12 Soils and Peat

12.1 Introduction

12.1.1 Since the submission of the previous application for the Consented Development, there have been no changes to the ground conditions baseline and given that the infrastructure of the Consented Development is not changing, there would be no additional effects. The findings of the previous assessment and the FEI that was submitted during determination of the application therefore remain valid, and the previous chapter is set out in full below, with a brief update included in relation to planning policy.

12.1.2 This chapter reports the findings of the assessment of the potential impacts associated with the development of a wind farm consisting of up to 17 turbines and all ancillary infrastructure (the Consented Development) on the soil and peat resource within the Site. The analysis in this chapter also presents the results from two peat surveys (Appendix 12.1) and the findings of a peat slide risk assessment (Appendix 12.2).

12.1.3 A qualitative impact assessment has been based on peat depth surveys and field assessment of the quality of peat and associated habitats (Blairbeg Consulting Ltd, Appendix 12.1). The assessment includes a review of the context of the assessment; methodology; baseline conditions; potential effects (both direct and indirect) and mitigation. The assessment considers potential impacts during the construction, operational and decommissioning phases of the Consented Development. In addition, Appendix 12.2 considers the potential risks associated with peat instability during the construction phase. The soil and peat assessment should be considered in conjunction with Chapter 11: Ecology, which includes an assessment of Groundwater Dependent Terrestrial Ecosystems (GWDTEs). The soil and peat assessment should also be considered in conjunction with the geology underlying the Site (as set out in Chapter 13: Geology) and water resources (Chapter 15: Hydrology and Hydrogeology). An assessment of potential cumulative effects of the Consented Development on peat resources has also been considered.

12.1.4 The chapter has been prepared by qualified soil scientists from Wardell Armstrong and is based on field surveys undertaken by Blairbeg Consulting Ltd, a consultancy with recent relevant experience of peat surveys on the Shetland Islands. The scope of this assessment meets the requirements of current planning regulations and guidance set out for best practice for construction in peatlands defined by SEPA[1], NatureScot (previously SNH) [2] and the Scottish Government[3]. The assessment also conforms to the methodology identified in IEMA's EIA Guidelines[4]

12.2 Methodology

Study area

12.2.1 The Study area includes the area within the Application Boundary (Figure 12.1), which is a moorland environment where peat is present throughout, with a variable depth that supports a variety of blanket bog habitats. The Study Area contains a number of surface water catchments that have also been taken into account for the assessment of the peat resource (see Chapter 15: Hydrology and Hydrogeology). The habitats, which are characteristic of the peat resource, have been degraded over large areas of the Study Area, principally due to agricultural uses and overgrazing. Overgrazing has resulted in the

formation of poor vegetation causing widespread erosion and loss of peat and resulting in deep gullies within the peat together with expanses of bare peat at the surface.

12.2.2 The baseline analysis comprised desk based analysis of published information[5] on the soil and peat associations typically found on Yell. This initial data was informed and corroborated by a peat depth survey on a grid that covered the Study Area, together with descriptions of the ground flora, in accordance with National Vegetation Classification (NVC) guidelines (which is outlined in further detail in Chapter 11: Ecology). To inform detailed design further, peat depth surveys were concentrated at the proposed location of the turbines and construction infrastructure.

12.2.3 Conserving and improving the condition of the moorland and blanket bog habitats is a primary goal of the Consented Development. This goal will be met through a Habitat Management Plan (HMP) which aims to alleviate any ecological impacts by enhancing and restoring habitats within the Site. The Beaw Field Outline Habitat Management Plan ((OHMP) Appendix 10.4) provides a summary of the aims, methods and scope of works that will be undertaken within the HMP which will be prepared for the consented development.

Desk study

12.2.4 The desk based study examined the published soils information on Yell, including the following sources of information that were used to determine the impact of the Consented Development on the peat resource within the Site:

- The Macaulay Institute for Soil Research (now the James Hutton Institute)[5];
- Carbon – rich soils, deep peat and priority peatland habitats (NatureScot)[6].

Field survey

12.2.5 The field surveys consisted of:

- A preliminary survey carried out between 22nd and 25th January 2015 recording details of peat depths taken on a 250m grid with record of erosion features, drainage, peat cutting, grazing pressure and vegetation cover (Appendix 12.1);
- Following the initial turbine layout and design of infrastructure, a further detailed survey, discussed and approved by SEPA was carried between 5th and 9th August 2015, where peat depths were recorded on a 50m to 100m grid where access tracks, turbine bases, hardstandings and other infrastructure would be potentially located (see Figure 12.2).

Peat depth mapping

12.2.6 The purpose of the peat surveys was to:

- Identify areas of peat, based on the definition in the Soils Survey of Scotland[7], which are organic soils >0.5m in depth;
- To identify the extent of impacts resulting from grazing pressure;
- To inform the carbon balance calculation for the Consented Development (Chapter 13: Carbon Balance);
- To assess the potential risk of peat landslide during construction of the Consented Development (Appendix 12.2);

- To inform the infrastructure design and minimise the depth and volume of excavated peat;
- To characterise the nature and condition of the peatland habitat; and
- To enable an estimate of the volume of peat that would be excavated for each component of the Consented Development.

Impact assessment methodology

12.2.7 The sensitivity of the peat resource to disturbance and loss has been determined based on the classification in Table 12.1, which draws on criteria related to the potential for active carbon sequestration through peat formation and the presence of sensitive habitats such as blanket bog.

Table 12.1: Sensitivity classification

Receptor	*Sensitivity*	*Justification*
Peat resource		
Deep peat resources (>0.5m) supporting blanket bog habitat	High	Deep carbon rich and supporting sensitive habitats / species including blanket bog, bog pools. Typically the following NVC Communities: M1 and M2 – Sphagnum auriculatum bog pool community M3 - Eriophorum bog pool community M18 - Sphagnum raised and blanket mire M19 – Eriophorum blanket mire.
Deep peat resource (>0.5m) supporting degraded blanket bog habitat	Medium	Deep carbon rich supporting habitat that has been degraded resulting from overgrazing and other agricultural practice, including wet and dry modified bog. Typically the following NVC Communities: M6 (b to d) – soft rush communities present on deep wet peat. M15 – wet dwarf shrub heath on deep peat M20 - wet and dry highly modified blanket bog M25 - heather moor, Molinia caerulea dominant on deep peat.
Un-vegetated, acid grassland and degraded blanket bog deep peat soil (>0.5) OR Shallow peat (<0.5m) and peaty topsoil	Low	Carbon rich soils unlikely to be actively peat forming. Typically the following NVC Communities: U6a & b – degraded blanket bog grassland dominates M15 - but on shallow peat M23-rushy pasture, not dependent on deep peat M25 – species bog on shallow peat

12.2.8 During construction peat would be excavated, handled and stored. Peat would also be used to rehabilitate existing degraded habitat together with the reinstatement of disturbed areas as a consequence of construction activities. Therefore, to assess the change in state of a receptor (peat and its habitat) the following scale has been used to inform and define the magnitude of change criteria.

Minimum change	to	Maximum change
No loss	to	Total loss
Reversible	to	Irreversible
Negligible	to	High

12.2.9 Yell is the largest of Shetland's north isles[8] extending to an area of approximately 212km^2 of which the majority is open moorland with deep peat (Figure 12.1) that has developed on a range of bedrock types. Based on an assumption that at least 70% of Yell's land area has deep peat (i.e. is capable of peat forming i.e. peat depths of >0.5m minimum with known depths >4m). The minimum peat volume on the island has been estimated to be approximately 220Nm^3, on the basis of an average of 1.5m peat depth. The Site extends to an area of 1,135ha, within which a grid peat depth survey has established that peat depths ranged from 0 (peat absent) to a maximum 4.35m. The average peat depth across the Site is 1.25m, which is also defined as deep peat. An extremely conservative comparison of the volume of peat within the Site, compared to that potentially on Yell, indicates that, as a maximum, the Site contains approximately 6% of the total peat resource on Yell. The footprint of the Consented Development (25ha) is the total area of peat resource that would be potentially affected, which constitutes at a maximum 0.1% of the peat resource on Yell. Therefore, it is considered that the potential disturbance of peat within the footprint of the Consented Development is not significant when considered in the context of the volume of peat on the Island of Yell as a whole. In consequence, and throughout this assessment, the potential impact on peat resulting from the construction of the Consented Development has been compared to the peat resource at a local level. This has been defined as the peat resource present within the Site, which extends to an area of 1,135ha, compared to the area disturbed, within the footprint of the Consented Development.

12.2.10 The magnitude of change criteria presented in Table 12.2 takes account of the magnitude of change from the baseline condition, combined with an element of professional experience based on assessments that have previously been agreed and accepted as good practice. This approach has been adopted in the absence of available specific and documented guidance in connection with determination of the magnitude of effect in relation to the soil / peat resource and land quality. It should be recognised that because there is ubiquitous evidence of current and ongoing peat loss within the Site, there is potential for positive or beneficial impacts as a consequence of the Consented Development. The magnitude of beneficial change has been identified in Table 12.2.

Table 12.2: Magnitude of change from the baseline

Magnitude of change	***Guideline criteria***
Negative impacts	
High	Total loss of or alteration to the baseline resource such that post development characteristics or quality would be fundamentally and irreversibly changed. The magnitude of the change would be such that coherence of its ecological structure and function would be altered at a local level to an extent that the complex of habitats and / or the sensitive species are lost or substantially diminished. At a Site level this would equate to the total volume of peat disturbed >2.5% of the total peat resource within the Site.

