significance.

8.9.9 Reptiles

8.9.9.1 Assessment of Effects

275 As above, decommissioning works are likely to be highly localised, temporary and of short duration. Suitable reptile habitat occurs in the vicinity of the substation and therefore movements of heavy plant and vehicles in areas of marshy grassland, heathland and proposed scrub habitats adjacent to the substation has the potential to kill or injure reptiles. Therefore, prior to mitigation, effects of low magnitude and minor significance are predicted during decommissioning.

8.9.9.2 Mitigation

276 Decommissioning activities, such as movement of heavy plant and construction vehicles, directly affecting areas of suitable reptile habitat will be mitigated through measures such as gradual habitat clearance and appropriate timing of works (i.e. undertaken during the reptile active season which is typically March – September inclusive), wherever possible. In addition, vehicle movements will be restricted to existing areas of hardstanding as far as possible.

8.9.9.3 Residual Effects

277 Following implementation of mitigation, potential effects on reptiles during decommissioning are predicted to be of neutral magnitude and **negligible** significance.

8.9.10 Birds

8.9.10.1 Assessment of Effects

278 Baseline surveys in 2011 indicated that the only species likely to be of concern were lapwing and curlew, both of which have a relatively low tolerance of disturbance when breeding. Two lapwing and two curlew breeding territories were wholly or partly within 300 m of the proposed substation perimeter during baseline surveys in 2011. At worst, the disturbance could lead to the abandonment of territories or the failure of breeding attempts for the duration of decommissioning (potential for disturbance for up to two breeding seasons).

279 The temporary (i.e. up to two breeding seasons only) loss of production from two breeding territories of curlew and lapwing is predicted as an effect of low magnitude and minor significance.

8.9.10.2 Mitigation

280 Predicted adverse effects can be avoided by undertaking decommissioning outside the bird breeding season (typically March to August for most species).

281 If decommissioning work extends into the bird breed season the following measures would be implemented:

- An ecologist will be present on site before works commence to check the locations of breeding bird territories within the working area and a 300 m buffer, and regularly thereafter to update the information. A mitigation plan will be prepared aiming to reduce disturbance to sensitive species which will be approved by SNH.
- Decommissioning activities will be contained within defined 'Working Areas' to prevent additional disturbance to nesting birds.

282 Habitats will be reinstated on completion of decommissioning works to provide suitable habitat for breeding bird species present in baseline surveys, including lapwing and curlew.

8.9.10.3 Residual Effects

283 Assuming it is not possible to avoid works during the bird breeding season, a residual effect of low magnitude and **minor** significance will remain.

8.10 Monitoring

284 Pre-construction surveys for protected species will be carried out for otter and badger. All watercourses within 250 m of infrastructure will be surveyed for signs of otter, and all habitat within 50 m of infrastructure will be surveyed

for signs of badger. If necessary, a disturbance licence will be sought for any relevant shelters, resting places or setts.

285 Watercourses and other habitats will be visually monitored by a suitably qualified person, such as the ECoW for signs of pollution during the construction works.

286 Preconstruction intertidal invertebrate sampling and biotope verification will be undertaken at lower, mid and upper shore sampling stations along three transects running perpendicular to the shore in the area of the cable landfall at appropriately low spring tides.

8.11 Assessment of In Combination Effects

287 In combination effects from the Project are only likely at the intertidal area (where construction activities may overlap).

288 Effects on intertidal habitats are considered to be of negligible significance both for construction and operation with no effect predicted for decommissioning. Therefore, no cumulative effects arising from the onshore construction works in combination with offshore construction are predicted.

8.12 Assessment of Cumulative Effects

289 This section considers the potential cumulative effects of the Onshore Works in combination with the following proposed schemes:

- Aikengall II Wind Farm and associated substation.
- Crystal Rig III Wind Farm.
- SPT NnG scheme to connect Neart na Gaoithe to the National Grid.

