Appendix 2.2

Updated OPRMP

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APPENDIX 3.6: OUTLINE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (OCEMP)

Peel Wind Farms Yell Limited, Beaw Field Wind Farm

Annex 1 Outline Peat Reinstatement and Management Plan Update addressing comments from SEPA

June 2016

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MINERAL ESTATES AND QUARRYING
WASTE RESOURCE MANAGEMENT

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1 INTRODUCTION

1.1.1 This Outline Peat Reinstatement and Management Plan (OPRMP) describes methods to be used by the Principal Contractor when excavating, moving and reinstating peat.

1.2 Definitions

Habitats with the Site:

Blanket bog

1.2.1 *"Area of peatland covering or blanketing a large area. They only occur under very oceanic conditions and are not confined by the surrounding topography. They receive little or no contribution from laterally moving water in the soil"* (SNH, 2015)[iii]. Blanket bogs are sub-divided into unmodified, and wet and dry modified blanket bogs. In Phase 1 Habitat surveys bog-moss abundance is an indicator of whether bog is modified or unmodified. When the drainage is extensive, further change in plant composition occurs and a dry modified bog develops (see ES Appendix 11.2 for details).

Bogs

1.2.2 Wetlands in which peat is accumulating, fed by rainwater, nutrient poor and acidic.

Peat, description, formation and typical profile identified within the Site

Peat

1.2.3 Peat is defined as the partially decomposed remains of plants and soil organisms which have accumulated in situ under waterlogged conditions. Peat accumulates where the rate of input of organic material from the surface exceeds the rate of decomposition and 'turn-over' of this new material. In Scotland peat is defined as a soil having a surface organic horizon (layer containing more than 60% of organic matter) more than 50cm in depth.

Peatlands

1.2.4 *"Landscapes with a peat deposit that currently support vegetation that may or may not be peat-forming, or may lack vegetation entirely. The presence of peat of vegetation capable of forming peat is the key characteristic of peatlands (Ramsar definition)."* (SNH, 2015)[iii]

Acrotelm

1.2.5 The acrotelm, or acrotelmic peat, is the upper aerobic layer of peat and consists of living and partially decayed plant material. It typically has a higher hydraulic conductivity and is defined in relation to distance to the permanent water table. Acrotelm thickness can vary with the topography.

Catotelm

1.2.6 The catotelm, or catotelmic peat, layer sits under the acrotelm, consists of highly decayed material, and is significantly denser, with low hydraulic conductivity, permanently saturated with water.

Drainage and rehabilitation

Grips

1.2.7 Drainage ditches cut in peatland to improve value for agriculture.

Reinstatement

1.2.8 A process of placing peat within an area for the purpose of restoration, when peat is brought from another location or temporarily excavated during construction and put back.

Restoration

1.2.9 A process of assisting the recovery of a system that has been degraded, damaged, or destroyed. For the purpose of this report, the restoration may or may not involve reinstatement of peat, i.e. translocation of peat from another area, or as in the case of borrow pits, placing peat into the base of the worked out void remaining after extraction.

1.3 Aims and Objectives

Aim 1: Mitigating Potential Impacts

1.3.1 This overarching aim will be tackled by way of a series of measureable objectives (set out below) which, if successful will deliver the aim. Objective 1.1; To identify and develop suitable methodologies to mitigate the potential impacts of the Proposed Development on peat that will be disturbed within the Site, summarised below but also set out in paragraph 12.6.12, in Chapter 12 of the ES:

1. Damage and loss of peat resources during handling and storage required for earthworks (e.g. drying, loss of vegetation, structure and water holding capacity);
2. Mixing of distinct soil layers, acrotelm with lower horizons of the catotelm, resulting in the loss of seed banks contained in the acrotelm; and
3. 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.

1.3.2 Objective 1.2; to manage peat so that this resource is not treated as a 'waste' byproduct of the construction of the wind farm. The waste hierarchy1 will be adhered to which, with respect to peat rehabilitation and management, comprises (from the most to least preferred):

- avoidance (not disturbing areas of deep peat, in particular);
- minimisation (ensuring that peat, once excavated does not become a waste as a consequence of windfarm construction);
- protection against damage (ensuring that excavated peat is managed so that it is suitable for rehabilitation elsewhere within the Site);
- reinstatement (re-use) of excavated peat (the details of which are contained in the OPRMP); and
- disposal (avoided using methods described in the OPRMP);

1.3.3 Avoidance and minimisation have been pursued through optimisation of the infrastructure layout so that it is located where peat deposits are shallower (see section 5.6 in Chapter 5 of the ES). Where other constraints resulted in infrastructure being located on deeper peat, options to minimise the amount of peat displaced, such as floating roads, have been considered (see paragraph 12.7.19, in Chapter 12 of the ES).

1.3.4 In order to protect peat against damage, its excavation and reinstatement will take place in accordance with the requirements of the OPRMP. Where practical, peat will be managed so that it is used directly to restore areas of excavated peat between the infrastructure and the undisturbed adjacent peat. Appropriate handling, storage and adoption of good practice measures and specific methods (based on relevant SEPA

[1] Based on the waste hierarchy described in Article 4 of the EU Waste Framework Directive, 2008/98/EC.

and other industry guidance documents listed in endnotes) have been considered and defined with reference to each aspect of wind farm infrastructure. The general principles of peat management are described in Section 4, and methods of reinstatement for specific infrastructure in Section 5.

Aim 2: Long-term potential benefits from improving the quality of peatlands within the Site.

1.3.5 Objective 2.1; To ensure that during construction peat is rehabilitated and managed in accordance with the long-term objectives of the Habitat Management Plan (see paragraph 12.6.14 of Chapter 12 of the ES), which include:

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

1.3.6 The peat excavated during the construction of the infrastructure must be rehabilitated and managed in accordance with SEPA's guidancei, which identifies techniques that are environmentally and ecologically acceptable (the options that will be used during construction of Beaw Field Wind Farm are shown in bold);

- ***Construction of dams or bunds to retain water on damaged or created peatland sites,***
- ***Restoration of turbine foundations and hardstanding,***
- *Re-use measures that may be acceptable in certain settings include,*
- ***Restoration of borrow pits and quarries using a shallow peat cover,***
- *Creation of new areas of habitat or other ecological features,*
- *Verge dressing using turves and/or acrotelm peat,*
- *Erosion control using 'sandbagged' peat,*
- ***Targeted infilling of existing degraded, cut-over areas of peat and***
- ***Lochan restoration.***
- *Practices that are generally considered not to be environmentally and ecologically acceptable and thus will not be used during the construction of Beaw Field Wind Farm include:*

- *Spreading of catotelmic peat spoil along trackside;*
- *Disposal of peat without an appropriate permit;*
- *Re-use resulting in bare deep catotelmic peat posing health and safety risks; and*
- *Placing peat in areas exposed to erosive flows or excessive depths of water ponding.*

1.3.7 The re-use options proposed for the Site provide well defined benefits for the ecology, carbon stocks and sequestration potential, hydrology and landscape, or/and are required to mitigate against potential adverse environmental effects (see paragraph 1.3.1). They work either by directly mitigating the impact of the construction, or offsetting it through restoration of some of the extensive degraded habitats present within the Site:

- Restoration of the borrow pits is required to mitigate the impact of the construction and to improve the existing habitat, given the degraded state of borrow pits 1, 2, and 4 (bare ground, decreased depth of peat cover, ongoing intensive erosion and peat decomposition).
- Restoration of margins of the infrastructure, such as track verges is required to ensure minimal impact of the Proposed Development on landscape and surrounding habitats.
- Restoration of gullies and drains (grips) is required to improve hydrological conditions within the Site, and to stop ongoing peat erosion and decomposition.
- Targeted infilling (peat translocation) within some of the most degraded areas of bare, cut and eroded peatland is needed to restore wet blanket bog in highly degraded areas where reduced grazing pressure alone would not suffice.

1.3.8 The details of environmental and ecological benefits of each of the above options, and methods of their delivery, are demonstrated in relevant paragraphs in Section 5 of this document.

1.3.9 The overarching aim of the OPRMP is to provide guidance and a framework for the Principal Contractor to effectively re-use all of the peat excavated during construction in order to avoid its disposal and deliver long term ecological benefits. The OPRMP sets out the details of why this is required and how it will be carried out in order to *"*[…] *have a high likelihood of achieving the desired outcomes through measures that:*

1. *Maintain or enhance peatland ecosystem services (such as carbon sequestration);*
2. *Minimise risks to ecosystem services (such as loss of habitat, or water quality or storage; or the initiation of peat slides);*
3. *Retain and use peat as close to the point of extraction as is possible; and*
4. *Retain peat spoil in a predefined area and set of environmental conditions."*

(SEPA, 2011)

1.3.10 The key environmental conditions that will be maintained for the re-use of peat to be successful and achieve the restoration of peatland habitats are:

- *Permanently waterlogged conditions;*
- *Low nutrient levels; and*
- *Low pH (or acidic conditions).*

(SEPA, 2011)

1.3.11 Maintenance of the above conditions will be ensured by application of the principles described in section 4 and solutions specific to each peat reuse technique outlined in section 5.

Implementation and Relationship with Other ES Documents

1.3.12 This is a revised version of the document which addresses points raised by SEPA in correspondence dated 19 April, 2016 (ref. PCS/145605). The OPRMP has been updated in order to provide clarification of the proposed peat reinstatement and management strategy for Beaw Field Wind Farm. This remains an outline document and will be further developed into the detailed PRMP should planning permission be granted.

Post-consent Ground Investigation Report

1.3.13 The detailed PRMP will be based on additional ground investigation (GI) required to inform the detailed design of access tracks, turbine foundations, hardstanding, construction compound and other wind farm related infrastructure. As a consequence, the GI will also inform the requirements for peat restoration.

1.3.14 In general, the post-consent GI will follow the approach recommended in Scottish Renewables and SEPA guidance (2012)[vi], which was outlined as follows:

1. *Review all the data collected during the Environmental Impact Assessment stage.*
2. *Detail proposals for further site investigation (ground investigation) for the site and borrow pits including, as required: Locations for trial pits and boreholes;*
    - *Areas for and density of additional peat depth probing;*
    - *Locations for further peat coring;*
    - *Area to be covered by detailed topographic survey; and*
    - *On-site chemical and off-site lab testing.*
3. *Carry out further site walkover surveys to check all information available to date, and suitability of the proposed methods and equipment for ground investigation.*
4. *Conduct the ground investigation and topographic survey work.*

1.3.15 The GI results will inform the detailed PRMP, itself part of the appointed Principal Contractor's Construction Environmental Management Plan (CEMP), and detailed Construction Method Statements (CMS). Please note, the Outline CEMP (OCEMP, see Appendix 3.6 of the ES), is the main document to which this report will be annexed. The data obtained by GI will provide information on the determination of soil and rock strength, groundwater conditions, the volume of the rock required to be extracted from each borrow pit for use as construction aggregate, and the quantitative slope stability assessment for the Peat Slide Risk Assessment (PSRA, Appendix 12.2 of the ES). With respect to the PSRA, the findings of GI will be used to update, review and expand as necessary the Geotechnical Risk Register, which informs the peat stability aspects for each project component such that the control measures to be used during construction can be defined in detail.

Construction Method Statements

1.3.16 Based on the final PRMP prepared by the Applicant, the detailed CMS documents will be prepared by the Principal Contractor addressing the following aspects of the works:

1. Peat translocation – (including peat translocation plan, see paragraph 4.1.7);
2. Cut and fill access tracks;
3. Floating roads;
4. Turbine foundations and hardstandings;

5. Borrow pits;
6. Site compound;
7. Gully/drain blocking; and
8. Targeted infilling;

1.3.17 The final PRMP and the above CMS documents will be subject to approval by the Shetland Islands Council, which will in all likelihood consult with SEPA and SNH to ensure that their views are taken into account prior to approval of the documents.

Habitat Management Plan

1.3.18 The procedures defined herein should also be followed in combination with the Habitat Management Plan (HMP) and PSRA. A final HMP to assist longer-term management and restoration measures will be provided following planning consent, and will be developed in consultation with relevant stakeholders, such as SNH and Shetland Islands Council. The OHMP is provided in Appendix 10.4 of this ES, it is important to note its aims, which are:

AIM 1

To enhance habitat conditions for identified species of importance present on or linked to the Site.

AIM 2

To alleviate ecological impacts arising from past and present land management practices on the Site, by conserving, enhancing and restoring important habitats and species.

1.3.19 Of particular relevance to the OPRMP are the following objectives of the OHMP:

Objective 1a

To create conditions on former lochans in southern Yell conducive to the enhancement and restoration of breeding Red-throated diver (Gavia stellata)

1.3.20 The lochans have been lost/ damaged due to overgrazing and erosion of surrounding peat. Therefore, the restoration of peat areas adjacent to the lochans through blocking of the gullies and grips, and targeted infilling of larger eroded areas, where suitable, will indirectly contribute to preservation of existing lochans and help in restoration of the damaged ones. For details of the lochans suitable for restoration see OHMP (ES Appendix 10.4).

Objective 2a

Reduce and / or arrest blanket bog / peatland degradation

1.3.21 The peatland restoration will take place primarily through reductions in grazing pressure over the entire 1,158ha Site. The OHMP recognises that not all areas of blanket bog habitat will recover quickly without intervention, for example the area around Moss Houll, in the centre of the Site. Other examples of highly degraded areas accommodate borrow pits 1, 2, and 4. Degradation in those locations will be addressed directly through peat translocation. These actions will speed up restoration of those areas to wet blanket bogs, through use of existing peat with vegetation from excavated areas, instead of relying on slower, natural revegetation if left bare. Additionally, the process will be expedited in other locations (including those adjacent to targeted infilling areas) through improvement in hydrological conditions of existing wet blanket bogs through blocking of gullies and grips.

1.3.22 While the OPRMP identifies the techniques that will be considered in the detailed designs required for peat reinstatement in discrete areas, the purpose of OHMP is restoration and improvement of the quality of natural habitats within the Site as a whole. The execution of the OPRMP will be followed by a programme of long-term aftercare set out in the OHMP.

1.4 Ecological Benefits of Blanket Bog Restoration

1.4.1 Blanket bogs is a UK Biodiversity Action Plan[ii] priority habitat, which means that it was identified as being threatened and in need of conservation action. Blanket bogsupports unique plants, birds and insects adapted to their particular conditions, some of which are not found anywhere else[iii]. Examples of important species present within the Site are birds: Golden plover (*Pluvialis apricaria*) and Dunlin (*Calidris Alpina*), and various species of mosses belonging to the *Sphagnum* genus. Those and other species will benefit from restoration of this habitat.

1.4.2 The bogs are known to contribute to the regulation of the climate, through the accumulation of carbon dioxide in the form of organic carbon (peat) that has been taking place for thousands of years. This has resulted in large stores of carbon—Scottish peatlands alone are estimated to store ten times more carbon than all of the UKs trees—of international importance. If allowed to decompose, this carbon would be released as carbon dioxide and contribute to climate change. But if the blanket bogs are maintained and restored, existing stocks will be preserved and the bogs will

continue to sequester more carbon dioxide. Peatlands are also important for regulation of flooding as they accumulate water and slow down rapid runoff during extreme rain events.

1.4.3 The importance of peatlands has been recognised by the Scottish Government. It aims to *"undertake a major programme of peatland conservation, management and restoration"* as one of three key steps to maintain and improve this significant element of the country's natural capital[iv]. Beaw Field Wind Farm, apart from being a renewable energy development, providing clean energy, would be a major peatland conservation and restoration project in Scotland.

1.4.4 To help achieve Objective 2a of the OHMP it is intended that all of the larger peat reinstatement areas, such as borrow pits, site compound and targeted infilling areas, will be restored to a modified wet blanket bog. This habitat has been prioritised because it is the type of habitat that is declining within the Site and has suffered the most over many years due to anthropogenic activities such as peat cutting, overgrazing, deliberate drainage and agricultural traffic resulting in semi-permanent tracks. All those factors led to alterations in plant species composition, reducing the quality of the blanket bog habitat leading to the complete loss of vegetation cover, resulting in widespread peat erosion and decomposition, and eventually a decrease in peat depth.