Table 12.2: Magnitude of change from the baseline

Magnitude of change	***Guideline criteria***
Medium	Loss of, or alteration to the baseline resource such that post development characteristics or quality would be partially lost or changed at a local level, to the extent that conservation objectives are unlikely to be achieved. At a Site level the magnitude of the change would be such that coherence of its ecological structure and function would be altered to an extent that the complex of habitats and / or the sensitive species are lost or substantially diminished. At a Site level this would equate to the total volume of peat disturbed >2.5% but <5% of the total peat resource within the Site.
Low	Small changes to the baseline resource, which are detectable but the underlying characteristics or quality of the baseline situation would be similar at a local and Site level to pre-development conditions, i.e. no material effects on conservation status of the peatland resource. At a Site level this would equate to the total volume of peat disturbed <2.5% of the total peat resource within the Site.
Negligible	A very slight change to the baseline conditions at a local and Site level, which is barely distinguishable, and approximates to the 'no change' situation.
Positive impacts	
High	At a Site level, a large area of improved habitat, through appropriate long term management, such that 90% of the ground cover is blanket bog forming habitat combined with management objectives defined in Scotland Peat Management Plan[14].
Medium	At a Site level, a moderate area of improved habitat, such that at least 50% of the ground cover is blanket bog forming habitat combined with management objectives defined in Scotland Peat Management Plan[14].
Low	At a Site level, small improvements in habitat, associated with land management changes such as reduced grazing pressure, reduction in areas of bare eroded peat and retention of surface water by reducing drainage locally improved condition of peat resource
Negligible	At a Site level, slight changes to the baseline condition, such that the ongoing deterioration in the condition of blanket bog habitat is slowed or halted.

12.2.11 The scale of impact is determined in relation to the sensitivity of the baseline resource and magnitude of change, using the matrix shown in Table 12.3, and relates to the excavation and loss of the peat resource as well as the reuse of peat to improve areas of degraded habitat, extensive peat loss and areas where peat has been recorded as absent, as a consequence of erosion.

Table 12.3: Scale of Impact

Magnitude of change ***+ve / -ve***	***Sensitivity***			
	High	***Medium***	***Low***	***None***
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

12.2.12 To determine the scale of impact of the Consented Development accurately, each project component (comprising turbine foundation, crane pad, hardstanding, access track and cable trenches, construction compound, substation, met mast and radio communications tower, see Table 12.4) has been considered by separate water catchments within the Site (refer to Figure 15.1). This enables the cross reference between hydrological impact assessment, as both are interlinked (Chapter 15: Hydrology and Hydrogeology).

12.2.13 Fundamental changes are those that are permanent, (detrimental, and / or beneficial) and would result in widespread change in the baseline environment. Within the matrix (Table 12.3) the effects that are defined as major and moderate are considered to be significant. In the context of this assessment this could be either positive or negative.

Assessment of Cumulative Impacts

12.2.14 The assessment of cumulative impacts on soils and peat considers the combined potential impact of other developments, with the potential to impact this resource, within a boundary determined as the same catchment(s) as the Consented Development and thus aligns with the approach adopted in Chapter 15: Hydrology and Hydrogeology. This includes the consideration of other developments currently in the planning process and within the same catchment(s) as the Consented Development. The approach to defining the significance of effects set out in Table 12.1 to Table 12.3 have also been used to determine the scale of cumulative impacts.

12.3 Consultation

12.3.1 The Applicant submitted an EIA Scoping Request to Scottish Ministers in April 2015 and a Scoping Opinion was subsequently issued in May 2015. The Scoping Opinion, which included responses from Shetland Island Council (SIC) (7th May 2015), Royal Society for the Protection of Birds (RSPB) (27th April 2015), Scottish Environment Protection Agency (SEPA) (8th May 2015), Scottish Natural Heritage (SNH) (now NatureScot) (8th May 2015) and Scottish Wildlife Trust (SWT) (7th May 2015), identified areas concerning blanket bog and peat for discussion and / or consideration within the EIAR. Their comments are summarised below.

- SIC, RSPB and NatureScot requested that the EIAR should include an appropriate HMP to include detailed descriptions of measures to conserve the blanket bog habitat and peat-forming vegetation.

Appendix 10.4 provides information on the HMP for the Consented Development including the consideration of restoring degraded bog areas for habitat improvement.

- SEPA requested that all groundwater abstractions are identified within 250m of excavations deeper that 1m in depth and 100m of excavations less than 1m in depth. A data request to SIC confirmed that there are no groundwater abstractions within the Site.
- SEPA requested that any proposals must be in accordance with the Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste and the regulatory position statement with Developments on Peat[9]. SIC further supports the views of SEPA in respect of the methods of proposed peat management. The guidance has been used to identify appropriate mitigation measures, which will be used to direct the Peat Reinstatement and Management Plan (PRMP) that would be prepared and agreed prior to the commencement of development, see Annex 1 of Appendix 3.6.
- NatureScot and SWT requested the Site be identified in a Phase 1 habitat survey and further classified according to the NVC system. Details of the survey techniques used to establish the baseline condition are described in Chapter 11: Ecology.
- SEPA objected to the original EIA requesting additional information on the reuse and management of peat and on potential impacts on groundwater extractions. These concerns were then addressed through an FEI submission (See Appendix 12.) leading to the objection being lifted and the scheme being consented.

12.4 Policy, legislation & guidance

12.4.1 In view of the importance of peatlands for carbon storage and the habitats they support, there are guidelines that must be followed so that key principles are not over looked during the process of site surveying and final design layout. This guidance includes;

- Scottish Renewables and SEPA 'Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste' (2012)[1];
- SNH 'Carbon-rich soil, deep peat and priority peatland habitats map: Consultation Document' (2014)[2]; and
- The Scottish Government 'Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments' (2007)[3].

12.4.2 This guidance has informed the approach to assessing significance of effects together with the design of mitigation measures to address potential impacts.

Construction good practice guidance

12.4.3 The construction of electricity developments on peatlands is subject to good practice guidelines, which wind farm developers, planning authorities and statutory consultees are required to follow. The guide promotes 'good' practice, not necessarily 'best' practice as this is evolving constantly. The guide aims to ensure that all developments are constructed in a sustainable way that respects the surrounding environment and minimises potential for environmental risks[10].

12.4.4 This assessment considers the following:

- Description of peat and mineral soils within the Site;

- Evaluation of peat slide risk throughout the operation (Appendix 12.2);
- Estimated volumes of excavated peat and predicted volumes for reuse (Annex 1 of Appendix 3.6);
- Mitigation measure embedded into the design of the Consented Development; and
- Mitigation measures required to manage the peat resource and maintain good practice techniques, including the methodology for the handling of excavated peat (Annex 1 of Appendix 3.6).

12.5 Legislative context

12.5.1 To produce a robust impact assessment, appropriate criteria have been selected to quantify the significance of impacts associated with the Consented Development. National Government policy includes The National Planning Framework 3[11] and the Scottish Planning Policy (SPP)[12], both of which were published on 23rd June 2014 setting out national planning policies to ensure a consistency of policy applications across Scotland. Local Policy consists of the Shetland Local Development Plan (LDP)[13].

The National Planning Framework 4

12.5.2 Draft National Planning Framework 4 is under preparation and will include all aspects of national planning policy as per the provisions of the Planning (Scotland) Act 2019. Draft NPF4 requires that development proposals for renewable energy developments must take into account impacts on carbon rich soils.

The National Planning Framework 3

12.5.3 Paragraph 4.22 discusses peatland restoration and its role in building Scotland's long-term resilience to climate change and reducing greenhouse gas emissions. Peatland restoration is planned on a large scale with The National Peatland Plan[14] guiding decision-making to ensure this resource is conserved and enhanced. This is affiliated with a peatland restoration target of 22,000ha per year set by Low Carbon Scotland (2013)[15].

Scottish Planning Policy

12.5.4 Under Paragraph 29 of the Sustainability policy principles, soil is introduced in relation to the requirement for sustainable development and avoidance of over-development to protect the amenity of new and existing developments, with specific consideration for water, air and soil quality. Paragraph 166 and Table 1 of SPP identifies carbon rich soils, deep peat and priority peatland habitats, as a potential constraint to be considered in the spatial planning for onshore wind developments (Chapter 4: Planning and Policy Background). Paragraph 169 states that any proposals for energy developments should consider the spatial frameworks for wind farms and heat maps where relevant. Considerations also need to include any impact on carbon rich soils using the carbon calculator (see Chapter 14: Carbon Balance for further information). Paragraph 205 supports this stating where peat and carbon rich soils are present, developments should aim to minimise CO_2 release during excavation, handling, storage and reinstatement of these resources.

Shetland Local Development Plan (LPD)

12.5.5 The Shetland Local Development Plan (LDP) 2014 was adopted by the Council on 26th September 2014 and is the established planning policy for Shetland. The document sets out the Council's land use strategy, promoting sustainable economic growth whilst conserving Shetland's natural and built

environment. Policy NH5: Soils states that development will only be permitted where appropriate measures are taken to maintain soil resources and functions to an extent that is considered relevant and proportionate to the scale of the development.

12.5.6 The Policy sets out that evidence of the adoption of best practice in the movement of, storage, management, reuse and reinstatement of soils must be submitted with the application. For certain scales of development, a soil management plan will be required to demonstrate that risks to soils, such as unnecessary disturbance, degradation and erosion have been avoided. For the Consented Development these techniques will be defined in the Peat Reinstatement and Management Plan (PRMP) (see Annex 1 of Appendix 3.6). The PRMP considers the use of best practice techniques for the excavation, handling and reuse of peat, based on the mitigation measures set out in this assessment.

12.6 Baseline

Site description

12.6.1 The Site is located in the south of island of Yell in the Shetland Islands, approximately 4km northeast of Ulsta and 1km northwest of Burravoe. The Site is centred on the Burn of Hamnavoe and the nearest settlements are Hamnavoe, Burravoe, Gossabrough and Ulsta (see also Chapter 2: Site Description and Figure 1.1).