290 The assessment of potential cumulative effects has been undertaken in line with a precautionary principle. Cumulative effects of the Onshore Works in combination with other proposed schemes are considered for all ecological receptors where residual construction effects of minor, moderate or major significance remain following mitigation.

8.12.1 Construction

8.12.1.1 Assessment of Effects

291 All residual construction effects on species are considered to be of negligible significance, and therefore no cumulative construction effects on species are predicted.

292 Minor adverse effects are predicted on Thornton Burn LWS as a result of construction of the Onshore Works. However, given the distance between the other proposed schemes and Thornton Burn LWS, no cumulative construction effects on this receptor are predicted.

293 Following mitigation, residual construction effects of minor significance remain for marshy grassland and dry heath habitats. Therefore, there is potential for construction of the Onshore Works, together with the other proposed schemes, to result in cumulative effects on these habitats. However, given the relatively small areas of marshy grassland and dry heath habitats affected, either directly or indirectly by the Onshore Works, the potential for cumulative construction effects is not predicted to exceed a minor significance, regardless of the magnitude of effects of the other proposed schemes on these habitats or the proportion of effect contributed by the Onshore Works. Therefore, in line with a precautionary approach, the Onshore Works is predicted to result in a cumulative construction effect of minor significance on habitats.

8.12.1.2 Mitigation

294 No significant cumulative construction effects (i.e. those of moderate or major adverse effect) were identified, therefore no mitigation, above that specified for construction, is proposed.

8.12.1.3 Residual Effects

295 All residual cumulative construction effects are considered to be **non-significant**.

8.12.2 Operation

8.12.2.1 Assessment of Effects

296 No significant residual operational effects are identified for designated sites, habitats or species and therefore no significant adverse cumulative effects are predicted with the other proposed schemes.

8.12.2.2 Mitigation

297 No significant cumulative operational effects were identified, therefore no mitigation is proposed.

8.12.2.3 Residual Effects

298 All residual cumulative operational effects are considered to be **non-significant**.

8.12.3 Decommissioning

8.12.3.1 Assessment of Effects

299 No significant residual decommissioning effects are identified for designated sites, habitats or species and therefore no significant adverse cumulative effects are predicted with the other proposed schemes.

8.13 Summary

300 **Table 8.18** below summarises the predicted effects of the Onshore Works on ecological receptors.

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction			
Intertidal habitats Disturbance to habitats due to cable laying and installation	Negligible	No mitigation proposed	Negligible
Designated sites Direct loss of willow trees at Thornton Burn LWS associated with construction of temporary bridge and trenchless construction technique working area Root compaction of AWI trees Damage to AWI trees Pollution and/or eutrophication of soils of AWI woodland Adverse effects on water quality within Woodhall Dean SSSI, Thornton Burn LWS and Dry Burn LWS resulting from pollution and siltation.	Minor (Thornton Burn LWS) to Moderate (AWI sites)	Use of trenchless construction techniques to minimise habitat loss Re-turfing/re-seeding post-construction Implementation of best practice water protection measures Tree root protection zones marked by arborist and fenced off Best practice construction methods Restricted vehicle movements in proximity to AWI sites Use of protective matting where required to prevent root compaction	Negligible (AWI sites) to Minor (Thornton Burn LWS)