1.4.5 The ES finding that blanket bogs once dominated the site is supported by the habitat survey (ES Appendix 11.2), which showed that the unmodified blanket bog made up only 8% of the Study Area, which is relatively small compared to widespread occurrence across much of Shetland. The dominant habitat within the Site was dry modified bog, comprising 39% of the Site, followed by wet modified bog, which made up 25%. It was concluded that the decline in presence of bog mosses and the resulting large areas of dry modified bog were likely to be the effects of drainage and peat cutting. The wet modified bog was often characterised by extensive hagging and areas of exposed peat, and areas of clearly deep peat, but next to no bog-mosses present. The habitat assessment concluded that the hagging was likely to have developed through natural causes, but some hagging and the low levels of re-colonisation by vegetation were likely to had been exacerbated by overgrazing and trampling by sheep. It is intended that the restoration of wet blanket bog areas through peat translocation and associated works to maintain appropriate hydrological conditions will lead to quick establishment of modified wet blanket bog habitats, which can be

managed through the HMP to return to active (peat-forming) unmodified blanket bog habitats.

1.4.6 The restored borrow pits and targeted infilling areas, such as those surrounding the site compound and Moss Houll, will link to the other existing areas of wet bog habitats (see habitats map in the ES Figure 11.3), extending their size and increasing their resilience and ecological value. The increase in resilience of adjacent habitats will be brought by increasing their extent and by improving their hydrological conditions through raising the water table. Raising the water table will ensure that the loss of peat through erosion and oxidation is stopped (see section 4.1.10 for general principle of keeping the water table close to the surface and section 5.6 for description of how this will be achieved in targeted infilling areas).

1.5 Policy and Guidance for Peat Management

1.5.1 This PRMP has been prepared with regard to the advice contained in SEPA letter dated 19.04.2016, good practice guidance documents[i,v,vi,vii] and advice from SNH (Andrew McBride, personal communication).

2 PEAT CONDITIONS ON SITE

2.1.1 Following a desk based study, Blairbeg Consulting Ltd carried out a preliminary peat survey (see Appendix 12.1 of this ES). Peat depths were recorded on a 250m grid with notes about the nature and condition of the peatland habitat.

2.1.2 An additional survey was carried out to inform preparation of the final layout of all associated infrastructure. This survey recorded peat depths on a 50m and 100m grid. A total of 1,762 sample points defining peat depth were recorded. The peat depths ranged from between peat absent to a maximum of 4.35m, with an average depth of 1.25m. For further details, see Appendix 12.1.

2.1.3 The peatland within the Site is extensively degraded, which has been caused by anthropogenic activities such as overgrazing, peat cutting, waste disposal, and semi-permanent, randomly placed, tracks crossing the Site (see Appendix 12.1 and Photograph 1). Erosion has been taking place across the Site as frequent hags and gullies show (see ES Figure 12.3). Figure 3.6.1.7 is a geomorphological map which illustrate this: all areas not covered with water, except for bare ground and marked patches of relatively intact peat, are covered by a dense network of gullies and are heavily dissected (see ES Figure 3.2). A full and detailed description of the peat condition within the Site is presented in Chapter 12 of the ES: Soils and Peat.

Photograph 1 Area near Moss Houll exhibiting widespread degradation

2.1.4 The other data that has been used to inform the OPRMP are the surveys and assessments described in Chapter 10: Ornithology, Chapter 11: Ecology, Chapter 13: Geology and Chapter 15: Hydrology and Hydrogeology.

3 PEAT BALANCE

3.1 Total Excavation and Reinstatement Volumes

3.1.1 The total volume of peat to be excavated during construction has been calculated based on the following data and assumptions:

- NEXTmap Britain 5m Digital Terrain Model[2];
- Peat depths provided by surveys conducted by Blairbeg Associates Ltd (see Chapter 12); and
- The probe depth records being representative of the actual peat depth, however some soft mineral deposits underlying peat, such as clays, may have been included, which means that the estimates of peat volumes are considered to be worst-case.

[2] http://www.intermap.com/data/nextmap

3.1.2 At this stage, based on the data and assumption identified in the previous paragraph, all peat excavated during construction can be reused within the Site through methods listed in paragraph 1.3.6. Table 1 provides a summary of the excavation and reinstatement volumes that have been calculated for each project component. The analysis identifies that when using the "as excavated" volumes the reinstatement results in a surplus of approximately 25,807m^3 of peat, which comprises less than 10% of the total excavated volume. Assuming a minimum of 10% loss of volume due to settlement, it is anticipated that there would be no surplus peat after completion of wind farm construction (all of the surplus would be reused to achieve target reinstatement depths). In the unlikely event that this assumption proves to be inaccurate, this surplus may be reused for additional areas of targeted infilling as the requirement for restoration far exceeds the availability of peat for this purpose (see paragraph 5.6.10).

3.1.3 The estimates will be subject to review using the information from the GI and taking into account revised design.

Table 1: Indicative Peat Balance

Project Component	Phase (months)	Excavated volume of peat (m^3)	Reinstated Area (m^2)	Reinstated Depth (m)	Reinstated Acrotelm (m^3)	Reinstated Catotelm (m^3)	Reinstated Total (m^3)	Balance ($m^{3)}$
Acces Track verges	0-24	82,170	12,581	0.3	3,774	-	3,774	78,396
Turbine bases and hardstanding perimeter	9-24	89,170	9,214	0.3	2,764	-	2,764	86,406
Anemometry mast	0-24	120	78	1.5	23	97	120	-
Radio tower	0-24	9	30	0.3	9	-	9	-
BP1 (void)	0-6	5,590**	5,900	2	1,770	10,030	11,800	-6,210
BP1 (other*)	0-6	-	19,243	0.5	5,773	3,849	9,622	-9,622
BP2 (void)	0-12	26,390**	9,000	2	2,700	15,300	18,000	8,390
BP2 (other*)	0-12	-	51,874	0.5	15,562	10,375	25,937	-25,937
BP3 (void)	0-24	35,730**	10,900	2	3,270	18,530	21,800	13,930
BP3 (other*)	0-24	-	64,012	0.5	19,204	12,802	32,006	-32,006
BP4 (void)	0-24	8,130**	9,150	2	2,745	15,555	18,300	-10,170
BP4 (other*)	0-24	-	21,331	0.5	6,399	4,266	10,666	-10,666
Compound during construction	3-24	3,810	3,835	1	1,151	2,685	3,835	-25
Substation	3-24	1,380	320	0.3	96	-	96	1,284
Ditch/gully blocking	0-24	-	300	1.5	90	360	450	-450
Targeted infilling	0-24	-	45,000	1.5	13,500	54,000	67,500	-67,500
Total		252,486	262,768	-	78,830	147,848	226,679	25,807

* area comprising scree slope, benches, overburden mound and the borrow pit perimeter

** volume of peat excavated from the entire borrow pit footprint

Note: revised values are shown in red; volumes are “as excavated” and do not account for compression.

3.2 Volumes of reinstated peat for different elements of the infrastructure

3.2.1 This section provides a summary of the volume of reinstatement peat required for each individual component of wind farm infrastructure. The description of the peat reinstatement techniques that are specific for each element of the infrastructure are considered in Section 5.

Access Tracks

Cut and Fill Tracks

3.2.2 The entire length of access track required for construction is 11.1km, equating to a footprint of 10,484m^2 within which peat will be disturbed. The total approximate excavated peat volume would be 82,170m^3, offset by a reinstatement area of 12,581m^2, in order to restore the surface between the edge of the track and undisturbed peat. The volume is calculated on the basis that all tracks would be designed on the basis of removing peat and soft superficial material (cut) and track construction using aggregate from borrow pits (i.e. worst case); for a typical track design see Figure 3.10 of the ES. An approximate reinstatement volume of acrotelm turves has been calculated at 3,774m^3 to restore the access track verges. In certain sections of the access track, catotelm peat will also be required, subject to detailed design, in particular the use of floating roads (see Section 3.2.3). The actual form for access track design will be designed utilising the results of the detailed GI.

Floating Roads

3.2.3 The current estimates of peat volumes are conservative (worst case scenario), as they are based on the construction using no floating roads, where the tracks would go over areas with deeper peat deposits. At this stage of the design it is estimated that approximately 900m of tracks passing through peat could be potentially suitable for a floating road. This is where the gradient is less than 1 in 20 (3°) and the surface is predominantly flat, without abrupt changes in levels, e.g. not passing through large gullies and highly eroded areas (see paragraphs 12.7.19–12.7.21 in Chapter 12 of the ES). The design of floating roads will be dependent on the results of the post-consent GI and good practice design criteria at the time. Construction techniques that use floating roads will reduce the volume of peat excavated for access tracks to a maximum of 76,000m^3.

Turbine Foundations and Hardstanding areas

3.2.4 To facilitate the construction of turbine foundation, crane pads and hardstandings, peat will be excavated to prepare an area sufficient for the construction of each of the foundation for the 17 turbines. The details of the foundations will be determined following GI, however the OPRMP is based on the excavation being circular and up to 17m in diameter (see Figure 3.4 of the ES for a typical foundation design). Likewise,

the design of the crane pad hardstanding will be dependent on the results from the GI, however Figure 3.5 of the ES provides a typical design used in the OPRMP.

3.2.5 A total of 89,170m^3 of peat is expected to be excavated for turbine bases. Excavated peat (acrotelm turves only) will be used to reinstate the disturbed area between turbine base and undisturbed peat (with an approximate total of 2,764m^3). Catotelm removed in advance of the construction of each turbine base will be used in borrow pit restoration and targeted infilling.

Anemometry mast

3.2.6 To construct the foundation for anemometry mast requires an area of 78m^2 of peat to be removed in advance, corresponding to up to 120m^3 of excavated peat. Due to a small displacement of peat required for the mast foundation and anchoring, and inevitable compression of the excavated peat (minimum 10% volume loss, see paragraph 3.1.2), it is anticipated that all excavated peat will be reinstated in situ to the depth of surrounding peat (approximately 1.5m), therefore the base will be up to 1.2m of catotelm, restored using 0.3m of acrotelm turves to a level flush with surrounding peat habitat.

Radio tower

3.2.7 The radio tower is located in area of very shallow peat and peaty topsoil, which is approximately 0.3m deep. Due to the construction design all excavated peat (approximately 9m^3 of vegetated turves) will be reinstated following construction of the mast, to a level flush with the surrounding land.

Borrow Pits

3.2.8 Borrow pit reinstatement for each individual borrow pit will depend upon the final borrow pit design (based on the findings of the GI providing, among others, precise volumes of suitable mineral available for extraction). These details will be included in the final version of the PRMP. All borrow pit voids will be reinstated to a maximum depth of 2m peat (the profile comprising a lower horizon of 1.7m of catotelm peat and a surface horizon of 0.3m of acrotelm containing vegetation) with the total volumes of 11,800; 18,000; 21,800; and 18,300m^3 for BP1–4, respectively.

3.2.9 Additional peat will be required for restoration of the scree slope, benches, overburden mound and the perimeter of the borrow pit. The depth of the peat used will vary, but it will be on average 0.5m in total, comprising 0.3m of acrotelm and 0.2m

of catotelm (likely to be transferred as intact 0.5m thick turves). The peat volumes required for this purpose are estimated at 9,622; 25,937; 32,006 and 10,666m^3 for BP1–4, respectively.

3.2.10 The volumes have been calculated, "as excavated" (see paragraph 3.1.2), without accounting for inevitable settlement of reinstated peat[3], and they may also reduce if replacement of rock-filled roads with floating roads is identified to be feasible. They will also be subject to adjustment upon the final borrow pit design post-consent.

Site Compound

3.2.11 The Site compound will be located within an area typified by shallow peat (<0.5m) and bare ground. The current condition of the peat habitat has resulted from overgrazing, peat cutting, erosion and lowering of the local water table (see Figures 12.4 and 12.5). The construction area is 7,670m^2 with an approximate associated volume of peat excavation of 3,810m^3, which comprises shallow highly degraded peat and remnant pillars of intact peat habitat. The area surrounding the compound is similarly disturbed and has been identified as a target infill area to restore peat land during construction.

3.2.12 In addition, when construction is complete, the footprint of the compound will be reduced and restored with reinstated peat, to a level flush with surrounding, restored peatland. The expected volume of reinstatement is 3,835m^3, equivalent to the amount excavated.

Substation

3.2.13 The substation is located in an area of highly degraded peat with hags and erosion present (Figure 12.3). The construction area is 1,520m^2 with an approximate volume of excavation of 1,380m^3. The perimeter of the substation will be reinstated using approximately 96m^3 of acrotelm turves (0.3m depth) only.

Ditch/gully Blocking

3.2.14 Excavated peat will be required for blocking ditches (grips) and gullies, in accordance with the principles of the OHMP. On the basis that approximately 2–3m^3 of peat will be used to construct each dam, and a total of 100–150 peat dams (this is a conservative estimate as intensive gully networks cover the entire site, to rectify all of

[3] It is well-known that settlement of peat occurs after its translocation, see for example SNH (2015) Peatland Action Guidance for land managers; Installing peat dams, available at: http://www.snh.gov.uk/docs/A1268162.pdf, which recommends accounting for settlement when constructing peat dams.

them a much greater number of dams would be required, see aerial view of the Site in ES Figure 3.2) are constructed, with a depth up to 1.5m, the total volume would be up to 900m^3 of catotelm (due to its amorphous, low water permeability characteristics) together with acrotelm to complete the dam.

3.2.15 Where suitable, acrotelmic and catotelmic peat will be used to infill the gullies behind the dams. Volumes of peat required for this purpose are relatively small and will be estimated during the post-consent GI, when it will be possible to precisely identify locations of gullies to be infilled. The assessment of the suitability for infilling behind dams, will depend on factors such as slope gradient, size of the gully, presence or absence of flowing water, and the extent of natural revegetation. In some locations, hagg reprofiling will be more appropriate.

Targeted Infilling

3.2.16 Targeted infilling will be a reinstatement of peat in suitable areas other than ditches and gullies, where the acrotelm layer has been eroded, which contain islands of deeper peat. It is estimated that there will be enough acrotelm turves and catotelm to reinstate 3.5ha up to a depth of 1.5m. The exact depths, locations and volumes required are subject to post-consent GI.

Cable Trenches

3.2.17 Cable trenches will run parallel to the access track edges to minimise intrusion into peat. The excavation of peat for the trenches will be undertaken from the access track, ensuring no vehicle movement on the vegetated areas adjacent to tracks. The space taken by the cables would be small and it is expected that all excavated peat will be reinstated in situ following the general principles described in Section 4.

4 PRINCIPLES OF EXCAVATION, STORAGE, RE-USE AND REINSTATEMENT

4.1 General Principles

4.1.1 An Ecological Clerk of Works (ECoW) will be appointed prior to the GI and construction. Their role will be to undertake Site walkovers with engineers and contractors to precisely identify areas of sensitivity, highlighting where impact can be reduced by developing the detailed design of access tracks, foundations, crane pads and hardstanding within the tolerance of micrositing permitted in the consent.

4.1.2 All CMS and plans will be accompanied by justification of the final design or construction methods identified by the Principal Contractor (see paragraph 1.3.16 for

the list of required CMS). The Principal Contractor will be required to ensure excavated peat is reused onsite, subject to the conditions and methods of reinstatement described in this section. The CMS documents will, among others, address the following:

1. *Produce a construction timetable and illustrate seasonal considerations.*
2. *State which measures will be put in place to deal with weather related events (flash floods, peat slide, snow melt, dust)*
3. *Track and road material, and other hard-standing material to minimise pollution.*
4. *How sediment management will be adapted in emergency situations to cope with high rainfall and runoff*
5. *How construction will be scheduled around key site constraints (such as the breeding or migration seasons for bird and fish). Where scheduling is not practical it will state what other mitigation can be put in place.*
6. *How construction will be scheduled to benefit site restoration*

(Scottish Renewables et al. 2015)[v]

4.1.3 The Principal Contractor will prepare an inventory of appropriate plant for undertaking all reinstatement works to ensure that no unnecessary disturbance of the ground surface occurs. The work will be carried out by skilled operators under the supervision of a groundwork engineer who has previous experience in projects involving peat translocation in a similar environment.

Minimising damage to existing vegetation

4.1.4 In order to minimise damage to the existing vegetation (wet bog vegetation in particular), mobile plant required for reinstatement and landscaping works will be positioned on constructed access tracks, hardstanding areas or existing disturbed areas wherever possible. Areas to be excavated will be clearly marked on the plans and then on the ground to ensure that no work is carried outside the construction footprint.