Soil association

12.6.2 Soils within the Site belong to the Arkaig Association[5] category of soil, consisting of peaty ranker soils and non-calcareous gleys that exhibit poor drainage. The parent material comprises shallow drifts derived from schists, gneisses, granulites and quartzites, as well as minor parent materials: colluvium and rock debris. Drift cover is patchy and occurs mostly in infilled valleys and depressions. The landforms are varied, but the association is generally characterised by strongly undulating, moderately rocky to very rocky lowland or weakly stepped hillslopes (Chapter 13: Geology). The association is frequent in the Shetlands, occupying approximately 10% of the land cover and is generally thin and patchy. It is present within infilled valleys in otherwise ice-scoured landscapes. The association is dominated by peaty gleys and peat developed on gentle slopes, such as those within the Site. The peaty gleys are generally poorly drained and habitats range from heather moor to upland blanket bog (Chapter 11: Ecology provides more details of the flora within the Site).

Preliminary peat survey

12.6.3 A preliminary peat survey across the majority of the Site was carried out between 22nd and 25th January 2015 by Blairbeg Consulting Ltd (Appendix 12.1). The aim of the survey was to provide a record of peat depths on a regular grid, together with information on the nature and condition of the peatland habitat. Peat depths were sampled to full depth to the underlying strata on a 250m grid.

12.6.4 An additional peat survey, undertaken between 5th-9th August 2015, sampled the peat depth at a 50m and 100m grid resolution and was completed to inform the final turbine layout, concentrating on the route of access tracks and the footprint of turbines, hardstanding, borrow pits, Site compound and substation (Figure 12.1). The approach to the survey was approved by SEPA and a combined total of 1,762 sample points have been used to establish the depth of peat within the Site (Figure 12.2).

12.6.5 Within the Site, peat depth ranged from 0m (mineral soil, or peat absent) to a maximum depth of 4.35m. The average depth was 1.25m, with the standard deviation of 0.78m indicating high variability. This can be attributed to anthropogenic influences impacting on the peat resource such as overgrazing and peat cutting which damage vegetation cover making peat susceptible to erosion as a consequence of wind blow, desiccation, water erosion and the action of freeze / thaw during the winter months. As a result, extensive gullying is present within the Site (Figure 12.3).

12.6.6 Peat and moorland habitats were generally observed to be in a degraded state and subject to water and wind erosion (Appendix 12.1). Evidence of erosion and the effects of grazing were evident throughout the Site, particularly near the major watercourses (Burn of Hamnavoe and Green Burn), rising ground with a steep gradient, along the corridor of the B9081 road and the perimeters surrounding the lochs of Horsewater, Litla Water and Evra Water.

12.6.7 Soil erosion was evident in the form of hags and gullies (see Figure 12.3); the locations of these features were not individually recorded, as they were numerous and were present over the majority of the Study Area. At each survey location, bare, un-vegetated areas and areas of bare rock were recorded qualitatively (using the scale: extensive, frequent or infrequent) (see Figure 12.4). Grazing pressure was recorded as high, moderate or low based on the following criteria (see Figure 12.5):

- High: tracks or trampled ground frequent with conspicuous dunging and evidence of vegetation being over-grazed;
- Moderate: some tracking or tracks present but evidence of dunging or grazing localised and infrequent; and
- Low: impacts scarce or absent.

12.6.8 These observations have been used to inform the sensitivity of the peat resource (Table 12.1). The results of the preliminary survey are presented in Appendix 12.1.

Agricultural land capability

12.6.9 The agricultural capability of the land within the Site has been identified using the Land Capability Classification for Agriculture (LCCA) assessment[16]. The land has been classed as low quality due to degradation and suitability for moorland grazing throughout the year. The evidence from the baseline survey confirms that the current agricultural use, for moorland sheep grazing, has resulted in extensive and ongoing deterioration of the peatland habitats. In consequence, the potential impact on agriculture and land capability has been scoped out of the assessment.

Habitat

12.6.10 The majority of the Site was classified as either dry modified bog (38.9%) or wet modified bog (24.6%). Unmodified blanket bog accounted for 8.0% of the habitat within the Site and unimproved acid grassland covered approximately 7.1% of the Site (Appendix 11.2). The effects of drainage and peat cutting are also considered likely to have reduced the range of moss species present in the Site and is likely to have resulted in the area defined as dry modified bog (Chapter 11: Ecology).

Assessment of impacts

Construction phase

12.6.11 During the construction of the wind farm there is the potential for a range of impacts that could adversely affect the quality of the peatland with the Site. Potential impacts include:

- Loss and fragmentation of peatland due to disturbance at the location of turbines and wind farm infrastructure;
- Destabilisation of the peat resource, resulting in an increased risk of peat slide during construction (see Appendix 12.2);
- Water discolouration and increased sediments in water courses, as a consequence of drainage from areas of construction related operations; and
- Loss of carbon store, contained within the undisturbed peat that has the potential to be released as CO_2, it should be recognised that degraded peat exhibits lower levels of sequestration, due to loss of habitat function and within the Site, because of the widespread occurrence of degraded peatland habitat, the function of peat as a carbon store is likely to be limited.

12.6.12 Direct negative impacts on the peat resource include:

- Damage and loss of peat resources during handling and storage required for earthworks (e.g. drying, loss of vegetation, structure and water holding capacity);
- Mixing of distinct soil layers, acrotelm with lower horizons of the catotelm, resulting in the loss of seed banks contained in the acrotelm; and
- Compaction through trafficking and inappropriate use of construction machinery that results in reduction in quality of peatland adjacent to areas where construction will take place.

12.6.13 Indirect and potentially positive impacts on the wider peatland habitat include:

- Reinstatement of excavated peat into areas where current peat loss is extensive and ongoing;
- Use of excavated peat for peat plugs to arrest the flow of surface drainage; and
- Use of acrotelm and vegetative layer to cover otherwise bare peat, thus increasing the potential for peat formation.

12.6.14 The area, approximate volume of disturbed peat and range of peat depth likely to be affected (post embedded mitigation) during construction has been summarised in Table 12.4.

Table 12.4 The area, average peat depth and approximate volume of peat that would be disturbed with each component of the Consented Development.

Project component	***Construction footprint (m^2)***	***Approximate volume of peat disturbed (m^3)***	***Average depth of peat (m)***
T1	3,690	7,370	2.00
T2	3,670	5,260	1.43

Table 12.4 The area, average peat depth and approximate volume of peat that would be disturbed with each component of the Consented Development.

Project component	*Construction footprint (m^2)*	*Approximate volume of peat disturbed (m^3)*	*Average depth of peat (m)*
T3	3,700	4,380	1.18
T4	4,800	6,670	1.39
T5	3,680	6,840	1.86
T6	3,580	5,650	1.58
T7	4,010	5,690	1.42
T8	3,510	6,940	1.97
T9	3,640	6,670	1.84
T10	3,980	5,010	1.26
T11	3,840	5,500	1.43
T12	4,150	6,450	1.55
T13	3,830	5,860	1.53
T14	4,180	2,010	0.48
T15	3,740	5,940	1.59
T16	4,410	520	0.12
T17	3,960	2,410	0.61
Sub Total	**66,370**	**89,170**	-
BP 1	14,790	5,590	0.52
BP 2	27,670	26,390	1.13
BP 3	23,410	35,730	1.86
BP 4	17,930	8,130	0.62
Sub Total	**83,800**	**75,840**	-
Compound	7,670	3,810	0.48
Substation	1,520	1,380	0.90
Anemometry Mast	78	117	1.5

Table 12.4 The area, average peat depth and approximate volume of peat that would be disturbed with each component of the Consented Development.

Project component	*Construction footprint (m^2)*	*Approximate volume of peat disturbed (m^3)*	*Average depth of peat (m)*
Radio Communications Tower	30	9	0.30
A001 (4360m)	35,670	21,400	0.55
A002 (2120m)	24,100	23,730	0.98
A003 (730m)	9,700	9,450	0.97
A004 (310m)	2,510	3,130	1.25
A005 (310m)	3,190	2,100	0.66
A006 (400m)	4,140	4,370	1.06
A007 (110m)	1,170	120	0.10
A008 (670m)	8,660	8,760	1.01
A009 (230m)	2,990	3,460	1.16
A010 (50m)	420	300	0.71
A011 (100m)	780	810	1.04
A012 (270m)	2,210	2,420	1.10
A013 (790m)	4,950	2,120	0.43
Sub Total	**100,490**	**82,170**	-
Total of all Project Components	259,958	252,496	n/a

Notes:

- The analysis has been based on the footprint shown on Figure 3.1. Details of access track numbers are shown on Figure 3.9.
- Borrow Pits are defined as BP.
- Access track volumes consider any peat disturbance for cable trenching.

Summary

12.6.15 Average peat depths within the actual footprint of the Consented Development range from 0m to 2m, with the deepest average peat depth at the location of Turbine 1 within the Burn of Hamnavoe catchment (see Table 12.5 and Figure 15.1).

12.6.16 The construction footprint required for the erection of each turbine depends on the localised topography and the extent of cut and fill required to construct a working and hardstanding area. Through design, the footprint required for each turbine can be minimised such that it does not exceed 4,800m^2 for each turbine and 66,370m^2 in total. However, it should be noted that approximately 27% of the construction zone for each turbine would be restored using excavated peat to facilitate construction. The depth of the restored peat horizon would be determined to achieve a final profile similar to that of the adjacent undisturbed area.

12.6.17 Borrow pits 1 and 4 have relatively shallow cover of peat at <1m; borrow pit 3 has a deeper peat cover with an average depth of 1.86m. Borrow pit 2 also has an average peat depth at 1.13m. The footprint of the borrow pits have been designed to avoid areas of peat >2m in depth, while providing access to competent material that can be extracted for aggregate.