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Habitats Direct loss of blanket bog and M23 marshy grassland habitat. Indirect effects through disruption of hydrological regime and pollution.	Negligible for majority of habitats Minor for; arable; blanket bog; wet modified bog / acid flush; wet modified blanket bog; improved grassland; semi-improved neutral grassland; poor-semi-improved neutral grassland; unimproved acid grassland; marshy grassland/acid flush/blanket bog; marshy grassland (non M23); and hedgerows Moderate for Marshy grassland (M23), dry heath, and dry heath / acid grassland mosaic	Micro-siting in areas of sensitive habitat Use of trenchless construction techniques to minimise habitat loss Re-turfing/re-seeding post-construction Reinstatement of hedgerows Implementation of best practice water protection measures Tree root protection zones marked by arborist and fenced off Best practice construction methods Restricted vehicle movements in proximity woodlands Use of protective matting where required to prevent root compaction to trees	Minor effect for M23 marshy grassland, dry heath, and dry heath / acid grassland mosaic. Negligible effects for all other habitats.
Badger Road casualty Accidental capture Limitation of movements	Minor	Best practice working measures 15 mph speed limit within the Onshore Works area Construction fencing designed to allow badger movement Covering open trenches or providing 'escape ramps'	Negligible
Bats Loss of commuting/foraging habitat Severance of linear habitat features Disturbance and habitat degradation from artificial lighting	Minor	Use of trenchless construction techniques to avoid loss of valuable bat habitats (e.g. woodlands) Re-instatement of hedgerows following construction Best practice lighting measures and working during daylight hours in areas close to habitats of value to bats	Negligible
Otter Road casualty	Minor	Best practice working measures	Negligible

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Pollution and/or siltation of watercourses Accidental capture Limitation of movements		Bridges/culverts designed to allow passage of otter 15 mph speed limit within the Onshore Works area. Pollution and sediment run-off control measures Construction fencing designed to allow otter movement. Covering open trenches or providing 'escape ramps.'	
Reptiles Killing and injury during construction works	Minor	Gradual habitat clearance prior to works Appropriate timing of works	Negligible
Birds Potential for destruction or damage of nests	Minor	Site clearance and construction activities (and as much of the construction activity as possible completed) outside of the breeding season An ecologist present on site to check the working area before works commence Any nests discovered during construction appropriately protected to ensure that they are not destroyed before any works commence in that area of the site	Negligible
Temporary disturbance	Minor	Removal of the surface vegetation before the breeding season commences Site clearance and construction activities (and as much of the construction activity as possible completed) outside of the breeding season Strict adherence to the working areas set up at the onset of construction to prevent additional	Negligible

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
		disturbance to nesting birds Reinstatement of habitat disturbed during works following completion	
Operation			
Intertidal habitats Disturbance to habitats due to maintenance activity	Negligible	No mitigation proposed	Negligible
Designated sites Adverse effects on water quality within Woodhall Dean SSSI, Thornton Burn LWS and Dry Burn LWS resulting from pollution and siltation	Moderate	Use of trenchless construction techniques to minimise habitat loss Re-turfing/re-seeding post-construction Implementation of best practice water protection measures Tree root protection zones marked by arborist and fenced off Best practice construction methods Restricted vehicle movements in proximity to AWI sites Use of protective matting where required to prevent root compaction	Negligible
Habitats Pollution/siltation of watercourses Direct loss of habitat associated with repairs / maintenance works	Minor	Use of trenchless construction techniques to minimise habitat loss Re-turfing/re-seeding post-construction- Implementation of best practice water protection measures Tree root protection zones marked by arborist and fenced off Best practice construction methods Restricted vehicle movements in proximity to woodlands Use of protective matting	Negligible

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
		where required to prevent root compaction	
Bats None	Negligible	None	Negligible
Badger Disturbance	Minor	Pre-construction checks	Negligible
Otter Disturbance	Minor	Pre-construction checks	Negligible
Reptiles Killing and injury during excavation associated with cable maintenance	Minor	Gradual habitat clearance prior to works Appropriate timing of works	Negligible
Birds None	Negligible	None	Negligible
Decommissioning of the Cable, Transition Pits and Other Related Components			
Terrestrial Ecology and Ornithology	Minor to Moderate	Best practice water protection methods. Pre-decommissioning checks undertaken by an ecologist to determine if there are any changes to the baseline in respect of protected species and ornithology Re-turfing/re-seeding of habitats disturbed/damaged during decommissioning Implementation of best practice water protection measures Reinstatement of any hedgerows damaged during decommissioning Tree root protection zones marked by an arborist and fenced off Restricted vehicle movements in proximity to Ancient Woodland Inventory Site Use of protective matting, where required to prevent root compaction	Negligible