4.1.5 Tracked, low ground-pressure, long reach 360^{o} excavators will be used for peat handling and reinstatement works, as it enables sufficient room to allow initial side casting and subsequent pulling back of turves over reinstated peat. A low ground-

pressure excavator, with a single point weight of no more than 10 tonnes, will be used, together with portable bog-mats, to undertake restoration of degraded peat if the maximum extent of the long reach arm has been met.

4.1.6 Reinstatement of vegetation will be focused on natural regeneration utilising peat vegetated turves (acrotelm). To encourage stabilisation and early establishment of vegetation cover in existing bare peat areas near the infrastructure, for which the quantity of excavated acrotelm turves will not be sufficient, a nurse moorland grass seed mix will be used (see Section 4.4).

4.1.7 Where practical, reinstatement will be progressive to minimise double-handling of peat and distances between donor and receptor areas. To achieve this, a detailed peat translocation plan will be prepared by the Principal Contractor and will be agreed with SEPA, prior to construction. The PRMP requires that the recommendations of the SEPA guidance[vi] to identify sources of material and the logistics are fulfilled. The plan will be based on the areas potentially suitable for targeted infilling, identified in Figure 3.6.1.7, which will be informed by the findings of the post-consent GI. The plan will include (but not be limited to):

- location of excavation (donor) areas;
- corresponding receptor areas;
- temporary storage areas (if not possible to avoid, see Section 4.3);
- volumes of excavated, reinstated, and stored peat, respectively, for each distinct area; and
- areas where use of bog mats will be required.

Maintaining water table close to the reinstated surface

4.1.8 Blanket bogs are rainwater fed, they naturally develop in wet and cold areas. The layer of vegetation, such as sphagnum mosses slows down the runoff of the water, which together with low evapotranspiration rates (due to low temperatures) typical for the climate of Yell (see paragraph 5.6.6), maintains waterlogged conditions in which plant remains do not decompose completely and gradually form a layer of catotelmic peat underneath. Catotlemic peat has got low hydraulic conductivity, which means that it slows down the movement of water. Slowly permeable bedrock like glacial till or solid rock further helps to maintain a high water table by not letting water drain downwards.

4.1.9 When peat is disturbed or translocated artificially it is prone to drying because of its fragmentation which lets the water drain away and prevents it from accumulating. The water can flow through fragments down and horizontally, if allowed to. To create conditions suitable for wet bog restoration, the reinstated peat needs to be kept wet, otherwise, the vegetation will dry out, the peat will shrink and crack, and will ultimately be eroded by water and wind. Which will make the restoration unsuccessful and is likely to create problems such as peat floods and water pollution.

4.1.10 The main principle of keeping the water close to the reinstated surface (maintenance of high water table) is to use natural and artificial enclosures to slow down the horizontal flow of water. For the enclosure to work, the peat surface needs to be flush with or only slightly (<0.3m) above the level of adjacent land (to allow for settlement). This will be achieved with the help of the results of topographic survey carried out as a part of the GI, informing about the differences in surface levels between the areas to be infilled and adjacent land. If the level of translocated peat is substantially higher (>0.5m) above the adjacent, undisturbed peat or the side of the enclosure (e.g. a bund), then it would be at high risk of drying out and being easily eroded as the water will not be held effectively by the peat alone, it will naturally flow sideways. Details of how the above principle will be executed in practice are provided for each of specific reinstatement areas in relevant paragraphs of Section 5.

4.1.11 Consideration will also be given to the impacts of excess water gathering in any areas where peat is used in reinstatement, where saturation of peat with water (although desired), if excessive, may increase the risk of peat liquefaction, leading to subsequent bog bursts and peat overflow. The reinstated peat may also be prone to buoyancy, which may increase the risk of peat slide. These effects will be addressed through appropriate gully dam and bunds design within the areas of targeted infilling, and design of the borrow pit overburden mounds. The main solution for this will be the use of compost filter socks[4]. The concept of this solution is shown in Figure 3.6.1.5. It functions through allowing the water to filter through when it reaches the top of the impermeable bund, therefore not allowing for peat to swell and overflow.

4.1.12 Attention to the correct placement of peat, without voids and no vegetation placed at depth, will be needed to ensure that hydrological continuity is maintained, thus preventing preferential subsurface flow paths (for instance within backfilled cable

[4] See for example: http://www.filtrexx.com/en

trenches) or at the interface between the reinstated peat and the underlying mineral subsoil. Measures to address these risks have been included in the general principles outlined in paragraphs 4.2.1–4.2.4.

4.1.13 Temporary peat storage (see Section 4.3) will be defined on peat translocation plans and placed in accordance with the findings of the GI (see paragraph 1.3.14). Most peat to be used in the restoration of borrow pits will inevitably have to be double-handled, whereas, peat used in targeted infilling will be translocated directly from the place of excavation to the receptor area, without temporary storage.

4.1.14 Damage to existing bog vegetation will be minimised through adherence to the following procedures:

- Defined construction footprint, within which all construction related activity will take place.
- Use of temporary working surfaces (bog mats) where this cannot be avoided.
- Excavating only the minimum depth and extent of peat required for any given element of the infrastructure.
- Use of non-vegetated (bare peat, rock, or mineral subsoil) areas for temporary storage and excluding construction traffic from any vegetated surface demarcated on peat translocation plan (paragraph 4.1.7) and on the ground under supervision of the ECoW.
- Peat will not be spread on adjacent land to avoid smothering of existing vegetation.

4.1.15 All the works will incorporate the mitigation measures identified in Chapter 15 of the ES (Hydrology and Hydrogeology) to maintain existing peatland hydrology, in particular:

- Use of crushed stone (angular rock) aggregate for the construction of access tracks and hardstanding areas to maintain (slightly restricted) lateral flow of water and hydraulic connectivity of areas separated by the tracks. This will ensure that the tracks do not act as impermeable dams, which could result in drying out of the areas located downslope of them.
- Regular inspection and cleaning of drains, and infilling of pot holes on the track surface to reduce the potential for sediment mobilisation and washing off to watercourses.

- Limiting excavations to those that are only absolutely necessary, further avoiding deep peat through micrositing where possible.
- Excluding traffic from vegetated areas, thus maintaining existing rainwater interception, evaporation, and runoff rates.
- Following relevant guidance and codes of practice to limit the potential for disturbance or contamination of water resources as specified in Table 15.11 and referred to in the OCEMP.
- Use of compost filter socks in construction of the lower boundaries of the borrow pits and the subsoil bunds where artificial containment of the peat may be required (as per concept shown in Figure 3.6.1.5), including temporary storage areas.

4.1.16 Peat will not be used to create bunds around infrastructure, shoulders on tracks or floating roads.

4.2 Excavation

4.2.1 Prior to any excavations, the Principal Contractor will produce a detailed Method Statement identifying where and how excavated peat will be used in reinstatement works to minimise double-handling of peat (a detailed peat translocation plan will be prepared as per paragraph 4.1.7). Classification of excavated materials will depend on the re-use of peat in reinstatement works. Within the Site, the material excavated is likely to comprise peat (sub-divided into acrotelm turves and catotelm) and mineral subsoil. The GI will provide the detailed properties of peat present in different locations within the site, informing their suitability for restoration which will in turn inform the peat translocation plan.

4.2.2 Areas of peat within the development footprint will have the surface horizon (acrotelm), with vegetation, stripped off as turves using a low ground pressure (tracked), long-reach 360^{o} excavator (or similar). The turves will be a minimum of 0.3m in depth and where practical excavation of turves up to 0.5m, should they be suitable for the receptor area, may provide additional benefit of larger and stronger intact segments. While it will depend on the machinery used by the contractor, the general sequence of work will comprise cutting out of the turves and placing them in the receptor area, transportation container, e.g. a dumper/tipper truck (in case of longer distance translocation), or temporary storage (if called for by the translocation plan).

During transport the acrotelm turves will only be stacked in two layers maximum with the vegetated side upwards, using a suitable geomembrane to separate them.

4.2.3 The underlying catotelm peat will be removed and stored (if temporary storage is required, and only for the peat used to restore the borrow pits) separately to avoid mixing with the acrotelm; the successful use of the acrotelm turves requires:

> *Separate storage of the acrotelm is a potentially significant means of encouraging the rapid regeneration of peatland vegetation across areas of exposed peat. This is because it contains viable propagules in the form of living plants, seeds, bulbs/bulbils and rhizome fragments etc. and because it will retain a degree of function as an appropriate substrate for their regeneration or germination.*
>
> (SEPA, 2011)[i]

4.2.4 The removal of catotelm may require several sections to be lifted in any one area, the number of which will depend on the depth of each lift and depth that the horizon extends to. Loose peat will be temporarily stored in windrows, either within worked out areas of the borrow pits, or adjacent to the construction compound, where there is little or no viable peat habitat present. Care will be taken not to mix the catotelmic peat with underlying mineral substrate (e.g. boulder clay). Avoiding mixing with the underlying mineral substrate is important for successful restoration of the habitat because it maintains acidic, nutrient poor conditions:

> *The inclusion of a mineral fraction may alter the nutrient status and drainage characteristics of the peat and this may ultimately favour the colonisation of inappropriate or 'weedy' species, especially if small islands of mineral substrate are left exposed within the spoil. Although these 'weeds' may well be overwhelmed in time by the peatland species, this is dependent upon appropriate management of the peat spoil environment and if this is not the case, then the 'weed' species will have gained a foothold that will facilitate their further spread.*
>
> (SEPA, 2011)[i]

4.2.5 Peat rehabilitation will follow the reverse order with catotelm placed first (to form to lower peat horizon) and acrotelm placed as the upper peat horizon. Turves will be placed close to one another, slightly butted together to avoid bare peat sections. Protruding edges will then be levelled, ensuring that a high proportion of the

vegetation (present on top of the acrotelm turves) forms a continuous surface. Loose peat from temporary windrow storage will be used to fill gaps between turves and fill edges of the receptor area.

4.3 Temporary Storage (peat used in reinstatement of borrow pits only)

4.3.1 A small proportion of excavated peat will be stored on Site. Temporary storage will be required to hold excess peat which cannot be moved to receptor areas directly. This will be used for reinstatement of the borrow pits only. In particular, peat used for the targeted infilling (see Section 5.6 for details of this technique) will not be double-handled.

4.3.2 Suitable temporary storage areas are more appropriately sited in areas with lower ecological value, low gradient slopes, to minimise the potential risk of peat slide, such as some of the potential targeted infilling areas identified in Figure 3.6.1.7. Storage locations would be agreed with the ECoW prior to the commencement of the construction phase and provided on the peat translocation plan (prepared as per paragraph 4.1.7) to accompany the PRMP and the CMS. The CMS will describe any intended drainage, pollution prevention and material stability mitigation measures that may be required.

4.3.3 When storing peat, the peat profile will be maintained by storing acrotelm turves and catotelm separately (see paragraph 4.2.3). The excavated turves will be placed, rather than tipped loose, to preserve their structural integrity. Peat stores will be bunded using impermeable material (most likely clayey mineral soils, e.g. boulder clay, sourced from non-peat soil turbine excavations). The bunds will ensure that the peat is kept wet by preventing water from draining away from the storage. Overspill protection will be provided using compost filter socks (see paragraph 4.1.11) Mixing of the bund material with peat will be avoided as explained in paragraph 4.2.4.

4.3.4 Excavated materials will not be located within 70m of any watercourse unless otherwise agreed with the ECoW. This is an additional environmental safety measure to ensure that should the storage containment fail, any slurry from stored peat does not run off and discharge into adjacent watercourses. Any edges of cut peat that may remain exposed, or areas of peat excavation on steep slopes, will be stabilised using geotextile, such as geojute and seeded with a nurse crop (see paragraph 4.4.2), to reduce risk of erosion.

4.4 Bare Peat

4.4.1 The period of time when bare peat surfaces are exposed will be minimised. The phasing of work will be carried out so as to reduce the amount of total exposed ground at any one time. By excavating complete acrotelm turves and replacing as soon as possible after catotelmic peat (if applicable) has been re-distributed the areas of exposed bare peat will be minimised. Any areas of bare peat restored as a part of the targeted infilling (see Section 5.6 for details of this technique) will be covered with acrotelm turves. The restored areas will be fenced and monitored (see Section 5.7).

4.4.2 Where vegetation is not re-growing the area will be seeded with a nurse crop. The species mixture will be specified in the final PRMP and confirmed with SNH (see paragraph 1.3.16), and may include lowland species to encourage early establishment, using species and cultivars that are generally alien to the peatland habitats, and therefore are unlikely to hybridise with native species or persist during the term of the HMP[vii]. The purpose of the nurse crop is to stabilise the peat and to provide a micro-climate for the seedlings of mire species to establish.

4.4.3 On sloping ground near the infrastructure, which will not be suitable for placement of acrotelm turves, bare peat may need to be covered with biodegradable geojute mesh (a type of geotextile). The geojute will be laid on the peat and pegged into position. The area will be seeded with nurse crop, with a small dose of lime and fertiliser to aid its establishment.

5 REINSTATEMENT OF SPECIFIC AREAS

5.1 Cut and Fill Access Tracks

5.1.1 When constructing tracks, the restoration of track verges will be undertaken as track construction progresses. Following construction of the section of access track, turves will be replaced along the road edges to allow quicker re-vegetation and soften visual landscaping of the road edges. Acrotelm turves will be used for this purpose, this will be done in a manner to ensure works tie in with the surrounding topography, landscape and ground conditions, and only where this is required. The width of the reinstated verges will be kept to a minimum (it is envisaged that up to 2m width will be required to cover disturbed surface on the side of the track).

5.1.2 To ensure successful restoration, track sides will be shaped so as to form a part of the drainage system, so that the water preferentially gathers on the reinstated turves on the sides of the tracks. Following the general principle of keeping the peat wet, the

verges will not protrude above the surface of the track and adjacent land. This will also ensure that the water does not preferentially gather on the track, leading to erosion of its running surface. The turves will only be placed where the longitudinal track gradient does not exceed 5° to ensure their long term stability. The works will also conform to the principles described in paragraphs 4.1.4–4.1.7, to ensure that existing bog vegetation is not damaged.

5.1.3 In particular, the design and construction of tracks on peat will prioritise the reduction of impacts on and the maintenance of the existing peat hydrology at the site. This will be achieved through construction of water crossings (see Chapter 15 of the SE, Hydrology and Hydrogeology) and constructing the access tracks from permeable aggregate (compacted stone) so that they will not disrupt the lateral flow of water, thus maintaining the hydraulic connectivity of the peatland. At the same time, where restriction in the lateral flow of water is required, like at the boundaries of targeted infilling areas (see Section 5.6), the sides of the track can be lined with slowly permeably surface, such as the clayey mineral till underlying peat at the Site.

5.1.4 It is estimated that a maximum of 82,170m^3 of peat will be excavated during construction of the tracks. This is a 'worst-case' scenario as it assumes that floating road construction will not be possible. As the area of excavation will be wider than the tracks running surface and the fill, some of the peat will be reinstated in situ. It is estimated that, on average, there will be a 2m wide strip of land each side of the track (see Figure 3.10). The acrotelm turves, from the 0.3m top layer, will be used for that purpose.

5.1.5 It is estimated that the reinstatement area will be 1.3ha in total and that 3,774m^3 of acrotelm peat will be used. The reinstatement will be carried out progressively with acrotelm turves excavated from other areas placed directly on the sides of the tracks. This will take place everywhere where the cut tracks pass through peat. The peat displaced by the track fill material will be used in the restoration of the borrow pits and targeted infilling. See Photograph 2 for an example of the difference between poor and good practice of track verge reinstatement.

Photograph 2 Poor (left) and good (right) reinstatement of track verges (Scottish Renewables et al. 2015)

5.2 Turbine Foundations and Hardstandings

5.2.1 Some catotelmic peat (depending on the target depth of reinstated peat) will be replaced around the turbine base excavations, and re-turfed with acrotelm. Peat will be placed into any areas disturbed by the construction activities, around the crane hardstandings, rotor assembly hardstandings and other areas used in the construction phase. The majority of the excavated peat from those areas not used in situ will be reused for the purpose of borrow pit restoration and targeted infilling.