12.6.18 The total area affected during the construction phase would be 25ha, equivalent to 2% of the Site. The average peat depth within the footprint of the Consented Development is 1.10m and the volume of peat is approximately 1.7% of the total peat resource within the Site.

12.7 Embedded mitigation

12.7.1 The approach to mitigation for peat takes account of the irreplaceability of the resource once it has been disturbed, as a consequence of excavation, handling and storage. Reinstatement of peat excavated resources would, in time, revert to habitats of similar characteristic to the moorland habitats identified in the baseline condition (modified wet / dry blanket bog and wet mire habitats) and this would be achieved through the HMP. The mitigation hierarchy adopted by the Chartered Institute of Ecology and Environmental Management (CIEEM)[17], which has been used in the assessment, includes the following hierarchy:

- Avoid negative impacts, where these are considered significant;
- Reduce the magnitude of impacts, where these cannot be avoided;
- Compensate for significant effects that cannot be avoided by either design or environmental management during the construction process; and
- Ongoing and long term management of vegetation to develop self-sustaining habitats.

12.7.2 This approach has been adopted for the design and layout of the Consented Development, as far as is practical, potential impacts and mitigation measures identified for other environmental issues have also been taken into account. Chapter 5: Design Evolution and Alternatives identifies how this approach informed the design. Mitigation design measures have been developed in the following stages:

1) Minimise the disturbance, loss and fragmentation of peat resource through design and layout (to avoid, where possible areas of deep and intact peat);

2) Where this cannot be avoided adopt good practice techniques during the construction and operational phases; and

3) Provide ongoing habitat management during the operational phase.

12.7.3 The first two stages of this approach have also been adopted in the analysis of the risks from peat instability during the construction phase.

Construction phase

Turbine layout

12.7.4 Peat depths within the Site have been identified as 'deep' if >0.5m in depth. However, deep peat is prevalent throughout the Isle of Yell[14]. Constraint analysis (Chapter 5: Design Evolution and Alternatives) identifies that within the Site areas of deeper and more continuous peat have been avoided in the turbine layout, as these areas are also constrained by the buffer zones for Red-throated diver flight lines and the obstacle limitation surface for Scatsta Airport (see Figures 5.2 and 5.5).

12.7.5 The Consented Development of 17 turbines comprises three fewer turbines than the 20 turbine scheme originally considered during the EIA Scoping phase. The combined length of the associated access tracks for the Consented Development is also reduced from that which was considered during the Scoping phase. This reduction in scale of development has limited the potential area of peat disturbed by:

- <1.1ha associated with the removal of three turbines and associated crane pads and hardstanding; and
- <0.95ha for 300m of access track and turning head required for access to each of the turbines removed.

12.7.6 Where practical and taking account of other constraints, such as geotechnical, safety buffers etc., turbines have been located away from areas of habitat that are defined as blanket bog and ground water dependent terrestrial ecosystems (Chapter 11: Ecology and Appendix 15.1). However, Turbines 7, 9, 10 and 12 would be located within areas defined as blanket bog habitat. For each turbine, where possible, the access track and associated turning head has been designed to minimise potential impact on adjacent areas of blanket bog habitat. It has not been possible to avoid all areas of blanket bog habitat within the overall design requirements for the Consented Development and maintain an optimal turbine spacing, in order to reduce wake effects and ensure that the turbines operate efficiently.

Access tracks

12.7.7 The design of the access tracks has also been considered in the design evolution process (Chapter 5: Design Evolution and Alternatives). A number of iterations have been taken into account that have influenced the volume of peat disturbed to construct access tracks, which has been considered in the following sections.

Access track during construction

12.7.8 The design of the track layout (which includes allowance for cable trenches) has minimised the areas of redundant tracks by using turning places instead of circular tracks as this minimises the extent of infrastructure and as a consequence the impact on peat during construction. In addition, use of existing tracks that can be widened, have been used in preference to constructing tracks on undisturbed peatland.

12.7.9 For the majority of access track construction, the design uses standard techniques for construction, removing peat and superficial material horizons to bedrock and using aggregate to prepare a running surface for the HGVs required during construction. It should be noted that the ground investigation may identify suitable material in substrata that can be used as a base layer for access track construction. This construction design is preferred for the following reasons:

- The relief and topography within the Site are variable, such that there are relatively few sections of road that exhibit the horizontal and cross fall gradients that fit the design criteria for the use of floating roads;
- The peat surface is highly variable, and therefore not suitable for floating roads in all cases; and
- There are sections of track where there is little or no peat, which require no further mitigation.

Use of B9081 during construction phase

12.7.10 The route selection has been assessed in Chapter 17: Traffic and Transportation; in which the justification for selecting a junction off the B9081, in order to avoid construction traffic travelling through Hamnavoe, Houlland and Burravoe was considered. The preferred site entrance has been identified to the east of Hamnavoe and this would require a purpose constructed access track to connect the junction on the B9081 with the Site compound. Therefore, approximately 3km of access track would be constructed traversing the Site to the south of Beaw Field and north of Hamnavoe. Four design options were considered for the access track with the analysis of the potential volume of peat to be disturbed for each option is shown in Table 12.5 and Figure 5.9. The final design option (3) includes all of the associated access tracks for the Consented Development. Options 1 and 2 were discounted before access tracks to the Site compound, substation and turbines were designed.

Table 12.5 Access track design options and volume of peat handled

Design option	***Volume of peat disturbed*** ***m^3***	***Comments***
Use of B9081 to gain access into the Site (and compound) to the north of Burravoe.	Minimal	This option was discounted because of the potential impact of large construction vehicles, including haulage vehicles travelling through Hamnavoe, Houlland and Burravoe.
Access track, option 1 – shortest route from junction to Turbine 8, on an alignment to the west of Beaw Field.	15,670	The access track would have been constructed within areas of deep peat, where use of floating tracks would not have been practical due to the gradient of the track and the need to construct water course crossings. The total volume of peat disturbed would increase significantly to extend the track to the Site compound and substation.
Access track, option 2 – following a route of an existing access track from a point south of Beaw Field to the B9081, to the north of Burravoe.	18,000	The alignment of this access track was too close to an existing Scottish Water supply pipeline, crossing the Site to a manhole junction south of Beaw Field (see Figure 2.3). If the realignment of the pipeline was included in the design, this would significantly increase the total volume of peat disturbed.
Access track, option 3 (see A001 and Figure 5.8).	19,530	Preferred design option takes a route that maintains a buffer of 10m between the Scottish Water pipeline and the access track, whilst maintaining an even gradient between water course crossing points. It provides construction access to Site compound and long term operational access to substation. This option resulted in the route crossing shallow peat deposits and as a consequence, the lowest volume of deep peat disturbed (see also note below that provides further details on the calculation of peat volumes for each option).

Table 12.5 Access track design options and volume of peat handled

Design option	*Volume of peat disturbed* m^3	*Comments*
Note:	For Options 1 and 2 the final routes of the access track was discounted because: - For Option 1 the track would pass through areas of deep peat, exceeding the depths identified for either of Options 2 or 3. The total volume of peat disturbed to extend the track to the substation would be the largest of the three options - For Option 2 considerable additional areas of peat disturbance would be required to realign the Scottish Water pipeline. Although the volume of peat has not been determined, it is considered that this option would ultimately result is larger volumes of peat being disturbed, together with the impact on existing infrastructure, therefore it has been discounted.	

12.7.11 Four Turbines, T12, 13, 15 and 17 are situated to the east of the B9081, to the north of Burravoe (and south of Gossabrough). Between the Site compound and turbines T9 and 12 to the north, the option of using the B9081 as the construction access track was discounted due to the following:

- The potential disruption to other road users;
- An increase in the number of junctions, off the B9081 to gain access to each of the turbines; and
- The potential disruption to services located within the corridor of the B9081.

12.7.12 As a consequence of this analysis, Option 3 was adopted combined with a purpose constructed wind farm access track constructed to the east of the B9081.

Construction compound

12.7.13 The temporary construction compound has been located within an area of limited remaining peat, a consequence of overgrazing and peat cutting, leaving the area with an average peat depth of 0.48m. There are small areas of intact peat but in others underlying bedrock has been exposed, see Appendix 12.1 and Figure 12.4. The area adjacent to the Site compound is also heavily degraded. During the construction period the area surrounding the compound will be reinstated using surplus peat available.

Substation

12.7.14 The substation has been located within an area of existing peat cutting, which as a consequence, is an area with limited residual peat depth and reduced volume (see Appendix 12.1 and Figure 12.4).

Anemometry mast

12.7.15 The anemometry mast is located within an area of degraded wet modified bog with an average peat depth of 1.5m. The footprint of the tower is 78m^2 with an approximate peat excavation volume of 117m^2. This area was selected as a representative location to monitor the wind speeds across the Site.

Telecommunications tower

12.7.16 The radio communications tower is located on an existing area of shallow peat (<0.5m) and peaty topsoil. The footprint of the tower is 30m^2, with an approximate peat excavation volume of 9m^3.

Borrow pits

12.7.17 Borrow pits 1 and 4 have been located within areas of shallow / degraded peat such that the predicted potential impact is minor and not significant. Borrow pit 2 has been located in an area of dry modified bog and bare ground which also has a predicted potential impact on the peat / soil resource of 'minor' and thus 'not significant'. Borrow Pit 3, which is located within an area where aggregate can be used for Turbines 1 to 8 has a deeper peat profile >1.5m associated with a degraded wet modified bog habitat. The predicted impact is moderate and significant, prior to mitigation.