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
		Site clearance and decommissioning activities will take place (and as much of the decommissioning activity as possible completed) outside of the bird breeding season	
Intertidal Ecology	Negligible	None.	Negligible
Decommissioning of the Substation			
Intertidal habitats No effect.	Negligible	None	Negligible
Designated sites Adverse effects on water quality within Woodhall Dean SSSI, and Dry Burn LWS resulting from pollution and siltation	Minor	Best practice construction methods	Negligible
Habitats Pollution/siltation of watercourses Direct loss of habitat associated with vehicle movements	Minor	Implementation of best practice water protection measures Re-turfing/re-seeding post-works Best practice construction methods Restricting vehicle movements to areas of existing hardstanding	Negligible
Bats Possible effect from lighting	Negligible	None	Negligible
Badger Disturbance	Minor	Pre-construction checks	Negligible
Otter Disturbance	Minor	Pre-construction checks	Negligible
Reptiles Killing and injury associated with heavy plant/vehicle movements	Minor	Gradual habitat clearance prior to works Appropriate timing of works	Negligible
Birds	Minor	A mitigation plan to be	Negligible

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Disturbance leading to loss of young production from bird breeding territories for up to two breeding seasons		agreed with SNH based on pre-decommissioning checks undertaken by an ecologist and updated over duration of decommissioning phase Decommissioning activities will be contained within main Working Area to avoid wider disturbance Reinstatement of breeding wader habitat post decommissioning.	
Cumulative & In Combination Effects			
Designated sites	Negligible	None	Negligible
Habitats (marshy grassland and dry heath habitats)	Minor adverse	As specified above for construction	Minor
Species	Negligible	None	Negligible

Table 8.18: Summary of Predicted Significant Effects

8.14 References

ARG (Amphibian and Reptile Groups), 2010). *ARG Advice Note 5: Great crested newt habitat suitability index*. [online] http://www.herpetologic.co.uk/images/uploads/ARGUKAdviceNote5_HSI_May_2010.pdf (accessed, September 2011).

Anderson A.R, Ray D, Pyatt D.G, (2000). *Physical and hydrological impacts of blanket peat afforestation at Bad a Cheo, Caithness: the first five years*. Forestry 73.

Atherton, I., Bosanquet, S., Lawley, M., 2010. *Mosses and Liverworts of Britain and Ireland – A Field Guide*. BBS. Plymouth.

Averis, A., Averis, B., Birks, J., Horsfield, D., Thompson, D., & Yeo, M., 2004. *An Illustrated Guide to British Upland Vegetation*

BERR (Department of Business, Enterprise and Regulatory Reform), 2008. Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry. Technical Report from BERR to the Department of Enterprise & Regulatory Reforms (BERR) in association with DEFRA. Available online from: <http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43527.pdf> [accessed Jun 2011].

Bloor, P. and Barton, C., 2011. Discussion on birds in the Thorntonloch area. [email] (Personal communication, 9 June

BCT (Bat Conservation Trust), 2007a. *Bat Surveys: Good Practice Guidelines*. BCT. London

BCT (Bat Conservation Trust), 2007b. *Bats and lighting in the UK – bats and the built environment series*. BCT. London

Connor, D. W., Allen, J. H., Golding, N., Howell, K. L., Lieberknecht, L. M., Northern, K. O. and Reker, J. B., 2004. The Marine Habitat Classification for Britain and Ireland. Joint Nature Conservation Committee (JNCC). Available online from: <http://www.jncc.gov.uk/> .[accessed Mar 2012].

Cooper, E.A., 1998. *Summary descriptions of National Vegetation Classification grassland and montane communities*.

Eaton M.A., Brown A.F., Noble D.G., Musgrove A.J., Hearn R., Aebischer N.J., Gibbons D.W., Evans A. and Gregory R.D., 2009. Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. *British Birds* 102, pp296-341.

English Nature [now Natural England], 2001. *Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough

English Nature [now Natural England], 2004. Bat mitigation guidelines. English Nature. Peterborough.