5.3 Borrow Pits

5.3.1 After the construction there will be a requirement to restore the borrow pits. In general, the borrow pit voids will provide bowl-shaped enclosures that will be conducive to maintenance of water levels close to the reinstated surface, and thus prevent the peat from drying out. The placement of acrotelm turves on the surface will also prevent the underlying catotelmic peat from drying. The presence of the water table near the surface will be favourable for peat forming vegetation, such as sphagnum mosses. Therefore, these conditions will be favourable for the eventual restoration of an active wet blanket bog habitat, which will maintain and increase existing carbon stores (see Section 1.4 for the ecological benefits of restoration to this habitat). The area around the void, the overburden mound, scree slope and benches will be restored using 0.5m of peat (on average, comprising 0.3m acrotelm and 0.2m catotelm, transferred as entire vegetated blocks). Parts of the rock faces and benches created as a result of rock extraction will be left bare to provide suitable place for

colonisation by upland heat species, such as woolly hair moss (*Racomitrium lanuginosum*), thus increasing biodiversity.

5.3.2 This borrow pit restoration concept follows the examples cited in the Scottish Renewables and SEPA Guidance (2012)[vi]:

> *This borrow pit's design allowed unconsolidated peat to be used at depths of up to 2-3m to create a wetland habitat in line with habitat management plan objectives for the site. In this case the borrow pit was excavated downslope and the downslope worked face acted to retain high water levels within the restored area thus preventing peat drying out. Acrotelmic material (turves) was used where available on the surface and vegetation regrowth is observed to be progressing towards natural conditions in early years post construction (in this case <2 years).*

5.3.3 Borrow pit reinstatement designs will be confirmed upon results of the detailed GI, these details will be included in the final PRMP (see Section 1.1.1). The four subsections below provide descriptions of the reinstatement concepts for each of the borrow pits. The general principles for restoration of the borrow pits are similar, however the details will depend on post consent GI to develop the final design and restoration plans, taking account of the volume of required and available construction aggregate. Therefore, the restoration of borrow pit 1, has been considered in more detail than for the other borrow pits.

5.3.4 The target reinstatement depth of all of the borrow pits will be up to 2m, the target peat profile will consist of 0.3m of acrotelm turves and 1.7m of catotelm. The design requirement for rehabilitated peat depth of 2m depth includes:

- The depth of 2m is the maximum considered acceptable for the restoration of borrow pits[i].
- There are numerous examples of successful restoration of borrow pits using similar or greater peat depths[i, vi].
- Due to the shape of the voids remaining after rock extraction, use of up <2m of peat will be needed for the reinstated surface to match the level of adjacent land (see proposed borrow pit cross-sections in Figures 3.6.1.1–3.6.1.4)
- The voids have been designed to maintain both the level of the water table at approximately 2m and to ensure long term peat stability (level, enclosed surface).

- Even in case of BP1, where current surrounding peat depths are relatively shallow (<1m), there is evidence that the original peat depths were greater than those currently measured, and therefore the use of <2m peat depth would seek to recreate conditions suitable for active peat formation.
- For other borrow pits the current peat depths also vary but depths <2m are either present within or in the direct vicinity of the proposed borrow pits footprint.

Borrow Pit 1 (BP1)

5.3.5 BP1 will be the first construction activity that will involve peat excavation, as the aggregate quarried from here will be used in the construction for access track A001 (see Figure 3.1 of the ES). The amounts of peat excavated from the borrow pit footprint will be approximately 5,590m^3, which is relatively small due to the high level of degradation that has taken place within and adjacent to the footprint of the borrow pit, including peat cutting and overgrazing which has resulted in peat wastage and presence of bare ground. Peat removed in advance of establishing the footprint of the borrow pit will be used for targeted infilling (see Section 5.6 for details of this technique) within nearby areas affected by a range of anthropogenic activities and on the verges of access track A001 (see Section 5.1).

5.3.6 It is anticipated (subject to detailed peat translocation plan, see paragraph 4.1.7) that BP1 will be restored within the first 3–6 months of the construction programme. The calculated reinstatement volume used in the borrow pit void is 11,800m^3 and the proposed reinstatement depth is up to 2m. The target peat profile within the borrow pit void will be formed by a lower horizon of up to 1.7m of catotelm peat and 0.3m of acrotelm with vegetation. The scree slope, benches, overburden mound, and the perimeter of the borrow pit will be restored using 0.5m of peat (on average) comprising 0.3m acrotelm and 0.2m of catotelm (complete 0.5m blocks will be used if possible).

5.3.7 As illustrated in Figure 3.6.1.1 (see Phase 3 – Restoration, and cross sections A-A and B-B), additional microhabitats and habitat boundaries will comprise:

- Restoration of the borrow pit edges and overburden mound with a layer of acrotelm turves.
- Rock scree and benches which will be reinstated using acrotelm turves, some of which will be left exposed to provide habitat for species such as woolly hair moss.

5.3.8 Details of the outline restoration are illustrated in Figure 3.6.1.1 (see Phase 3 - Restoration), the drawing shows that the final landform naturally transitions via the rock face and restored overburden mound into the surrounding area. The wet modified bog habitat will be an addition to the existing remaining pockets of blanket bog habitats located west and north, but not connected to the restored habitat within the borrow pit. As a consequence, this will extend the mosaic of this priority habitat, providing the ecological enhancement identified in the aims and objectives of the OHMP. The long-term success of the restored wet bog habitat in BP1 will also be supported by wind-blown seed coming from those nearby wet bog areas.

5.3.9 On the floor of the borrow pit, along the open edge of the excavation, a bund will be constructed (see paragraph 4.3.2 for details) prior to working the borrow pit, in order to screen the quarry operations behind. After peat reinstatement the bund will be closed to the sides of the excavation (as shown in Figure 3.6.1.1, Phase 3 - Restoration). The bund will be extended sideways after the reinstatement to provide complete enclosure for the peat, keeping the water table close to its surface and preventing any movement outside. Those extended sections will contain permeable compost filter socks (Filtrexx or equivalent) at the top (see Figure 3.6.1.5). Filter socks are highly permeable to water, at the same time they provide sediment and dissolved substance filtration potential. They will regulate water table level in the borrow pit by allowing the water to flow through if it reaches the top of the overburden mound, thus preventing the water table rising higher, which could lead to peat overflowing. Where the filter socks are used, they will be covered with vegetation (seeds can be incorporated into the compost fill mix) and naturally blend into the surface.

Borrow Pit 2 (BP2)

5.3.10 Aggregate from BP2 will be required for the construction of turbine foundations and hardstanding areas. BP2 will be restored to a wet modified bog habitat, similar to BP1. It is anticipated (subject to detailed peat translocation plan, see paragraph 4.3.1) that BP2 will be progressively restored within the first 12 months of the construction programme. Within the footprint of BP2, existing peat is known to be <1.7m, in depth, with remains of deeper peat (<2m) present south east of BP2, the depths tend to be shallower upslope, in north-west direction (see Figure 12.2). Therefore, the restoration target peat depth of <2m deep layer of peat is in keeping with surrounding peatland. The target peat profile within the borrow pit void will be formed by a lower horizon of up to 1.7m of catotelm peat and 0.3m of acrotelm with vegetation. The

scree slope, benches, overburden mound, and the perimeter of the borrow pit will be restored using 0.5m of peat (on average) comprising 0.3m acrotelm and 0.2m of catotelm (complete 0.5m blocks will be used if possible).

5.3.11 The indicative plans and cross sections of the working and restoration of BP2 are shown in Figure 3.6.1.2, they follow the concept described for BP1, above. The target restored habitat is also a wet modified bog, which will link with the target restored wet modified bog south east (this is currently an area of dry modified bog due to overgrazing and erosion), extending towards Burn of Evrawater, connecting with the larger wet bog area east of Burn of Evrawater, thus re-establishing and extending westward the presence of this priority habitat.

Borrow Pit 3 (BP3)

5.3.12 BP3 is the largest and most central borrow pit of the Proposed Development with an expected reinstatement volume of up to 46,820m^3 to a maximum depth of <2m. BP3 has the potential to be restored to a wet modified bog (which is its current habitat). BP3 will be used throughout construction and reinstated at the end of it (after approximately 24 months). The current peat depths for the area surrounding BP3 are given in Figure 12.2, they are between approximately 1 and 2.5m. The depth of reinstated peat will be up to 2m (lower peat horizon of 1.7m of catotelm and upper horizon of 0.3m of acrotelm with vegetation), as shown in Figure 3.6.1.3. The scree slope, benches, overburden mound, and the perimeter of the borrow pit will be restored using 0.5m of peat (on average) comprising 0.3m acrotelm and 0.2m of catotelm (complete 0.5m blocks will be used if possible).

Borrow Pit 4 (BP4)

5.3.13 BP4 aggregate is likely to be used from the beginning of construction as this location is immediately accessible from the Burravoe–Gossabrough section of the B9081. BP4 will be used throughout construction and will be the last of the borrow pits to be reinstated. Similar to BP1 the area within which BP4 is situated is characterised by high levels of degradation evident by bare ground and an abrupt transition to the neighbouring unmodified blanket bog habitat of comparably higher conservation value to the east. As a consequence of degradation the volumes excavated from this area are relatively small (up to 8,130m^3). The target peat profile within the borrow pit void will be formed by a lower horizon of up to 1.7m of catotelm peat and 0.3m of acrotelm with vegetation. The scree slope, benches, overburden mound, and the

perimeter of the borrow pit will be restored using 0.5m of peat (on average) comprising 0.3m acrotelm and 0.2m of catotelm (complete 0.5m blocks will be used if possible). The restoration will follow the principles described for BP1 as shown in Figure 3.6.1.4.

5.4 Site compound

5.4.1 The site compound and the surrounding area are generally characterised by a large extent of bare peat with isolated islands of peat over 0.5m and up to 1.5m deep (relative to the surrounding surface), which will be subject to restoration by targeted infilling (described in Section 5.6). The site compound area alone is relatively small (0.4ha). The area to be restored will be a part of the compound footprint that will become redundant after the construction (only a small part of the compound will remain functional for the operation of the wind farm). Some internal bunds may need to be constructed using mineral soil to allow for an average of 1m reinstated peat depth, linking remaining deeper peat rafts. This is necessary where the microtopography, historic peat cutting faces, and the infrastructure do not form enclosures to stabilise the reinstated catotelm and acrotelm turves. The bunds will maintain the water table close to reinstated surface, whilst at the same time allowing for controlled drainage.

5.4.2 The bunds will follow the same concept as the borrow pit overburden mounds (see Figure 3.6.1.5), although they will be only up to 1m high. The restored part of site compound, together with adjacent areas of the targeted infilling, will form a larger extent of restored wet bog, enclosed by the road from the east and the main track from the south. This will result in a large area of improved habitat replacing bare ground and saving the remains of deeper peat (peat islands) from complete disintegration (see Section 5.6 for details of the targeted infilling technique which will be used in the area surrounding the compound). The ecological benefits of wet blanket bog restoration are considered in Section 1.4.

5.5 Gully/Drain Blocking

5.5.1 The formation of peat deposits is reliant on a high water table, whether temporary or permanent, because otherwise dead plant tissues would decompose and most of the carbon would be released back to the atmosphere as carbon dioxide. The existing erosion features identified across the whole of the Site (for example gullies, as shown in Photograph 3 and grips) will promote dewatering of upslope peat, accelerating its

degradation. The drying of peat is not desired because it alters plant species composition and leads to peat wasting due to its exposure to air. This condition has to be rectified in order to allow peat bog restoration to take place, whether it is through natural revegetation or where peat will be translocated. The water table must be raised, so that the peat becomes more consistently waterlogged, thus creating wet conditions required for Sphagnum regeneration, protecting existing carbon stored in peat against oxidation, and enabling further carbon sequestration to take place again, once the peat forming vegetation dominates again (the ecological benefits of blanket bog restorations are considered in Section 1.4).

5.5.2 To help to raise the water table, a small proportion of peat excavated during construction (450m^3) will be used for the purpose of building dams across gullies and grips present near the infrastructure and the targeted infilling areas. Where suitable, peat will also be placed behind dams (infilling sections of the grips/gullies). SEPA guidance[vi] provides examples of such practices, including blocking of wider ditches and placement of peat behind the dams:

> *In some circumstances (and provided the conditions are appropriate, risks have been assessed and the nature of the peat material used is suitable) it may be beneficial to place peat behind such dams in order to speed up the restoration process and associated vegetation regeneration.*

Photograph 3 Example of a gully at the Site suitable for blocking using peat dams

5.5.3 The water table will be restored and maintained via blocking using a combination of peat dams (for gullies and ditches up to 1.5 wide and 1.2m deep[viii]), supported with plastic sheets where needed, stone, and timber dams (for wider and deeper gullies). For very wide gullies, where damming is not recommended, the reprofiling of haggs on the banks will be carried out to stop the erosion and encourage complete revegetation. There are a number of constraints that will be taken into account when selecting the dam material which include: slope, drain size and exposure of mineral substrate.

5.5.4 Dams will not be placed in areas of substantial peat slide risk, and generally will be in areas of almost flat land (gradient up to 3°). They will be made of highly humified (decomposed) wet catotelmic peat and compacted. The tops of the dams will be covered with acrotelm turves and will rise approximately 0.3–0.5m above the surface when placed. The dam will be keyed into the bottom and sides of the gully or grip, and the top of it will extend into sideway swales to divert the water back into the peatland. Photograph 4 shows an example of a gully restoration on a blanket bog using peat and plastic piling dams to slow down the flow of water and raise the water table, the difference between how this will be carried out within the Site and the one shown in the photograph is that, where suitable, the gullies will be subject to targeted infilling as well (see Section 5.6).

Photograph 4 Series of bunds and dams in a gully (from gully blocking undertaken in East Ayrshire, 2008)

5.5.5 Choice of the dam structure for a particular gully and dam construction will be based on specifications provided by SNH[viii] and Yorkshire Peat Partnership[ix], or other good

practice guidance available at the time the wind farm is constructed. The currently available specification provides a sound, evidence based guide to dam construction, however the specific conditions on Yell, such as high rates of rainfall, and thus, high rates of runoff, will result in specific tailoring or modifications of the design to suit local conditions. In addition, high degradation levels may require specific measures to ensure stability of the gully dams. These locally specific measures will be detailed in the final PRMP, in consultation Shetland Islands Council, SNH and SEPA.

5.6 Targeted infilling

5.6.1 Approximately 3.5ha of bare peat areas within the Site will be restored using up to 52,500m^3 of peat. The volumes of reinstated peat, and conversely, its depths, are based on "as excavated" volumes (see Table 12.4). The targeted infilling areas, such as that surrounding the site compound will link to the other existing patches of wet bog habitats, extending their size and that way increasing their resilience and ecological value (see Figure 11.3). The increase in resilience of adjacent habitats will not only be provided by the obvious benefit of the greater extent, but also lateral hydrological connection, slowing down the runoff and draining effect of numerous eroded areas to which the water naturally flows. The ecological benefits for restoring the targeted infilling areas to wet blanket bog habitat are considered in Section 1.4.

5.6.2 Although peat translocation is not often employed due to usual lack of surplus peat available for this purpose in peatland restoration projects, it has proved to be successful on other wind farm projects, such as Oswaldtwistle Moor (wind farm)[5]. The Applicant, Peel Wind Farms Yell Ltd[6], has also used peat translocation successfully during construction of the Scout Moor Wind Farm, north of Manchester. Large scale peat excavations have also been adopted on surface coal mines in East Ayrshire and other mineral operations throughout Scotland, for example in extension to Grievehill surface coal mine extension project (carried out in 2008). The methodology adopted for these operations, and outlined in this section, together with evolving good practice in handling peat, will be used to inform policies and procedures in the final PRMP, prepared prior to the construction. Figure 3.6.1.7 shows a larger extent of most suitable potential areas for targeted infilling which amount to 46ha in total (Table 2).

[5] http://www.conservefor.co.uk/case_studies/14
[6] Peel Wind Farms (Yell) Ltd ('PWFY Ltd') is part of Peel Energy Limited.

Exact locations of the targeted infilling will be informed by the GI, post-consent (see Section 1.1.1).

5.6.3 Wider areas of infilling will be concentrated in flat and contained areas, using additional mineral soil bunds where the existing containment (provided by features such as remaining islands of deep peat) or the containment created by the tracks and existing features would be insufficient to secure the peat and maintain high water table. Boulder clay bunds were found to be effective if properly located and not containing deep peat or too large an area (Andrew McBride, SNH, personal communication). As an additional protection against bog burst, compost filter socks will be incorporated into the containment bunds (see Figure 3.6.1.5 for the example of this concept and Figure 3.6.1.6 for the bund location within the targeted infilling area). The bunds will also break the slope (even though areas classified as suitable for targeted infilling are generally flat or inclined up to 3°).