Additional embedded mitigation that is subject to further Ground Investigation (GI)

12.7.18 There is the potential for additional mitigation associated with the design of access tracks, which has been considered in the following section. No additional embedded mitigation has been identified for other components of the Consented Development, including turbines, construction compound, substation, met mast and radio communications tower, therefore these have not been considered in the section of the assessment.

Access tracks

Floating roads

12.7.19 The overall topography of the Site and in particular the micro relief associated with hags, channels and peat cutting does not generally enable floating roads to be considered as a practical design option. As recognised by NatureScot (previously SNH) guidance[18], floating roads are site specific and not feasible for all developments. The design layout has avoided areas where the deepest areas of peat are known to be present. Following this initial application of survey results, floating roads were considered for three sections of the access track route (see Figure 12.1):

- a 150m section leading towards Turbine 17;
- a section approximately 475m long leading to Turbines 5 and 7; and
- a section approximately 245m long leading from Turbine 8 alongside Borrow Pit 3.

12.7.20 The gradient of these sections of track, associated with the change in topography and sharp changes in micro relief have influenced the design criteria. This has been based, in part, on the anticipated volume of aggregate required to form the floating road, where there are frequent changes in micro-relief, compared to the benefits that would result from the reuse of excavated peat, resulting from the construction of the access track on the underlying bedrock. The excavated peat would be used to reinstate peat land adjacent to the access track, through the in-filling of eroded peat gullies and to plug erosion gullies. Further detailed design of access track, will require further ground investigation and topographic survey; therefore, the final design of access tracks will be submitted and agreed in writing prior to the commencement of the construction activities onsite, unless otherwise agreed with the Local Planning Authority.

12.7.21 Floating roads could be used to reduce the amount of peat required for removal (refer to Figure 12.2). Areas where there is further potential to reduce the volume of peat excavated have been identified; two stretches on the main access route to the Site, an area close to turbine 14, and a stretch of access track leading to turbine 15. The construction of floating roads is possible at these locations as the land has a slope angle of less than 5%. The use of floating roads on these sections of track would reduce the amount of peat used in the access track construction to 76,000m³. Whether floating roads can be used will be dependent on the results of further ground investigation. As a consequence, this assessment has been based on the worst case for handling of peat, which therefore does not include the use of floating roads.

Operational phase

12.7.22 There would be minimal or no impacts upon peat resources during the operational phase, therefore no embedded mitigation is required.

Decommissioning phase

12.7.23 During decommissioning, activities would be less intrusive; therefore, no embedded mitigation measures are required.

12.8 Potential impacts

The potential impact on the peat resource of each component of the Consented Development has been defined in Table 12.6. The analysis identified the catchment of each component, so the analysis can be cross referenced to the hydrological study (see Chapter 15: Hydrology and Hydrogeology). The change of magnitude has been assessed with respect to the peat resource at a Site level (see para 12.2.10). The scale of impact takes account of embedded mitigation measures that have been incorporated into the design and footprint of the Consented Development (see Section 12.7: Embedded mitigation).

Table 12.6: Potential impacts of the Consented Development to the peat resource

Project Components	***Catchment***	***Phase 1 habitat classification and peat depth (see Table 12.2)***	***Sensitivity***	***Change of magnitude at a Site level***	***Scale of Impact***
T1	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T2	Burn of Hamnavoe	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T3	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor

Table 12.6: Potential impacts of the Consented Development to the peat resource

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
T4	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T5	Green Burn and Burn of Holligarth	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T6	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T7	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T8	Green Burn and Burn of Holligarth	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T9	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T10	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T11	Green Burn and Burn of Holligarth	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T12	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T13	Burn of Horsewater and Burn of Hummelton	Unimproved acid grassland/bare peat (>0.5m deep peat supporting acid grassland)	Low	Low	Minor

Table 12.6: Potential impacts of the Consented Development to the peat resource

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
T14	Burn of Green Burn and Burn of Holligarth	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T15	Burn of Horsewater and Burn of Hummelton	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T16	Burn of Kettlester	Unimproved acid grassland/bare peat (<0.5m shallow peat and peaty topsoil)	Low	Low	Minor
T17	Burn of Horsewater and Burn of Hummelton	Dry dwarf shrub heath (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
BP 1	Burn of Arisdale	Dry modified bog, acid grassland (>0.5m deep peat supporting acid grassland)	Low	Medium	Minor
BP 2	Burn of Hamnavoe	Dry modified bog/bare ground (>0.5m deep peat supporting acid grassland)	Low	Medium	Minor
BP 3	Burn of Hamnavoe/ Green Burn and Burn of Holligarth	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Medium	Moderate
BP 4	Green Burn and Burn of Holligarth	Unimproved acid grassland/bare peat (>0.5m deep peat supporting acid grassland)	Low	Medium	Minor
Site Compound	Green Burn and Burn of Holligarth	Unimproved acid grassland/bare peat (>0.5m deep peat supporting acid grassland)	None	Low	Negligible

Table 12.6: Potential impacts of the Consented Development to the peat resource

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
Site Substation	Burn of Kettlester	Unimproved acid grassland/bare peat (>0.5m deep peat supporting acid grassland)	None	Low	Negligible
Anemometry Mast	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
Telecommunications Tower	Burn of Neapaback	Wet dwarf shrub heath (<0.5m shallow peat and peaty topsoil)	Low	Low	Minor
Access Track (A001)	Burn of Arisdale	Dry modified bog (<0.5m shallow peat and peaty topsoil)	Low	Low	Minor
Access Track (A001)	Burn of Hamnavoe	Predominantly dry modified bog with areas of semi improved grassland and bare peat (<0.5m shallow peat and peaty topsoil)	Low	Low	Minor
Access Track (A001)	Green Burn and Burn of Holligarth	Dry modified bog and unimproved acid grassland/bare peat (<0.5m shallow peat and peaty topsoil)	Low	Medium	Minor
Access Track (A001)	Burn of Kettlester	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Low	Minor
Access Track (A001)	Burn of Horsewater and Burn of Hummelton	Wet modified bog, unimproved acid grassland (>0.5m supporting degraded blanket bog)	Medium	Negligible	Minor

Table 12.6: Potential impacts of the Consented Development to the peat resource

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
Access Track (A002)	Burn of Hamnavoe	Predominantly wet modified bog with areas of dry modified bog/bare ground (>0.5m supporting degraded blanket bog)	Low	Medium	Minor
Access Track (A003)	Green Burn and Burn of Holligarth	Dry modified bog and unmodified blanket bog (>0.5m supporting degraded blanket bog)	Medium	Medium	Moderate
Access Track (A004)	Green Burn and Burn of Holligarth	Dry modified bog and wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Low	Minor
Access Track (A005)	Burn of Hamnavoe	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Low	Minor
Access Track (A006)	Burn of Kettlester	Dry modified bog and unmodified blanket bog (>0.5m supporting degraded blanket bog)	Medium	Medium	Moderate
Access Track (A007)	Burn of Kettlester	Dry modified bog/pare peat and unimproved grassland/bare peat (<0.5m shallow peat and peaty topsoil)	Low	Negligible	Negligible
Access Track (A008)	Burn of Hamnavoe/ Burn of Kettlester	Unimproved acid grassland/bare peat, dry modified bog and wet modified bog (>0.5m deep peat supporting acid grassland)	Medium	Medium	Moderate
Access Track (A009)	Green Burn and Burn of Holligarth	Wet modified bog/unmodified blanket bog (>0.5m supporting blanket bog habitat)	Medium	Medium	Moderate

Table 12.6: Potential impacts of the Consented Development to the peat resource

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
Access Track (A010)	Burn of Kettlester	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Negligible	Minor
Access Track (A011)	Burn of Hamnavoe	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Negligible	Minor
Access Track (A012)	Burn of Hamnavoe	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Low	Minor
Access Track (A013)	Burn of Horsewater and Burn of Hummelton / Burn of Neapaback	Wet dwarf shrub heath (<0.5m shallow peat and peaty topsoil)	Low	Low	Minor

Assessment of potential impacts by component

Turbines

12.8.1 The foundation hard standings and crane pads for Turbines 7, 9, 10 and 12 have a predicted impact defined as 'moderate' due to the depth of peat and condition of the habitat, defined as 'unmodified blanket bog', within the construction footprint. In EIA terms, this is regarded as a 'significant effect', prior to additional mitigation. The predicted impact on peat during the construction of all other turbines is minor and not significant due to the footprints of the remaining turbines being located within areas of shallow peat and / or areas where the habitat has been classified as wet / dry modified bog. The areas of extensive gullying and bare peat (see Figures 12.3 and 12.4) that dissect the peatland are within and adjacent to the turbine footprints.

12.8.2 The total volume of peat to be excavated for turbine foundation, crane pads and hardstanding would be approximately 89,170m^3 in total, with the maximum volume for a single turbine not exceeding 7,370m^3 of peat. At a Site level the volume of peat that would be disturbed as a consequence of removing peat to construct the turbine foundations, crane pads and hardstandings is equivalent to approximately 0.6% of the total peat resource within the Site (based on the average peat depth of 1.25m across the Site (1135ha)), see Paragraph 12.2.10). Based on the criteria in Table 12.3, at a Site level the overall effect of turbine construction is minor and not significant in EIA terms.

Access tracks

12.8.3 The main access track (A001) from the B9087 to the Site compound exhibits a variable depth along the length of the construction corridor, with the section through the Burn of Horsewater (approximately

465m in length) having a peat profile <3.7m at the deepest (located close to T17, see Figure 12.1). However, large sections of the track would be constructed to the north of a corridor within which peat is either absent or disturbed as a consequence of previous restoration resulting from the laying of the Scottish Water pipeline (Figure 3.11). The predicted impact on the peat resource within the construction corridor is minor increasing to moderate for short sections of the track, prior to additional mitigation.