Entwhistle, A.C., Harris, S., Hutson, A.M., Racey, P.A., Walsh, A., 2001. *Habitat management for bats - A guide for land managers, land owners and their advisors*. JNCC. Peterborough

Fure, A., 2006. *Bats and Lighting*. The London Naturalist No. 85

Gilman K. 1994. (1994), *Hydrology and wetland conservation*. Institute of Hydrology Publication.

Institute of Ecology and Environmental Management, (2006). Guidelines for Ecological Impact Assessment in the United Kingdom.

JNCC (Joint Nature Conservation Committee), 2004. *Bat Workers Manual*. JNCC. Peterborough

JNCC (Joint Nature Conservation Committee), 2010. *Handbook for Phase 1 Habitat Survey - a technique for environmental audit*. JNCC. Peterborough.

MarLIN Marine Life Information Network (Marine Life Information NetworkMarLIN), 2011. The Marine Life Information Network. Available online from: <http://www.marlin.ac.uk/> [accessed Sept 2011].

Mueller-Dombois, D.R. and Ellenberg, H., 1974. *Aims and Methods of Vegetation Ecology*. Wiley, Colorado.

Natural England (2010). *Investigating the impacts of windfarm developments on Peatland in England: Part 1 Final Report*.

ODPM (Office of the Deputy Prime Minister), 2005. Circular 06/05: *Biodiversity and Geological Conservation - Statutory Obligations and Their Impact Within the Planning System*.

Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M., 2000. *Evaluating the suitability of habitat for the Great Crested Newt Triturus cristatus*. *Herpetological Journal* 10 (4): 143-155

Rodwell, J.S. (Ed.), 1991a. *British Plant Communities. Volume 1. Woodlands and scrub*. Cambridge University Press.

Rodwell, J.S. (Ed.), 1991b. *British Plant Communities. Volume 2. Mires and heath*. Cambridge University Press.

Rodwell, J. S. (Ed.), 1992. *British Plant Communities. Volume 3. Grassland and montane communities*. Cambridge University Press.

Rodwell, J.S. (Ed.), 1995. *British Plant Communities. Volume 4. Aquatic communities, swamps and tall-herb fens*. Cambridge University Press.

Rodwell, J.S. (Ed.), 2000. *British plant communities. Volume 5. Maritime communities and vegetation of open habitats*. Cambridge University Press.

Rodwell, J.S. (Ed.), 2006. *NVC User's Handbook*. JNCC, Peterborough.

Rose, F. (Revised and updated by O'Reilly, C), 2006. *The Wild Flower Key*. Frederick Warne. London

Scottish Executive, 2000. *Planning Advice Note 60: Planning for Natural Heritage (PAN 60)*

Scottish Executive, 2001. *European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements*.

Scottish Government, 2010, *Scottish Planning Policy*. TSG

SEPA (Scottish Environmental Protection Agency), 2011. *Land Use Planning System SEPA Guidance Note 4: Planning Guidance on Windfarm Developments V5*. SEPA

SNH (Scottish Natural Heritage), undated. *A guide to understanding the Scottish Ancient Woodland Inventory (AWI)* [on-line] <http://www.snh.gov.uk/docs/C283974.pdf> (accessed November, 2011).

SNH (Scottish Natural Heritage), undated b. Otters and Development [on-line] <http://www.snh.org.uk/publications/on-line/wildlife/otters/biology.asp> (accessed January, 2012).

Stace, C., 2010. *New Flora of the British Isles 3rd Ed*. CUP. Cambridge.

T&SS (Technical and Safety Services), 2011a. Bat Habitat Assessment. T&SS report for LUC

T&SS (Technical and Safety Services) 2011b. Bat Activity Surveys. T&SS report for LUC

WICLB (The Wildlife Information Centre for the Lothians and Borders), 2011. *Neart na Gaoithe – Notable species, designated site data*. Unpublished – data search for Land Use Consultants.