5.6.4 The bunds will also act as water retention and water table control features, holding the water in those locations for longer. In the event that water levels were to reach the top of the bund, the filter socks would permit a controlled release of water across adjacent areas, rather than an uncontrolled release that would be erosive in nature, leading to damage to adjacent habitats. This method will re-establish previously higher groundwater levels, and through that, and provision of the cover using the acrotelm turves, will encourage the revegetation of the degraded peatland (Photograph 5).

Photograph 5 Example of a bund holding peat and water (from gully blocking undertaken in East Ayrshire, 2008)

5.6.5 The bunds or/and plastic piling will be required in suitable targeted infilling (and gully/grip infilling) areas downslope of the tracks and infrastructure. Upslope of the tracks and infrastructure, the primary support and water retention for the area directly adjacent to it will be provided by the infrastructure itself. In case of larger targeted infilling areas the dams/bunds may be required further away.

5.6.6 Climate on Yell is characterised by high rainfall (1250 to 1500mm annually), with over 260 days with some rain, and low temperatures (7–8° annual average) compared to the mainland Scotland[7], and thus, low evapotranspiration rates. From this it is inferred that the period of time before the water table is established near the surface of the reinstated peat will not cause excessive drying, provided that the surface is covered with vegetated acrotelm turves.

Photograph 6 Bare ground (foreground) and peat islands (back) in site compound area

5.6.7 To ensure successful restoration, it will be carried out as a part of the construction programme (progressive handling and reinstatement). Smaller locations will be reinstated first to provide an on-site trial before larger and more demanding areas, such as those surrounding the site compound are reinstated. This will allow for the

[7] http://www.metoffice.gov.uk/public/weather/climate

adjustment of techniques, and reduce the risk of failure. If, as a result of trials, a need for major changes to the techniques used is required, the changes will be agreed in consultation with the Shetland Islands Council, SNH and SEPA. Peat used for targeted infilling will be handled only once. This measure will be secured by the requirement to prepare and follow the peat translocation plan (see paragraph 4.1.7).

5.6.8 The objective of reinstating peat will be to generate a complete cover of acrotelm turves, thus minimising the extent of bare peat, which otherwise would continue to erode and decompose. The final surface will be slightly compacted without making it too smooth. The reinstated micro-topography will be designed to encourage water containment in pools. When placing peat on mineral subsoil the base will be roughened first, using the serrated front edge of the excavator bucket, to reduce the potential for preferential flow of water and lateral movement of peat.

Potential Areas of Targeted Infilling

5.6.9 Potential targeted infilling areas were identified based on the following criteria:

- have slope gradient below 3°;
- contain bare ground and islands of deeper peat;
- are more than 50m away from watercourses; and
- in close proximity to the proposed infrastructure.

5.6.10 Table 2 shows that in total, over 46ha of such areas were identified, through the spatial analysis of the baseline data. Table 1 indicates that the available peat excavated as a consequence of constructing the wind farm, would be sufficient to restore approximately 4.5ha of such areas. Therefore, the application of this technique can be directed at the areas that are most suitable, from the technical feasibility and ecological benefit perspective. Examples of targeted infilling areas are shown in Photographs 7, 8 and 9, and their extent is shown in Plates 1, 2 and 3. The exact location of targeted infilling areas will be identified post-consent, based on the findings of GI, and included in the peat translocation plan (see paragraph 4.1.7) as a part of the final PRMP.

Table 2: Identified Areas of Targeted Infilling		
Area id	Area (ha)	Description
1	1.9	Between substation and T14
2	2.0	South of T14
3	4.2	Site compound
4	1.1	South of the site compound
5	3.8	South of T8
6	0.6	120m from track, west of BP3
7	4.0	North west of substation
8	1.2	North of Evra Water
9	0.7	South of Evra Water, adjacent to A001
10	0.4	South of Evra Water, adjacent to A001
11	0.5	Adjacent to A001, east of BP1
12	0.1	Adjacent to A001, east of BP1
13	0.2	Adjacent to A001, north of BP1
14	2.2	South of BP2
15	1.7	West of T16
16	1.5	South of T16
17	0.5	East T16
18	3.0	East of T15
19	0.4	South of T15
20	0.2	Inside the bend of A001, by T15
21	0.7	North of T15
22	0.7	East of A013
23	0.4	South west of A013
24	1.1	South of Swarta Shun
25	0.4	West of A013
26	0.6	A013
25	0.1	A013
26	3.7	East of Horsewater
27	0.5	East of B9801, south of BP4
28	2.7	West of T12. Unmodified blanket bog, but eroded
29	0.9	Adjacent to T6
30	0.6	South of T4
31	1.1	Near T4
32	1.6	North of T2
33	0.7	East of T3
Total	**46.1**	

Photograph 7 Potential targeted infilling area no. 15

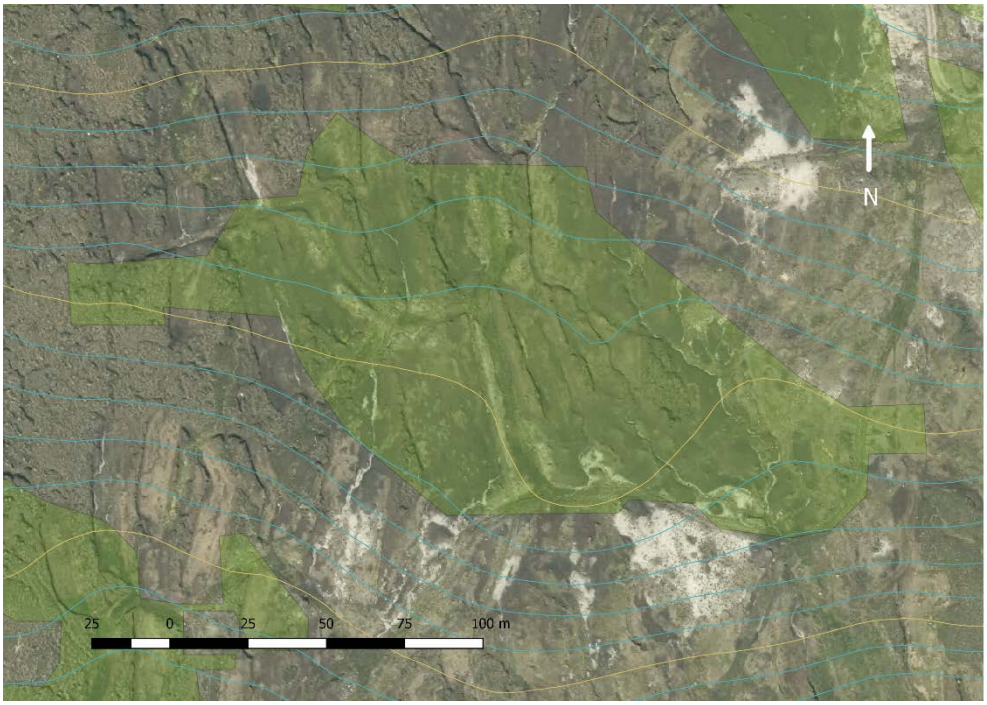
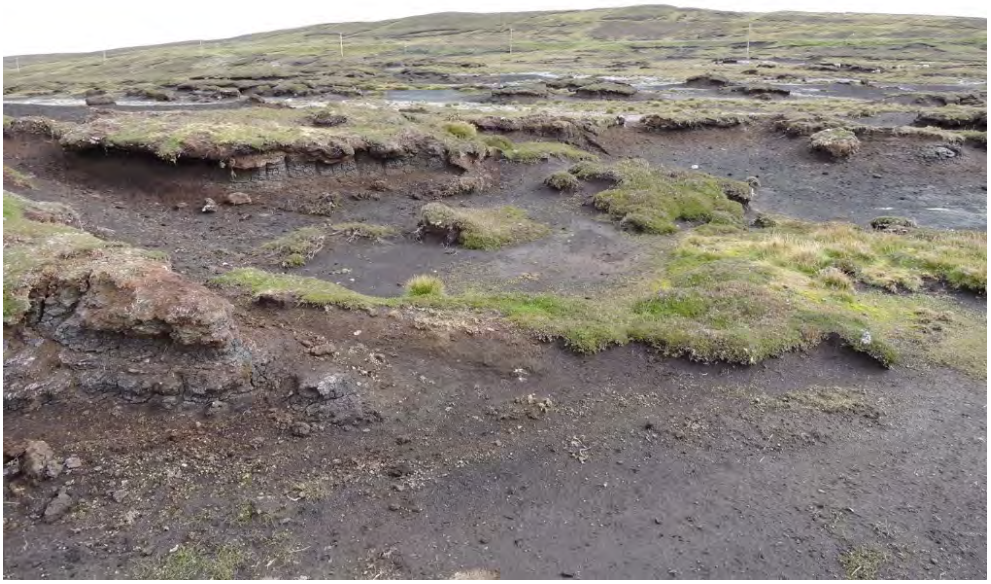


Plate 1 Potential targeted infilling area no. 15



Photograph 8 Potential targeted infilling area no. 3, Moss Houll, towards B9081 road

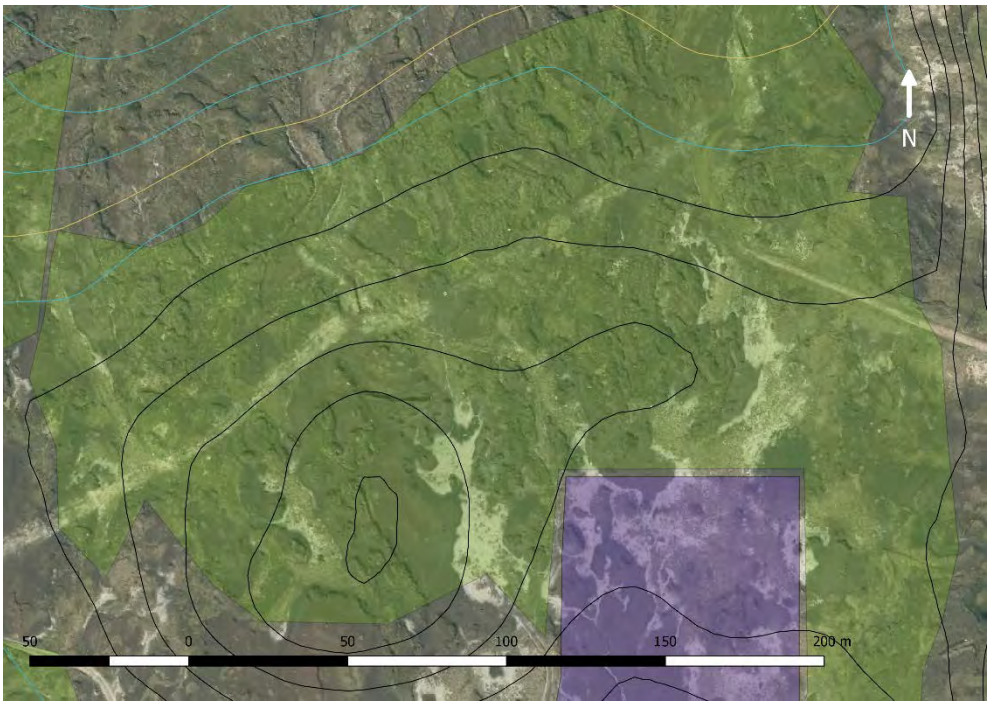


Plate 2 Potential targeted infilling area 3, with site compound (bottom right)

Photograph 9 Potential targeted infilling area no. 1, between the substation and T14

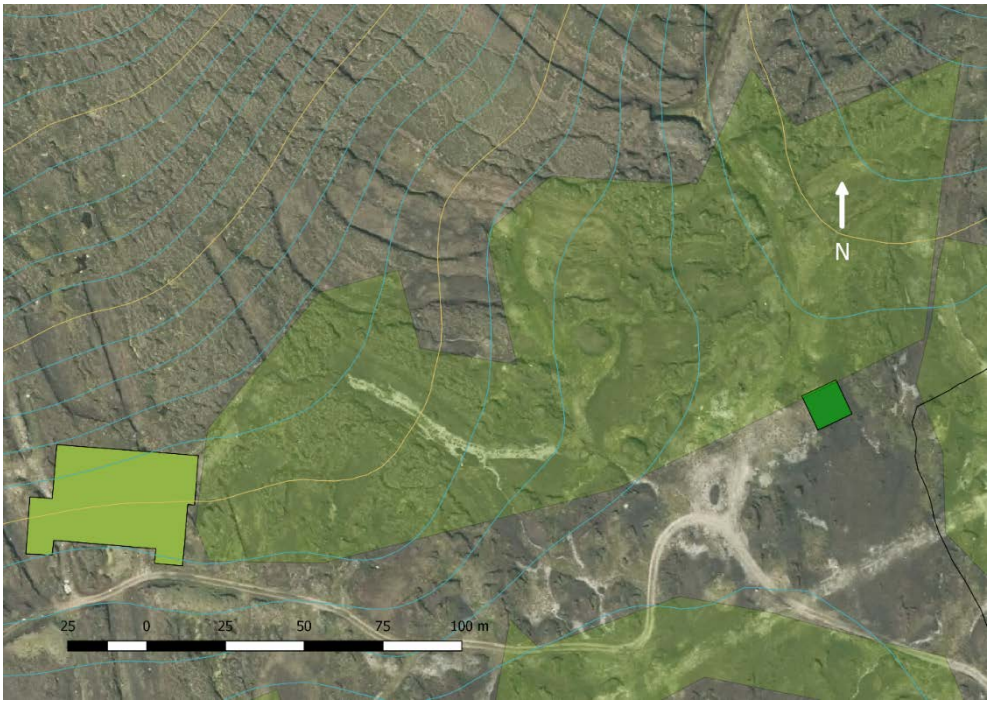


Plate 3 Potential targeted infilling area no. 1, between the substation (left) and T14 (right)

5.7 Monitoring

5.7.1 After reinstatement, the water table and condition of the vegetation will be monitored to inform aftercare management and rectify any unforeseen issues. Peat dams and targeted infilling areas will be monitored for their integrity and peat stability.

5.7.2 To monitor the vegetation fixed quadrats will be set up directly after reinstatement is complete. Location of the quadrats will be marked using ground pegs and their geographical coordinates recorded. Density of the quadrats will be at least 1 per each distinct reinstatement area, and at least 3 per each borrow pit. The condition of the vegetation will be monitored at the end of the construction period. The observations will include the percentage cover of sphagnum and indicator plant species, bare peat and vegetation height. The data will be used to inform aftercare management, as part of the HMP. The species composition of the vegetation will be monitored pre-restoration, and then 1, 2, 3, 5, 10, 15, 20 and 25 years after the restoration (see Table 1 in the OHMP).

5.7.3 Water table levels will be monitored using fixed boreholes within the reinstated areas in at least one location per borrow pit and any larger (greater than 0.25ha) targeted infilling location. Peat depth will be monitored annually in the same locations as the water table to ensure that no rapid decomposition is occurring. The monitoring will be part of the programme outlined in OHMP, and will be agreed with SNH and Shetland Islands Council.