12.8.4 Access track (A003) has a moderate predicted impact prior to mitigation due to depth of peat and presence of unmodified bog. Three other sections of access track (A006, A008 and A009) cross areas of unmodified blanket bog where the design track cannot be rerouted to avoid the habitat due to other physical and / or topographical constraints. These sections have a predicted impact which is 'moderate' and therefore significant, prior to mitigation. All other sections of access track are predicted to have a minor impact and not significant.

12.8.5 The total volume of peat to be excavated for access track construction would be approximately 82,170m^3 in total. At the Site level the volume of peat extracted during construction of the access tracks is approximately 0.6% of the peat resource within the Site. Floating roads would reduce the volume of peat excavated to approximately 76,000m^3. Based on the criteria in Table 12.3, at a Site level the overall effect of constructing access tracks for use in construction and during the operational phase of the wind farm is minor and not significant.

Site compound

12.8.6 The location of the Site compound has been selected due to the absence of peat, within an area where peat cutting, overgrazing and vehicle access (from the B9087) has resulted in severe erosion of peat, such that the majority of the compound area has very shallow or exposed underlying rock at the surface. Prior to mitigation, the potential impact is negligible and not significant, as the volume of peat that can be recovered prior to construction is minimal.

Substation

12.8.7 The total volume of peat expected for the substation is approximately 1,380m^3. This area was selected due to the presence of existing tracks and extensive peat cutting. The potential impact is negligible and not significant prior to mitigation.

Anemometry mast

12.8.8 The total volume of peat expected to be excavated for the anemometry mast is 117m^3 due to the small footprint. The potential impact is minor and not significant prior to mitigation.

Telecommunications/Radio communications tower

12.8.9 The total volume of peat expected to be excavated for the telecommunications tower is 9m^3. The potential impact is minor and not significant prior to mitigation.

Borrow pits

12.8.10 The total volume of peat to be excavated to expose aggregate within the borrow pits would be approximately 76, 000m^3, representing approximately 0.57% of the total peat resource with the Site, see Paragraph 12.2.11. Based on the criteria in Table 12.3, at a Site level the overall effect of developing borrow pits for construction is minor and not significant.

Total disturbance of peat resource

12.8.11 The total disturbance of peat resource during construction of the Consented Development is equivalent to 1.7% of the total peat resource within the Site (see also para 12.6.18). Based on the criteria in Table 12.3, at a Site level the overall effect on the volume of peat disturbed during the construction phase is low and not significant in EIA terms.

Summary of the area of peat resource disturbed by catchments within the Site

12.8.12 Table 12.7 gives details of the total area (ha) of the Consented Development and how the amount of excavated peat per catchment relates to the total catchment area (%). Appendix 12.3 provides a summary of the predicted volumes of excavated peat for each component of the Consented Development within each catchment boundary (see also Chapter 15: Hydrology and Hydrogeology).

Table 12.7: Summary of surface area of the Construction footprint of the Consented Development by catchment

Catchment	*Total area of catchment (ha)*	*Percentage of total catchment area (%)*
Burn of Arisdale	1.81	0.16
Burn of Hamnavoe	8.40	1.1
Green Burn and Burn of Holligarth	9.24	2.2
Burn of Kettlester	2.69	0.7
Burn of Horsewater and Burn of Hummelton	2.94	1.18
Burn of Neapaback	2.08	0.13

12.9 Mitigation measures

12.9.1 Specific mitigation measures that have been identified would be implemented through the construction period of 24 months (see Chapter 3 for the construction schedule) and would follow the recommended good practice on the construction of wind farms on peatlands[10]. Reinstatement of excavated peat would take place progressively during the construction phase, with additional peat used to restore the area adjacent to the construction compound, worked out borrow pits and more widely for peat plugging and infilling gully erosion in areas adjacent to the construction footprint. As a consequence, the requirement to stockpile peat during handling can be minimised.

12.9.2 The proposed Peat Reinstatement Management Plan (Annex 1 of Appendix 3.6) provides a summary of the peat reuse and management and will specify operational procedures required to maximise the reuse of peat, for the duration of the construction programme. The purpose of mitigation measures is to address the potential impacts of the Consented Development on the peat resource. In addition, peat management techniques have been defined to minimise the loss of the peat resource during construction and reinstate peat to the widespread areas where peat erosion has taken place on land adjacent to the main construction footprint. As a consequence, it is possible to deliver minor positive

benefits for the wider peat resource within the Site that can be secured and maintained during the operational phase through the HMP (Appendix 10.4).

Construction phase

Peat landslide hazard and mitigation

12.9.3 Construction of wind farms on peatlands requires the specific nature of peat deposits to be assessed to determine the potential risk of landslide, during the construction process. This requires peat landslide (or peat failure) risk to be assessed and managed throughout the lifetime of a wind farm development. Appendix 12.2: Peat Slide Risk Assessment, provides details of the assessment process carried out in order to provide a hazard rating for each of the project components of the Consented Development and also outlines mitigation measures that would be used to reduce the hazard to an acceptable level. The assessment was carried out using the "first pass" approach as recommended by the Scottish Executive (SE) guidance (2006)[19].

12.9.4 Appendix 12.2: Peat Slide Risk Assessment contains the analysis of the peat landslide hazard within the Study Area. The hazard ranking categories used in Appendix 12.2 are based on risk (probability) and potential consequences (exposure), should the peat landslide occur. According to the SE guidance the hazard should be ranked as: serious, substantial, significant, and insignificant. The SE guidance states that in locations where the hazard is rated as 'serious', the project should not proceed and that when the rating is 'substantial' the hazard should be avoided or mitigated in order to reduce the hazard ranking to significant or less. Where the hazard is rated as significant the project may proceed pending further investigation to refine assessment and mitigate hazard through micro-siting or redesign. Where the hazard is rated as insignificant, the project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate. The hazard rankings have been expressed in EIA terms, taking account of mitigation measures that are considered in more detail in Appendix 12.2.

12.9.5 The design includes embedded mitigation which would result in reducing the peat slide hazard across the Consented Development (see Section 12.7 Embedded mitigation) and these have been taken into account in the peat slide risk assessment (Appendix 12.2). The peat slide risk assessment demonstrated that overall, out of 47 project components (the number differs from the one used in this chapter as some tracks were divided into subsections due to change in hazard ranking, see Appendix 12.2 for details), the hazard was ranked as:

- serious (or High in EIA terms) were found in none of the locations;
- substantial (or Moderate in EIA terms, prior to mitigation) in 3 locations, which is expected to be reduced to significant with appropriate mitigation (subject to geotechnical investigation), mitigation measures for these areas have been considered in Appendix 12.2;
- significant (or Minor in EIA terms, prior to mitigation) in 13 locations; and
- insignificant (or Negligible in EIA terms) for 29 project components.

12.9.6 Additional mitigation measures are required where the hazard was ranked significant or substantial, these measures comprise:

- Detailed geotechnical site investigation to inform a Quantitative Risk Assessment to reduce the uncertainty, as per the SE guidance. This would involve trial pits, shear strength measurements and factor of safety (FOS) calculations.

- Further avoidance (micro siting), which is limited and subject to detailed geotechnical site investigation.
- Engineering measures, such as catch fences and ditches, slope buttressing.

Peat management and reinstatement

Peat handling

12.9.7 Where practical, excavated peat would be re-used onsite close to the construction footprint of each component. Reinstatement of peat to receptor areas would also take place progressively, such that areas of existing, but degraded habitat would be rehabilitated during construction. Progressive extraction and placement of peat would be undertaken using a 360° excavator, with a maximum reach of 23m, from the edge of the construction footprint. Therefore, taking account of all components an area up to 64ha around the construction footprint, but within the Site, is potentially available for peat reinstatement (Figure 12.6). Because the extent of degraded peatland and, as a consequence eroded peat resource, is widespread throughout the footprint of the Consented Development the receptor areas for reinstated peat are available and can be reinstated with excavated peat of a progressive basis. Using this technique would allow translocation of peat to take place in advance of the main earthworks required for each of the components of the Consented Development, without encroachment on unaffected areas of peat. Where reinstatement of peat would be beneficial in other areas of the Site, low ground pressure machinery and bog mats would be used to reinstate peat to areas where extensively erosion has previously taken place. An Ecological Clerk of Works (ECoW) would supervise the construction activities defined in the Construction Environmental Management Plan (CEMP, see Appendix 3.6 for the OCEMP).

Peat turves

12.9.8 Good practice for the extraction of peat requires methods that excavate peat from the surface in large turves or clumps. This method maintains the peat profile intact as far as possible, which means it is less prone to drying out following reinstatement. This technique is practical where areas of extensive erosion have taken place, for example adjacent to the construction compound and for the restoration of the borrow pits.

12.9.9 For areas where the reinstatement of whole turves is not practical, or suitable, the peat will be lifted to take account of the main horizons that make up the peat profile. The acrotelm peat layer (0.5-1.0m) is defined as the top layer of peat associated with any vegetation and seeds. The removal of this horizon would avoid the cross contamination of acrotelm and catotelm layers (see Annex 1 of Appendix 3.6). 360° excavators would remove the acrotelm in turves (approximately 200-300m thick depending on maximum rooting depth) and place the turves to one side. The turves would be cut with a flat bottom surface so that they can be placed within receptor sites. All turves would be placed to adjoin other turves within the receptor area, or the edge of bare exposed peat, in order to maintain the water content of the peat profile.

12.9.10 During construction, catotelmic peat would be excavated using an excavator by either placing peat directly to receptor areas adjacent to the construction footprint or loading dump trucks with a flat bladed face bucket to remove peat to its full depth. Peat loose tipped from the trucks into receptor areas would then be bladed out using a 360° bucket excavator. Specifically, this method would be used for the construction footprints that have been identified as having a significant impact in EIA terms prior to mitigation (specifically Turbines 7, 9, 10 & 12). Receptor areas include the land adjacent to the construction compound and reinstatement of peat in order to restore the borrow pits.

Peat storage

12.9.11 An approximate excavation volume for each infrastructure location is given in Table 12.4 and Appendix 12.3. In accordance with good practice, peat would be retained for in-situ reinstatement, to include:

- Around the base of each turbine to the edge of the temporary construction footprint;
- From the edge of the access track to disturbed edge of peat;
- To reinstate borrow pits, to give a peat profile depth of approximately 2m-3.5m depending on individual borrow pit design, see Annex 1 of Appendix 3.6; and
- Other areas with the construction footprint where peat has been removed on a temporary basis.

12.9.12 To facilitate this reinstatement, <30% of the excavated peat would be retained within the construction footprint. In addition, to improve the peat habitat generally within the Site, excavated peat would be used to infill erosion gullies, form peat bunds within surface ditches and used for the reinstatement of the compound (where peat has previously been lost to erosion), following the construction period. Details for the volumes of reinstatement for receptor areas are provided in Annex 1 of Appendix 3.6.

12.9.13 Temporary storage of peat would be required to hold excess peat that would be used for reinstatement, after construction has been completed. The borrow pits provide mitigation for this longer term requirement, through the use of detailed reinstatement schemes, whereby peat depth can be maintained to provide a surplus peat resource that can be utilised for future areas of peat reinstatement.

Reuse / reinstatement of peat

Turbines

12.9.14 The final design and type of turbine foundation would be informed by detailed ground investigations. The extent of extracted peat has been calculated for each turbine (see Table 12.4 and Appendix 12.3). The proposed method of constructing the turbines will be detailed in the CMP (Construction Management Plan) provided by the contractor. The displaced peat and vegetation at each turbine base would be reused for reinstatement of the turbine bases, track edges and crane pad edges.

Access Tracks

12.9.15 Where topographical constraints do not facilitate the option of floating roads, the access tracks would be restored with peat material excavated from borrow pit and turbine locations. Excavated peat would be used for verge reinstatements once the tracks' running surface has been installed, to create 'shoulders'. This is a necessary part of the landscape reinstatement process to create a suitable tie-in with the surrounding topography and is required as the track progresses. This would be done within as short a time period as possible where construction has been completed, to maintain optimum conditions for the seed bank and retained vegetation to establish and regenerate. The restored peat horizon would be of a sufficient depth to minimise desiccation of the surface that could result in losses during dry windy conditions.

12.9.16 Care would be taken when constructing verges to ensure there is no over-deposition on peat on either side. Low verges would be designed to permit any surface water to drain naturally. These verges are suitable locations for cable trenches required for buried cables.

12.9.17 There is a requirement for High Voltage (HV) and communication cable trenches to run from the substation to each turbine (Figure 3.7). These trenches would run parallel to the edges of the access tracks to minimise intrusion of peat and their excavation would be undertaken from the access tracks ensuring no vehicle movement on the vegetation. Therefore, this procedure would occur in conjunction with the access track verge reinstatement.

Borrow Pits

12.9.18 Borrow pit design and location has been selected to best avoid disturbance of deep / blanket bog peat. Additional mitigation measures are identified (see Table 12.8 and Annex 1 of Appendix 3.6) to maximise the long-term preservation of the excavated peat material whilst ensuring minimal storage time during construction.

12.9.19 Peat would be reused within borrow pit reinstatement providing the method of reuse and final reinstatement profile is in accordance with overall habitat and environmental reinstatement objectives. Use of temporary fencing for borrow pit reinstatement sites would control grazing pressures and allow vegetation to establish in accordance with the HMP (see Appendix 10.4 for OHMP). Dependent on the final borrow pit design, unconsolidated peat would be used at depths between 2 and 3.5m to create a saturated mire type habitat. Turves formed from acrotelm would be used on the surface to promote succession to habitats of equivalent value and those defined in the baseline environment.

12.9.20 The reinstatement of the peat profile depth would be variable, depending on slope and surface conditions, but would be a minimum of 0.3m deep. This is considered suitable for revegetation to a dry heath and acid grassland habitat, and is equivalent to that currently found within the previously disturbed areas of the Site. For details of individual borrow pit construction components and likely phases see Annex 1 of Appendix 3.6. For details of peat reinstatement for each borrow pit, see Table 12.8.

Site compound

12.9.21 The Site compound is located on an area of unimproved grassland / bare peat, the use of this area would result in minimal disturbance of peat material (Figure 12.4). Where peat is excavated elsewhere during construction, it would be used for reinstatement of the area adjacent to the compound, which has little or no peat left as a consequence of erosion. To stabilise the reinstated peat, internal bunds would be constructed within and around the perimeter. The bunds would allow for the reinstatement of catotelm peat to an approximate depth of less than 1.5m between bunds. Over the surface, the acrotelm turves would be placed to promote the early growth of vegetation, see Annex 1 of Appendix 3.6.

Substation

12.9.22 The substation is located on an area of existing peat cutting and has an average peat depth of 0.90m (see Table 12.4), therefore its construction would result in minimal disturbance of peat. This excavated peat combined with excavated peat from Turbines 11 and 14 would be required to reinstate the perimeter and direct surroundings of this area (see Table 12.8 for details).

Anemometry mast

12.9.23 The method of reinstatement of this area is similar to that described for turbine base reinstatement (see Paragraph 12.9.12). The surplus peat would be placed on the adjacent receptor areas (see Annex 1 of Appendix 3.6).

Telecommunications tower

12.9.24 The telecommunications tower is located in an area with an average depth of peat of 0.30m and an approximate peat excavated volume of 9m^3, see Table 12.4. Due to the small footprint of this component all peat turves would be used in-situ.

Degraded peat areas / gully restoration

12.9.25 Widespread and throughout the Site, the peatland consists of a degraded moorland habitat caused principally by overgrazing and agricultural use. This has resulted in the erosion of blanket bog habitats and underlying peat resource.

12.9.26 Peat excavated during construction is a suitable material for restoring the eroded gullies within the Site, see also Table 12.8. In addition, catotelm peat would be used for ditch blocking as 'peat plugs' as part of wider peatland restoration within the Site to raise water levels locally and improve the condition of adjacent blanket bog habitat. The success of peat plugging is weather dependent and the OPRMP (see Annex 1 of Appendix 3.6) provides advice on targeting this operation to avoid poor weather conditions. This restoration measure would also require an amount of acrotelm in order to promote the revegetation with sphagnum species.

12.9.27 As areas of extensive degraded peat land are present within the Site, the measures detailed in the OPMRP (see Annex 1 of Appendix 3.6) would be implemented to restore peatland for biodiversity and to improve the overall carbon balance of the development and wider ecosystem benefits (see also Chapter 14: Carbon Balance, Table 14.1). These measures would take place progressively and would result in minor, positive impacts for the majority of the project components (see Table 12.8).

Management of peat during the construction phase

12.9.28 The CEMP would include a monitoring scheme to measure and ensure the effectiveness of the mitigation measures (see Appendix 3.6 for the outline CEMP).The management of peat reinstatement would be a requirement of the PRMP (see Annex 1 of Appendix 3.6 for the OPRMP). Monitoring reports during construction would be undertaken on a regular basis and summarised annually and on completion of the construction phase. Once construction is completed, monitoring could be transition to the requirements of the HMP (see Appendix 10.4 for the OHMP).

Operational phase

12.9.29 There would be no additional or ongoing potential impacts upon peat resources during the operational phase. However, in conjunction with the HMP, grazing density within the Site can be managed for the duration of the operational phase. Overgrazing has largely contributed to the widespread and degraded status of the peatland habitat. Currently, grazing sheep density within the Site is up to a maximum of 1,800 livestock units, depending on the time of year. In an agreement between the Applicant (PWFY Ltd) and the landowners, the number of sheep will be reduced to a maximum of 600 to maintain a grazing density of 0.5 sheep per ha, to encourage the natural revegetation of reinstated peatland (as part of the mitigation undertaken during the construction phase) and to promote natural revegetation of eroded hags and areas of bare peat. The management requirements are considered in the OHMP (Appendix 10.4), which provides the objectives for the management, maintenance and enhancement of the peatland habitats for the duration of the operational period of the Consented Development.

Decommissioning phase

12.9.30 During decommissioning, operations that affect peatland within the Site would be less intrusive. As a consequence, good practice guidelines, relevant at the time of decommissioning would be adopted through the Decommissioning and Recovery Plan (DRP) that would be developed prior to decommissioning work on the Site. The DRP would provide an appropriate level of detail about how the site infrastructure would be removed and restored.