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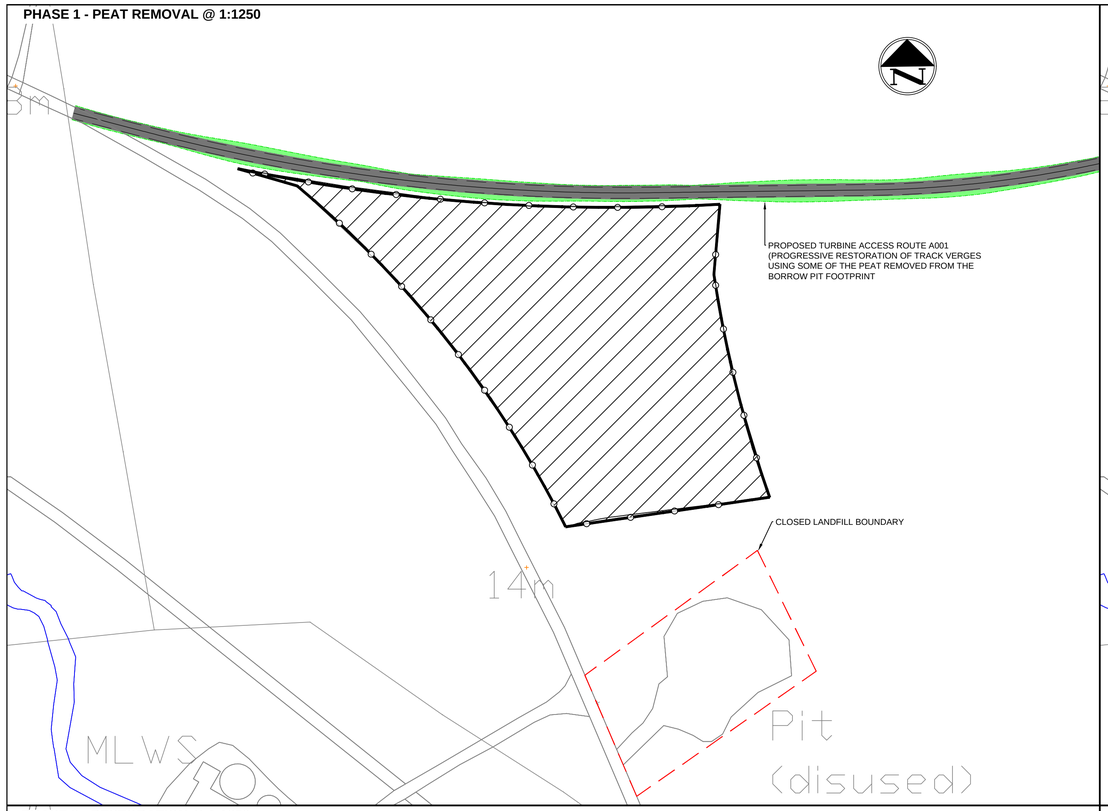
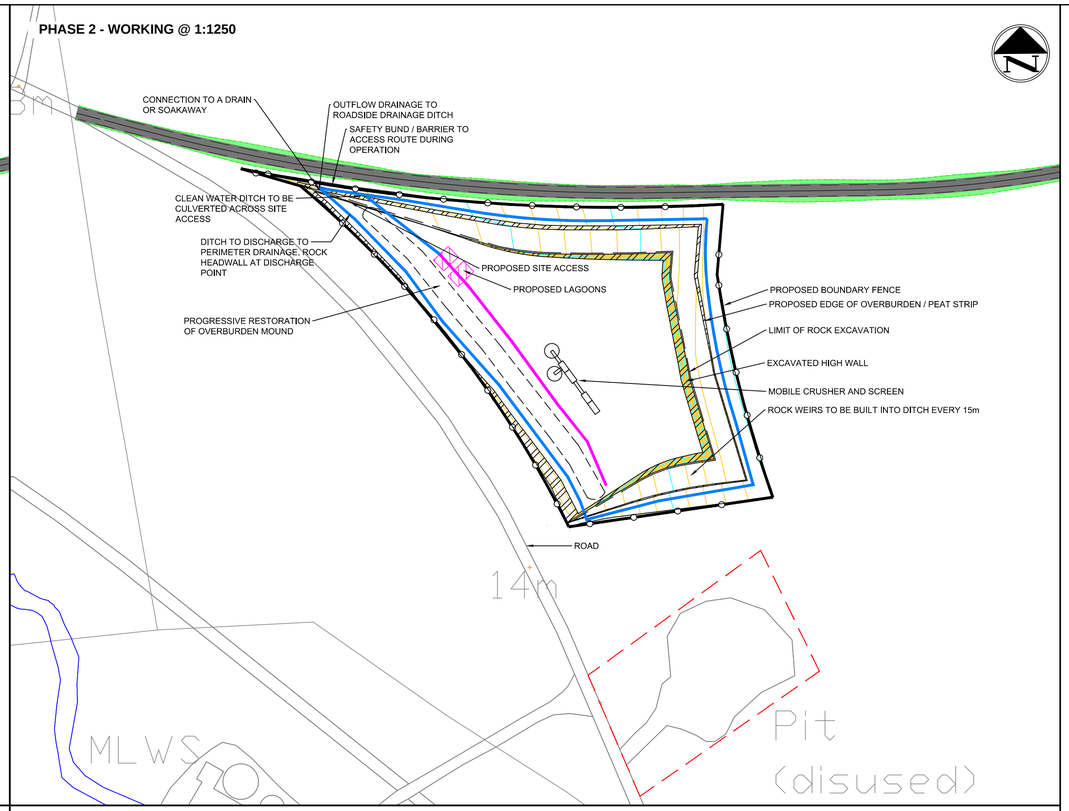
[i] SEPA (2011) Restoration Techniques Using Peat Spoil From Construction Works, Final Report, Prepared by EnviroCentre Ltd.
[ii] UK BAP list of priority habitats, available at: http://jncc.defra.gov.uk/page-5706
[iii] Scottish Natural Heritage (2014) Managing and restoring blanket bog to benefit biodiversity and carbon balance – a scoping study, available at:
http://www.snh.org.uk/pdfs/publications/commissioned_reports/562.pdf
[iv] Scottish Government (2013) 2020 Challenge for Scotland's Biodiversity – A Strategy for the conservation and enhancement of biodiversity in Scotland.
[v] Scottish Renewables, Scottish Natural Heritage, SEPA and Forestry Commission Scotland (2015) Good Practice during Wind Farm Construction.
[vi] Scottish Renewables and SEPA (2012) Guidance on Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste.
[vii] Adamson, H., Gardner, S. (2004) Upland Management Technical Guideline No. 4 Restoration and Management of Blanket Mires, available at:
randd.defra.gov.uk/Document.aspx?Document=BD1234_2432_TRP.doc
[viii] SNH 2015 Peatland Action Guidance for land managers, available at:
http://www.snh.gov.uk/docs/A1268162.pdf
[ix] Yorkshire Peat Partnership 2016 Online technical guidance notes, available at:
http://www.yppartnership.org.uk/restoration/technical-guidance-notes/

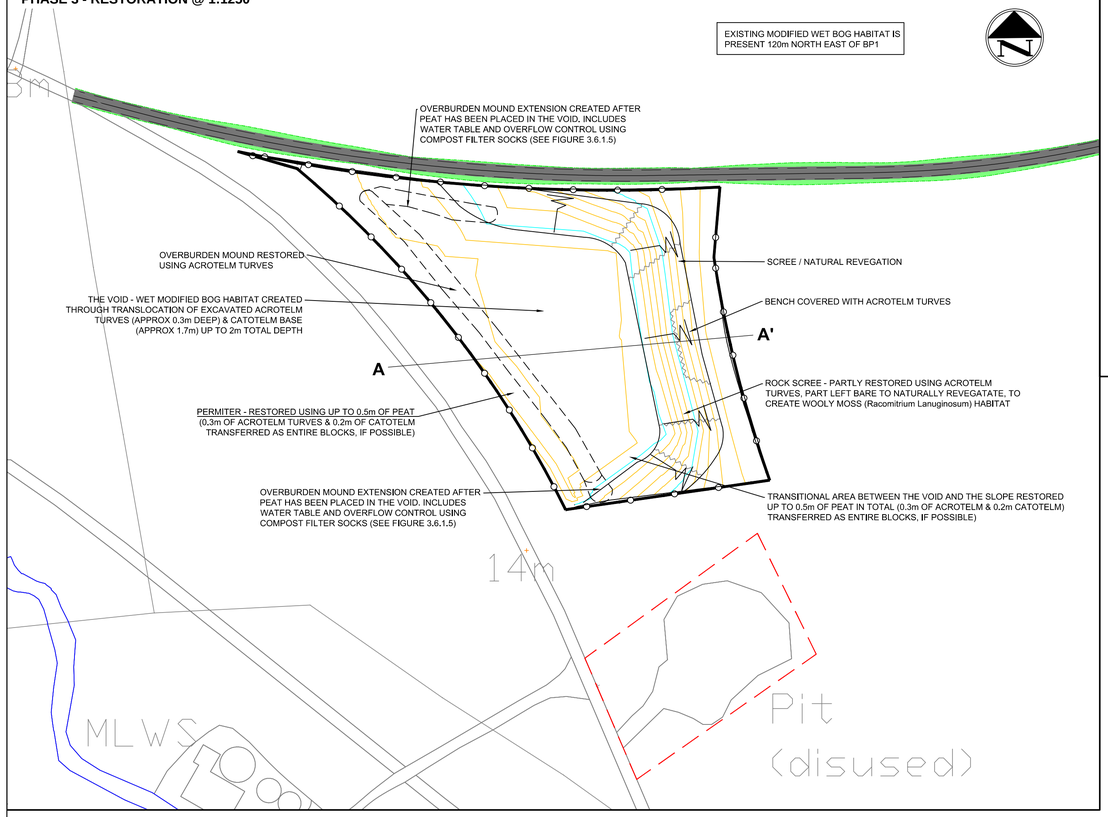
PHASE 1 - PEAT REMOVAL @ 1:1250



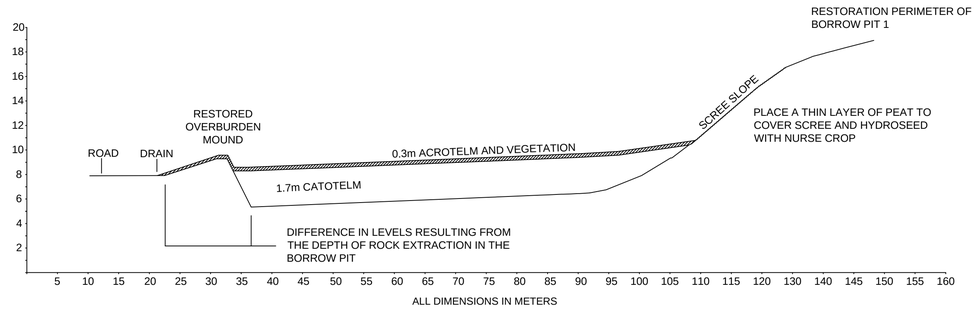
PHASE 2 - WORKING @ 1:1250



PHASE 3 - RESTORATION @ 1:1250



A - A' CROSS SECTION @ 1:500



NOTES

ALL WORKS SHOWN ARE INDICATIVE FOR PLANNING PURPOSES ONLY AND SUBJECT TO DETAILED DESIGN.

SCOUR PROTECTION NEEDED IF VELOCITY EXCEEDS 1 M/S

KEY

- AREA OF PROPOSED PEAT REMOVAL FOR STONE ACCESS
- PROPOSED CONTOURS
- CLEAN WATER DITCH
- DIRTY WATER DITCH
- PERIMETER FENCE

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	DB

CLIENT: Energy

PROJECT: Beaw Field Wind Farm

DRAWING TITLE: FIGURE 3.6.1.1
Borrow Pit 1 Restoration Plan

DRG No	SCALE	DATE
NT12001/Fig 3.6.1.1	As Shown @ A1	27.05.16
DRAWN BY: BCM	CHECKED BY: JO	APPROVED BY: DB

STOKE-ON-TRENT (HEAD OFFICE) TEL 01782 276700
NEWCASTLE UPON TYNE TEL 0191 252 0943
BIRMINGHAM TEL 0121 580 0909
LONDON TEL 020 7287 2872
CARDIFF TEL 029 2072 9191
LEIGH TEL 01942 260101
SHEFFIELD TEL 0114 245 6244
EDINBURGH TEL 0131 555 3311
TAUNTON TEL 01823 703100

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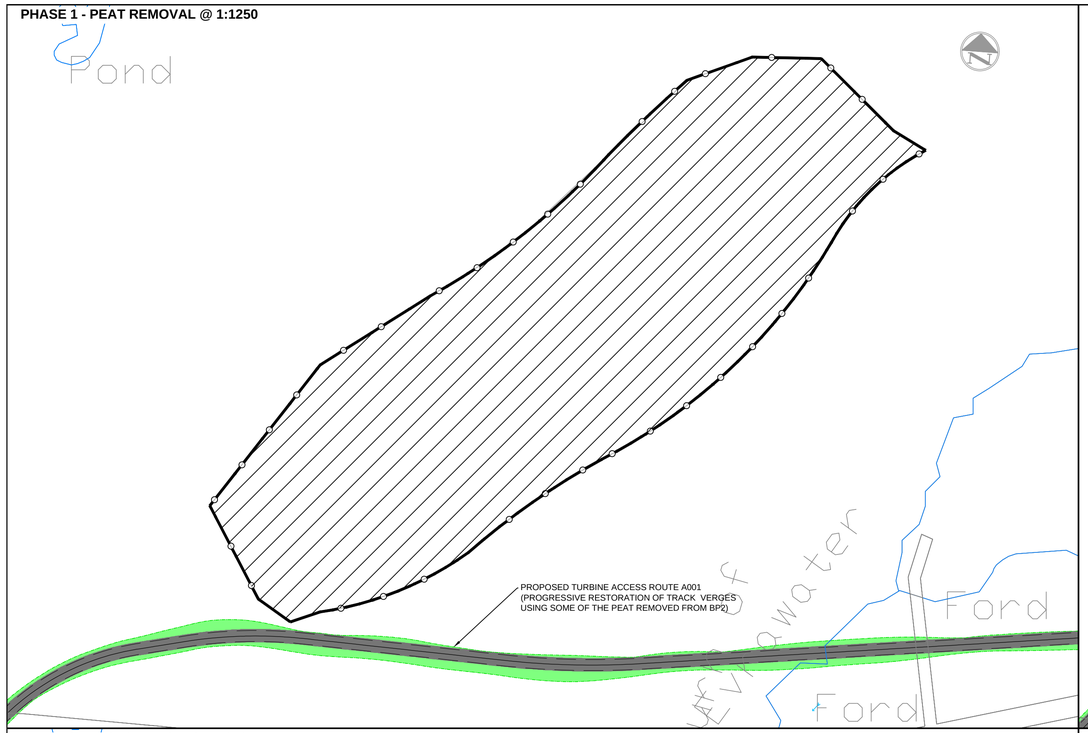
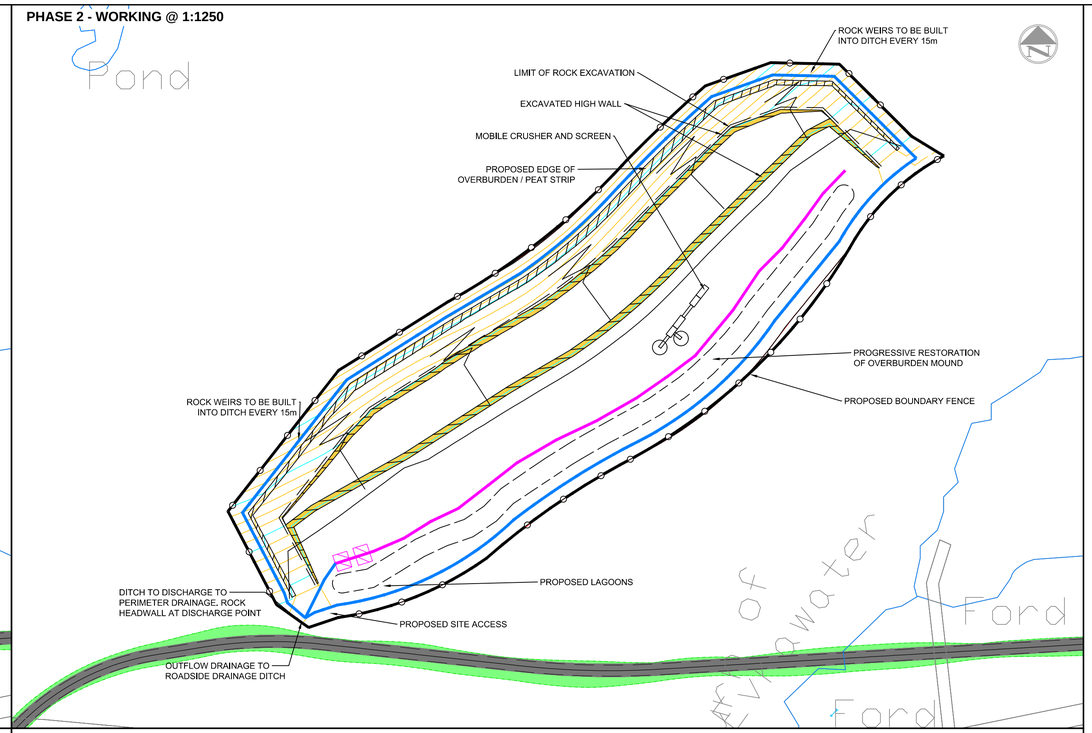
N:\NT\NT12001 – BEAW FIELD WIND FARM – EIA\03 – DESIGN\AUTOCAD\NT12001 FIGURE 3.6.1.1 BORROW PIT RESTORATION PLAN 2016-05-24.DWG