12.10 Assessment of residual effects

12.10.1 Table 12.8 contains the assessment of potential impacts taking account of mitigation measure in Section 12.9.

Table 12.8 Assessment of residual effects after mitigation

Project Components	***Scale of Impact before mitigation***	***Mitigation measures***	***Scale of Impact after mitigation measures included***
T1	Minor, negative	Excavated peat from the construction of T1 would be used to restore the turbine base and other disturbance from infrastructure. Reinstatement of peat would consist of acrotelm turves that would create a subtle tie-in to the surrounding area. Catotelm peat would also be required for this reinstatement. Details of further use of excavated peat from turbine construction are provided in Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant**.
T2	Minor, negative	Similar to T1, excavated peat would be used for reinstatement around the turbine bases and other infrastructure. Similar reinstatement measures as T1 would be implemented, details in Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant.**
T3	Minor, negative	Turbines 3, 4 and 5 have the same habitat type of wet modified bog. Turbine bases once construction is complete would be restored using excavated peat.	Scale of impact is likely to become **Minor, positive and not significant.**
T4	Minor, negative	Turbines 3, 4 and 5 have the same habitat type of wet modified bog. Turbine bases once construction is complete would be restored using excavated peat.	Scale of impact is likely to become **Minor, positive and not significant.**
T5	Minor, negative	Turbines 3, 4 and 5 have the same habitat type of wet modified bog. Turbine bases once construction is complete would be restored using excavated peat.	Scale of impact is likely to become **Minor, positive and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	*Scale of Impact before mitigation*	*Mitigation measures*	*Scale of Impact after mitigation measures included*
T6	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T6 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
T7	Moderate, negative	Turbines 7, 9, 10 and 12 are located on an area of unmodified blanket bog, so it is likely these areas would contain a substantial layer of acrotelm peat. Some of these acrotelm turves would be required for use in turbine base reinstatement.	Scale of impact is likely to become **Minor, negative and not significant.**
T8	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T8 construction. Similarly to T6, T8 is next to BP3. Peat would be used for gully restoration. Any excess peat would be appropriately stored in BP3 for use in the final reinstatement profile.	Scale of impact is likely to become **Minor, positive and not significant.**
T9	Moderate, negative	Like T7, T9 would be restored using excavated peat from turbine construction, with some remaining acrotelm used for borrow pit reinstatement, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, negative and not significant.**
T10	Moderate, negative	Similarly to T7 and T9, T10 would involve peat excavation on unmodified blanket bog. This turbine would involve using excavated peat from turbine construction.	Scale of impact is likely to become **Minor, negative and not significant.**
T11	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T11 construction. See Annex 1 of Appendix 3.6 for additional reinstatement proposals.	Scale of impact is likely to become **Minor, positive and not significant.**
T12	Moderate, negative	Like T7, T9 and T10; T12 reinstatement would include using the excavated peat from turbine construction, with some remaining acrotelm used for borrow pit reinstatement, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, negative and not significant.**
T13	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T13 construction. Reinstatement of T13 would be an improvement on the current habitat (unimproved grassland / bare peat).	Scale of impact is likely to become **Minor, positive and not significant**.

Table 12.8 Assessment of residual effects after mitigation

Project Components	*Scale of Impact before mitigation*	*Mitigation measures*	*Scale of Impact after mitigation measures included*
T14	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T14 construction.	Scale of impact is likely to become **Minor, positive and not significant**.
T15	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T15 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
T16	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T16 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
T17	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T17 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
BP 1	Minor, negative	BP1 would be restored within the first 3 to 6 months of the construction programme. Depending on the design of the borrow pit, a suitable reinstatement profile would be created using acrotelm turves and catotelm, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant.**
BP 2	Minor, negative	BP2 would be restored within the first 12 months of the construction programme. Depending on the design of the borrow pit, a suitable reinstatement profile would be created using acrotelm turves and catotelm, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant.**
BP 3	Moderate, negative	As BP3 is the largest of the borrow pits within the Consented Development it would be used to temporarily store peat during construction which would be kept wet with appropriate spraying / irrigation when required. Depending on the findings from further detailed surveys post consent, BP3 has the potential to be restored using peat from construction areas to its current habitat (wet modified bog) as the surrounding water table may be high enough for bog community establishment, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, negative and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	*Scale of Impact before mitigation*	*Mitigation measures*	*Scale of Impact after mitigation measures included*
BP 4	Minor, negative	The current habitat of BP4 is unimproved acid grassland / bare peat. BP4 would be restored a higher quality of habitat using reinstated peat from construction areas and acrotelm turves from nearby turbines located on unmodified blanket bog.	Scale of impact is likely to become **Minor, positive and not significant.**
Site Compound	Negligible, negative	Located on bare peat at Moss Houll, the Site Compound would be restored using excess peat from Turbines 14 and 16. Restoring this area would be an improvement on the current degraded habitat.	Scale of impact is likely to become **Negligible, positive and not significant.**
Site Substation	Negligible, negative	Reinstatement of this area would involve using excess peat from Turbines 11 and 14. Restoring this area would be an improvement on the current degraded habitat, similarly to the Site Compound.	Scale of impact is likely to become **Negligible, positive and not significant.**
Anemometry Mast	Minor, negative	The base of this component would be reinstated in a similar way to the Turbine bases as described in Table 12.8.	Scale of impact is likely to become **Minor, positive and not significant.**
Telecommunications Tower	Minor, negative	The average peat depth for this location is 0.30m with a surrounding area of degradation and erosion. This area would be reinstated in a similar way to that described for the Turbine bases.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 625m)	Minor, negative	The peat depth for this location is 0-0.17m, suggesting that the peat present is of minimal quality. Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. Excess peat would be stored in BP1 to be used for reinstatement purposes.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 602m)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 2, 013m)	Minor, negative	This length of track passes through semi-improved acid grassland, wet modified bog and predominantly through unimproved acid grassland / bare peat and dry modified bog / bare ground. Excess peat from this section of A001 would be used for landscaping the completed track by creating shoulders that are in keeping with the surrounding habitats mentioned.	Scale of impact is likely to become **Minor, positive and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	*Scale of Impact before mitigation*	*Mitigation measures*	*Scale of Impact after mitigation measures included*
Access Track (A001: 854m)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 465m)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A002)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A003)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A004)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A005)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A006)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A007)	Negligible, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact remains **Negligible, positive and not significant.**
Access Track (A008)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	*Scale of Impact before mitigation*	*Mitigation measures*	*Scale of Impact after mitigation measures included*
Access Track (A009)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A010)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A011)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. S see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A012)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A013)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**

Summary of the residual effects resulting from the consented development

12.10.2 The scale of impact for each project component of the Consented Development, taking account of peat handling and management mitigation measures, range from minor and not significant impact in EIA terms to a minor positive effect, assuming the implementation of the HMP, (see Appendix 10.4 for the OHMP). Of the project components where the impact is minor and not significant (Turbines 7, 9, 10 and 12, Access Tracks A003, A006, A008 and A009 and BP3), the primary mitigation methods have been directed at reinstating the peat habitat (acrotelm) to receptor areas where the HMP define specific long term aftercare management to maintain and improve the peatland habitat.

12.10.3 The project components where the resultant impact is minor and positive, (Turbines 1-6, 8, 11 and 13-17, Access Tracks A001, A002, A004, A005, A007, A010, A011, A012 and A013 (see Figure 3.1), BP1, BP2 and BP4 and the Site compound, substation, anemometry mast and telecommunications tower), the residual effect are a consequence of the mitigation measures that have been directed at reuse of peat within receptor areas located around the construction footprint. The area available to reinstate peat, based on peat receptor areas that can be reached from within the construction footprint is approximately 64ha in total, compared to 25ha of where peat will be excavated for construction of the Consented Development. Because the incidence of bare and eroded peat is extensive throughout the

construction footprint and the adjacent areas, a minimum of 64ha can be reinstated through infilling erosion gullies and areas of bare eroded peat. In addition, through use of peat plugs to slow the movement of surface water in the wider areas, the construction has the potential to deliver minor positive residual effects, subject to the requirements of the HMP that would take effect during the operational phase (see Appendix 10.4 for the OHMP). The residual effects after mitigation identified in Table 12.8 are on the basis that the HMP is fully implemented for the duration of the operational phase of the Consented Development.

12.11 Cumulative impacts

12.11.1 Cumulative effects on peat conditions may occur due to similar developments within the area. These effects would only potentially become significant if one or more similar developments were to be proposed locally. No similar developments are currently proposed on Yell.

12.12 Summary and conclusions

12.12.1 The chapter assesses the effect on the peat resource within the Site, as a consequence of the construction, operation and decommissioning of the Consented Development. In addition, the chapter contains a summary of the peat slide risk assessment, within which the risk has been considered in EIA terms.

12.12.2 The baseline conditions with the Site have been defined using standard peat depth survey techniques. The surveys comprised a regular grid across the Site, together with a second survey that that concentrated on each component of the Consented Development, at grid centres of approximately 50 to 100m. The survey defined the baseline condition with respect to peat depth and condition, together with a description of the habitat and the presence or absence of vegetation.

12.12.3 The engineering requirements of the Consented Development have designed to take account of the requirements for turbine foundations, crane pads, hardstanding, access tracks and cable trenches, construction compound, substation, met mast and telecommunications tower. The depth and volume of peat for each component has been assessed and individual components have then be located to, where possible, minimise the volume of peat disturbed. These have been defined as embedded mitigation measure included in the design of the Consented Development. The design and layout also took into account the potential risks associated with the risk of peat slide, from open, excavated surfaces that would be present for short periods of time during the construction phase.

12.12.4 Further mitigation measures have been developed to use the excavated peat to progressively reinstate areas of bare eroded habitat that are widespread and evident around with of the main components of the Consented Development. Using this technique, peat can be excavated and directly reinstated to receptors areas adjacent to the individual components during construction. In addition, peat can be reinstated over larger areas of bare ground (adjacent to the construction compound, substation and telecommunications tower) and, in addition for restoration of the borrow pits. Techniques have been defined to replace deep catotelm peat first and then use the acrotelm to reinstate vegetation of the surface of the bare peat.

12.12.5 During the operational and decommissioning phases, the potential impact on peat is minimal, and considerably less than that during the construction phase. The implementation of a proposed HMP has been identified to promote active management of the habitat within the Site and reverse the current

degradation of peatland habitats associated with overgrazing, erosion from drainage of surface water and to a lesser extent peat cutting.

12.12.6 The assessment did not predict any significant residual effect on the peat resource and subject to implementation of mitigation measures minor positive effects have been predicted as a consequence of reducing the extent of bare peat surrounding each of the components that comprise the Consented Development. The mitigation measures that have been identified will be requirements of the CEMP and PRMP, then subsequently during the operational phase maintaining these habitats through an effective HMP is an important component of the Consented Development.

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