ASMITH

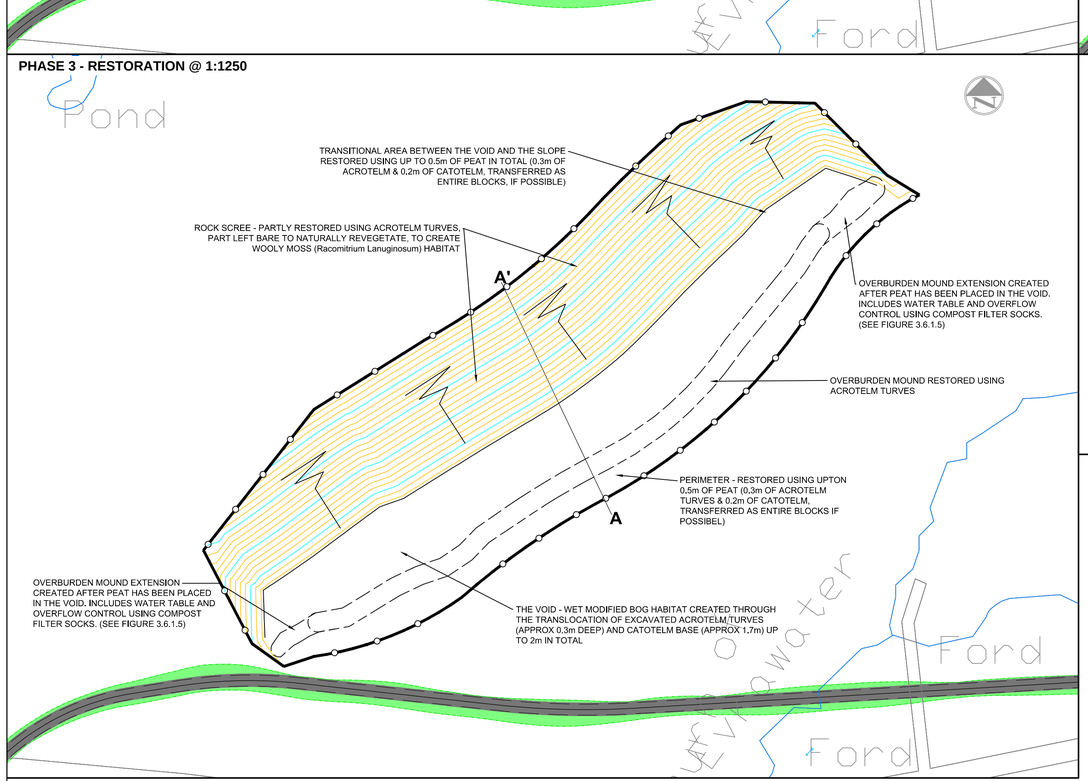
PHASE 1 - PEAT REMOVAL @ 1:1250



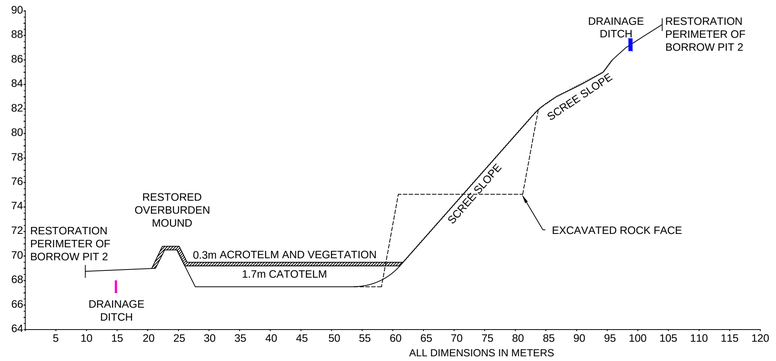
PHASE 2 - WORKING @ 1:1250



PHASE 3 - RESTORATION @ 1:1250



A - A' CROSS SECTION @ 1:500 (VERTICAL EXAGGERATION x2)



NOTES

ALL WORKS SHOWN ARE INDICATIVE FOR PLANNING PURPOSES ONLY AND SUBJECT TO DETAILED DESIGN.

SCOUR PROTECTION NEEDED IF VELOCITY EXCEEDS 1 M/S

KEY

- AREA OF PROPOSED PEAT REMOVAL FOR STONE ACCESS
- PROPOSED CONTOURS
- CLEAN WATER DITCH
- DIRTY WATER DITCH
- PERIMETER FENCE

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	DB

CLIENT: Energy

PROJECT: Beaw Field Wind Farm

DRAWING TITLE: FIGURE 3.6.1.2 Borrow Pit 2 Restoration Plan

DRG No	SCALE	DATE
NT12001/Fig 3.6.1.2	As Shown @ A1	27.05.16
DRAWN BY: AS	CHECKED BY: JO	APPROVED BY: DB

☐ STOKE-ON-TRENT (HEAD OFFICE)	TEL 01782 276700	☐ CARDIFF	TEL 029 2072 9191
		☐ LEIGH	TEL 01942 260101
■ NEWCASTLE UPON TYNE	TEL 0191 232 0943	☐ SHEFFIELD	TEL 0114 245 6244
☐ BIRMINGHAM	TEL 0121 580 0909	☐ EDINBURGH	TEL 0131 555 3311
☐ LONDON	TEL 020 7287 2872	☐ TAUNTON	TEL 01823 703100

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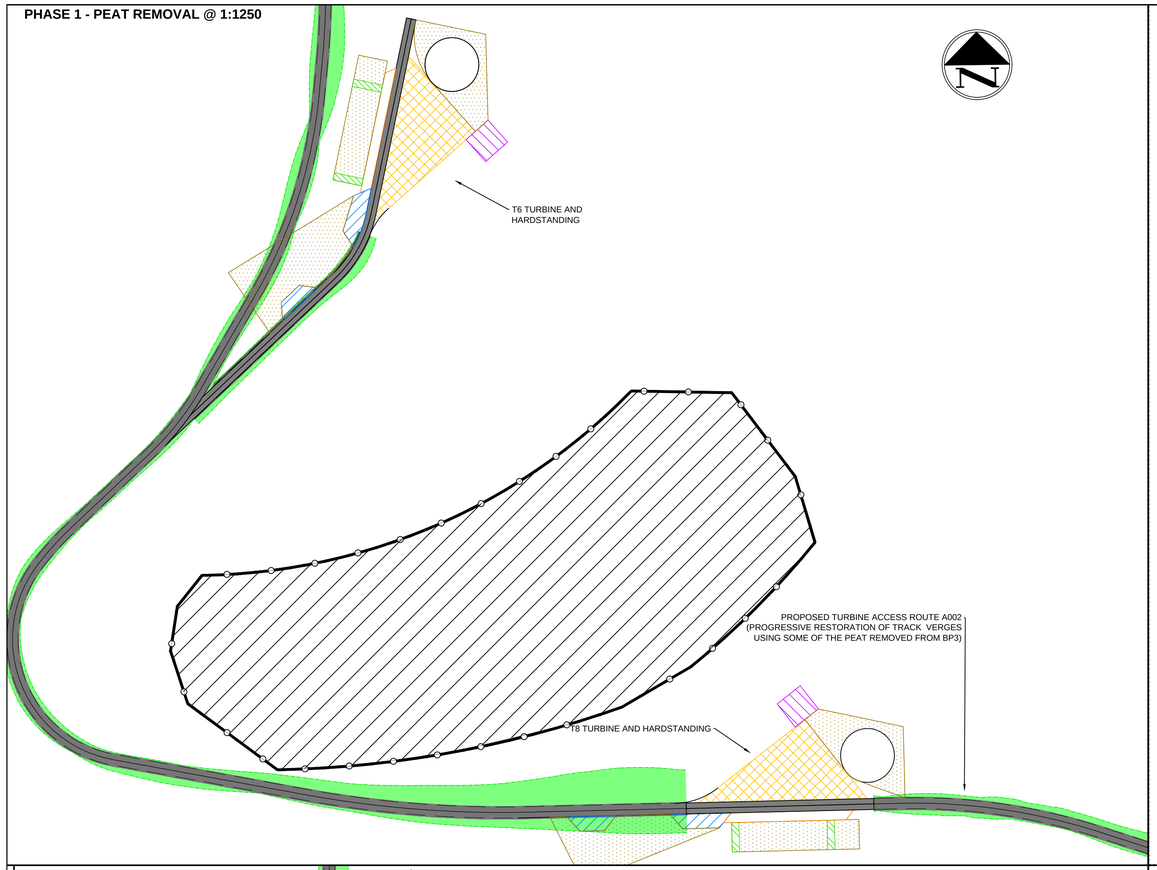
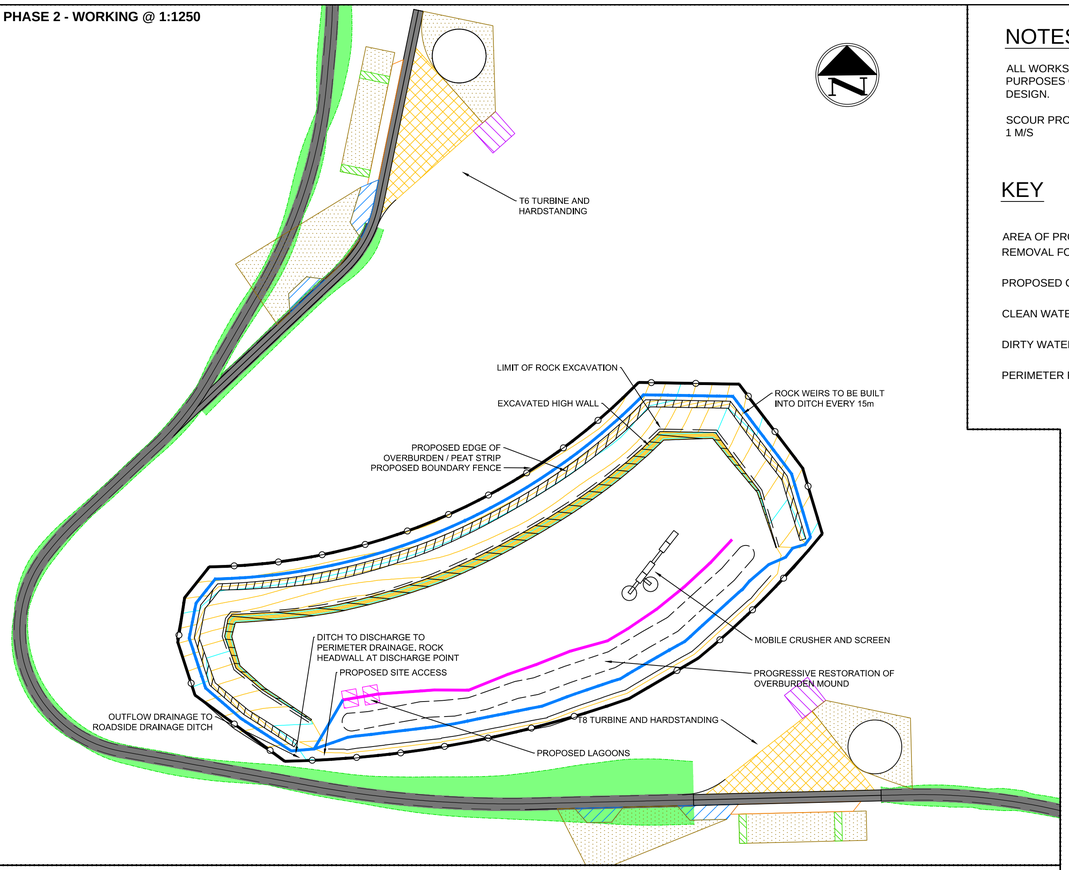
PHASE 1 - PEAT REMOVAL @ 1:1250



PHASE 2 - WORKING @ 1:1250



NOTES

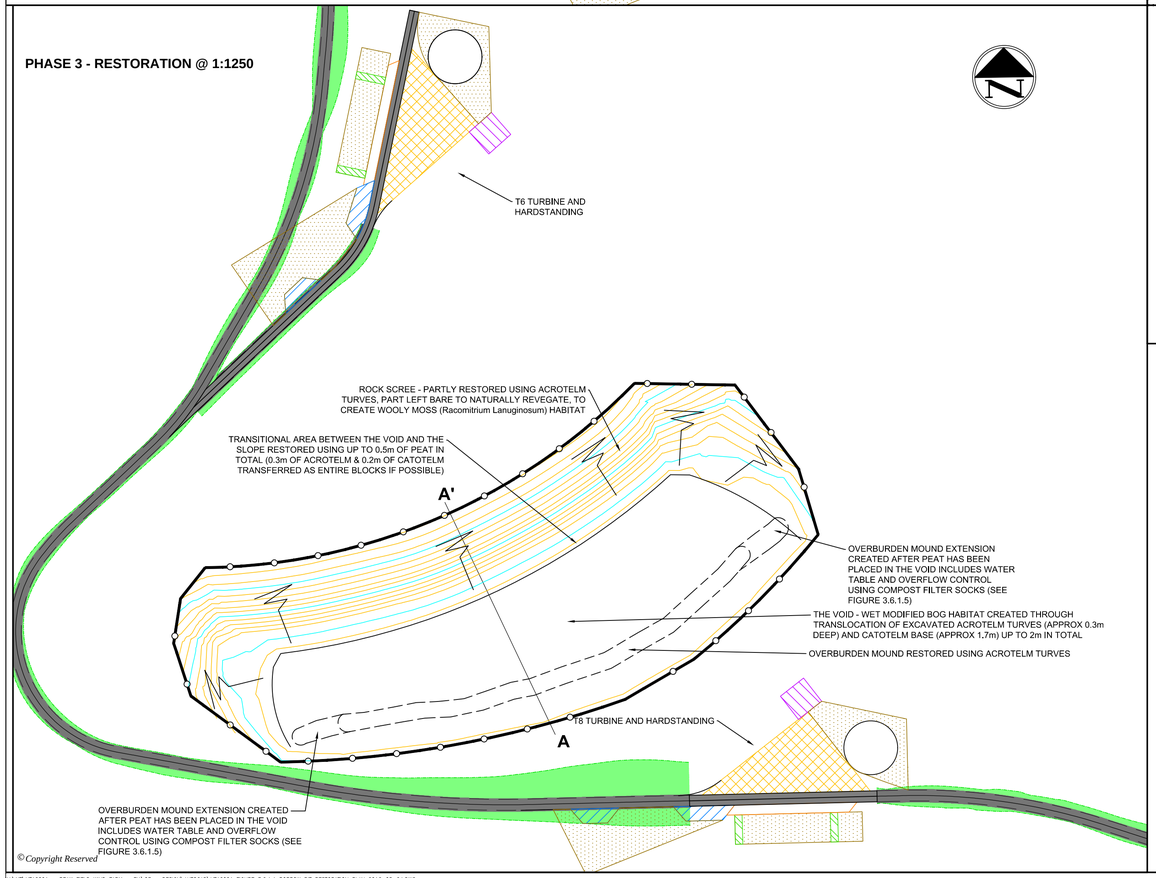
ALL WORKS SHOWN ARE INDICATIVE FOR PLANNING PURPOSES ONLY AND SUBJECT TO DETAILED DESIGN.

SCOUR PROTECTION NEEDED IF VELOCITY EXCEEDS 1 M/S

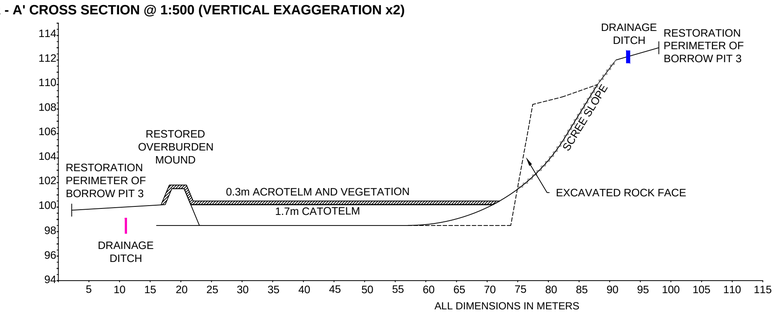
KEY

- AREA OF PROPOSED PEAT REMOVAL FOR STONE ACCESS
- PROPOSED CONTOURS
- CLEAN WATER DITCH
- DIRTY WATER DITCH
- PERIMETER FENCE

PHASE 3 - RESTORATION @ 1:1250



A - A' CROSS SECTION @ 1:500 (VERTICAL EXAGGERATION x2)



REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	DB

CLIENT: Energy

PROJECT: Beaw Field Wind Farm

DRAWING TITLE: FIGURE 3.6.1.3
Borrow Pit 3 Restoration Plan

DRG No	SCALE	DATE
NT12001/Fig 3.6.1.3	As Shown @ A1	27.05.16
DRAWN BY: AS	CHECKED BY: JO	APPROVED BY: DB

☐ STOKE-ON-TRENT (HEAD OFFICE)	TEL 01782 276700	☐ CARDIFF	TEL 029 2072 9191
☐		☐ LEIGH	TEL 01942 260101
■ NEWCASTLE UPON TYNE	TEL 0191 232 0943	☐ SHEFFIELD	TEL 0114 245 6244
☐ BIRMINGHAM	TEL 0121 580 0909	☐ EDINBURGH	TEL 0131 555 3311
☐ LONDON	TEL 020 7287 2872	☐ TAUNTON	TEL 01823 703100

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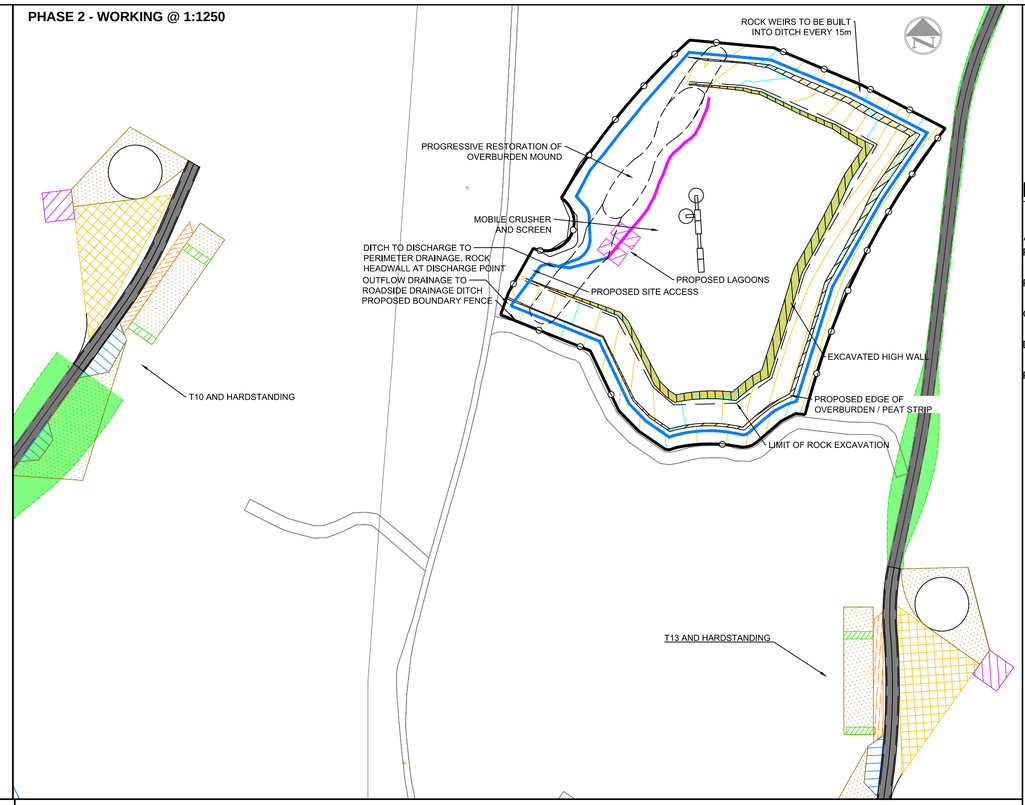
PHASE 1 - PEAT REMOVAL @ 1:1250

PHASE 2 - WORKING @ 1:1250



NOTES

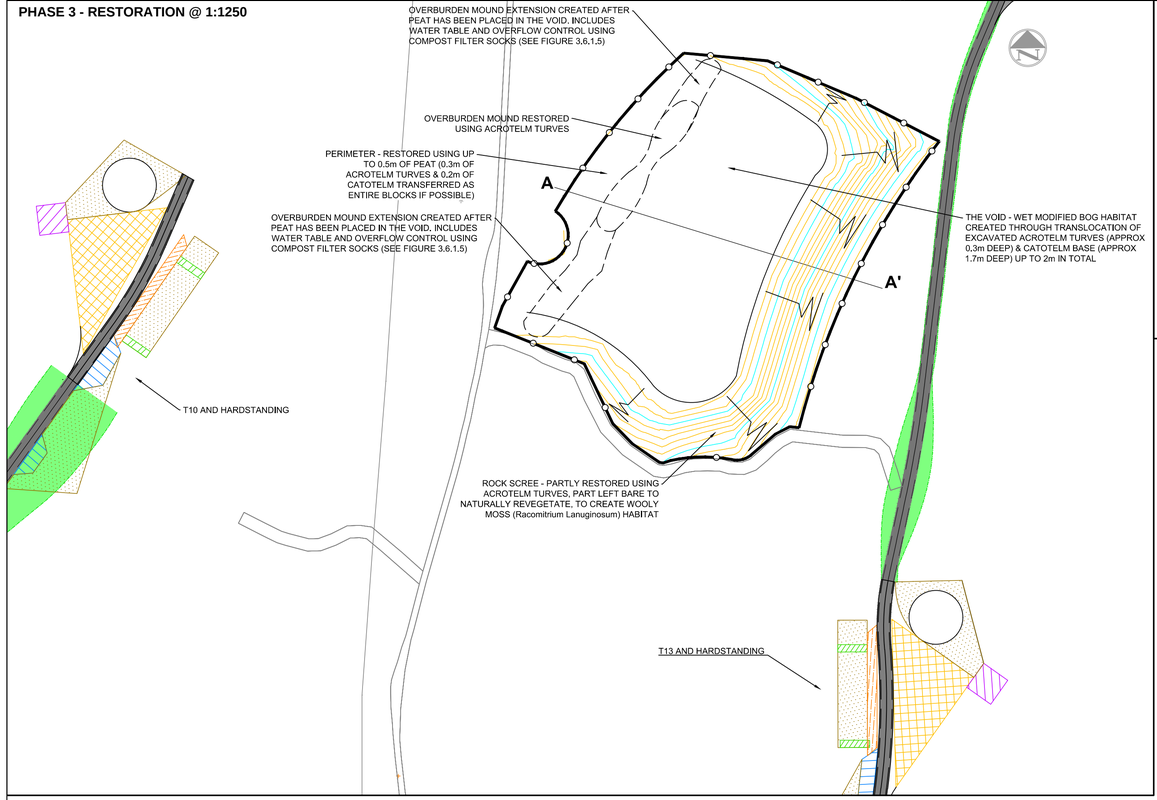
ALL WORKS SHOWN ARE INDICATIVE FOR PLANNING PURPOSES ONLY AND SUBJECT TO DETAILED DESIGN.

SCOUR PROTECTION NEEDED IF VELOCITY EXCEEDS 1 M/S

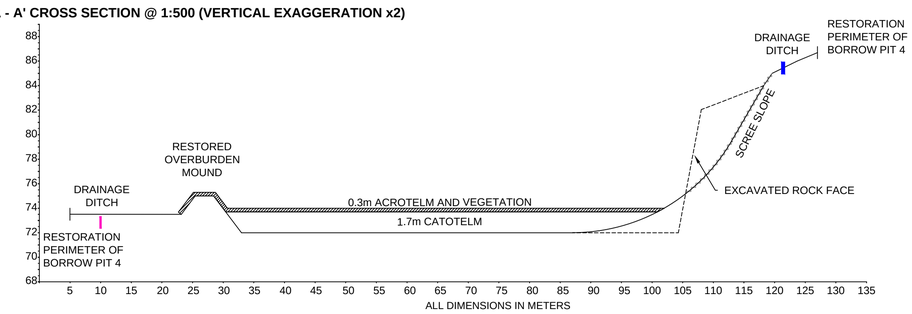
KEY

- AREA OF PROPOSED PEAT REMOVAL FOR STONE ACCESS
- PROPOSED CONTOURS
- CLEAN WATER DITCH
- DIRTY WATER DITCH
- PERIMETER FENCE

PHASE 3 - RESTORATION @ 1:1250



A - A' CROSS SECTION @ 1:500 (VERTICAL EXAGGERATION x2)



REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	DB

CLIENT: Energy

PROJECT: Beaw Field Wind Farm

DRAWING TITLE: FIGURE 3.6.1.4
Borrow Pit 4 Restoration Plan

DRG No	SCALE	DATE
NT12001/Fig 3.6.1.4	As Shown @ A1	27.05.16
DRAWN BY: AS	CHECKED BY: JO	APPROVED BY: DB

☐ STOKE-ON-TRENT (HEAD OFFICE)	TEL 01782 276700	☐ CARDIFF	TEL 029 2072 9191
		☐ LEIGH	TEL 01942 260101
■ NEWCASTLE UPON TYNE	TEL 0191 232 0943	☐ SHEFFIELD	TEL 0114 245 6244
☐ BIRMINGHAM	TEL 0121 580 0909	☐ EDINBURGH	TEL 0131 555 3311
☐ LONDON	TEL 020 7287 2872	☐ TAUNTON	TEL 01823 703100

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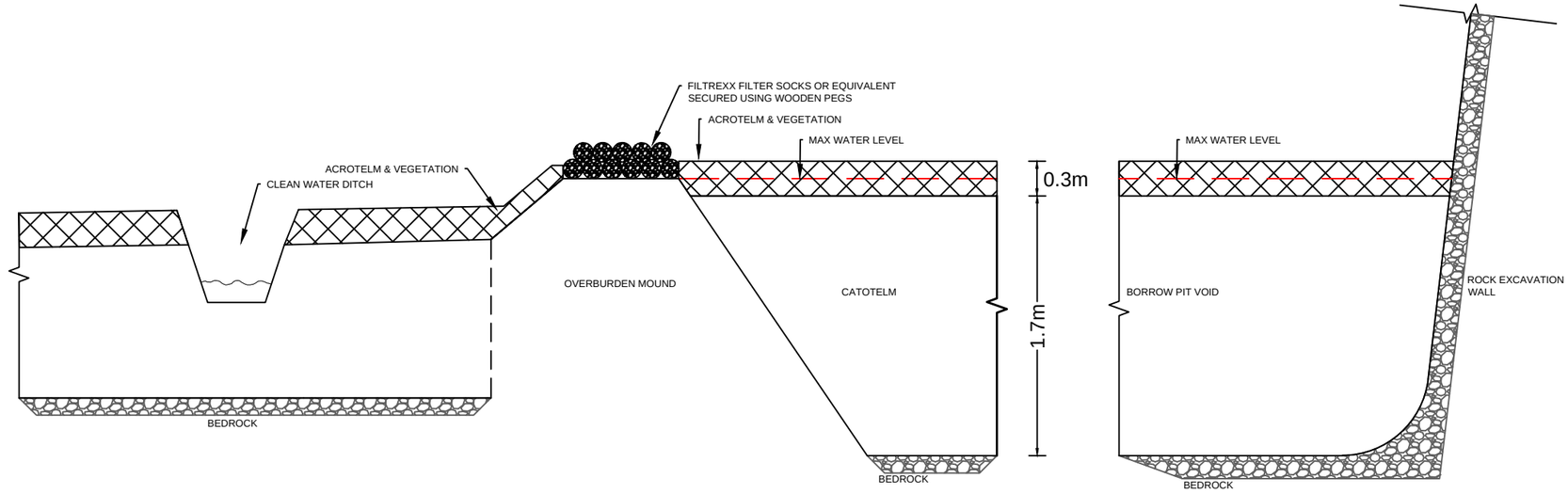

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	

CLIENT

Energy

PROJECT

BEAW FIELD WIND FARM

DRAWING TITLE

FIGURE 3.6.1.5
BORROW PIT OVERBURDEN
CONCEPT CROSS SECTION

DRG No	SCALE	DATE
NT12001/FIG 3.6.1.5	1:1000@A3	27.05.16
DRAWN BY	CHECKED BY	APPROVED BY
AS	JO	DB

☐ STOKE-ON-TRENT (HEAD OFFICE) TEL 0178 227 6700 ☐ CARDIFF TEL 029 2072 9191
■ NEWCASTLE UPON TYNE TEL 0191 232 0943 ☐ LONDON TEL 0207 287 2872
☐ WEST BROMWICH TEL 0121 580 0909 ☐ SHEFFIELD TEL 0114 245 6244
☐ GREATER MANCHESTER TEL 0194 226 0101 ☐ EDINBURGH TEL 0131 555 3311

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AERIAL SHOT SHOWING
PROPOSED FILL AREAS
@ 1:500 ON A3

N

A

A'

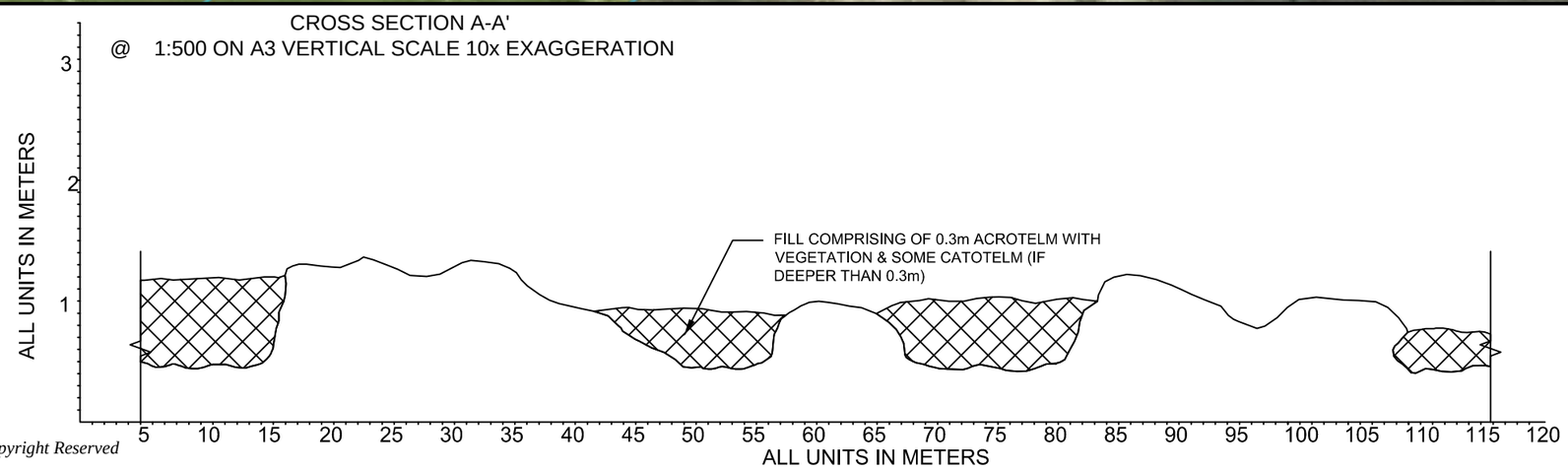
EXISTING PEAT

AREA OF FILL

CLAY MOUND BREAKING THE SLOPE, HOLDING WATER AND PEAT. FOR MOUND CONCEPT SEE FIGURE 3.6.1.5

T14

CROSS SECTION A-A'
@ 1:500 ON A3 VERTICAL SCALE 10x EXAGGERATION



REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	DB

CLIENT

PROJECT

BEAW FIELD WIND FARM

DRAWING TITLE

FIGURE 3.6.1.6
TARGETED INFILLING EXAMPLE
FOR AREA 1

DRG No	SCALE	DATE
NT12001/FIG 3.6.1.6	AS SHOWN	MAY 2016
DRAWN BY	CHECKED BY	APPROVED BY
AS	JO	DB

☐ STOKE-ON-TRENT (HEAD OFFICE) TEL 0178 227 6700
■ NEWCASTLE UPON TYNE TEL 0191 232 0943
☐ WEST BROMWICH TEL 0121 580 0909
☐ GREATER MANCHESTER TEL 0194 226 0101
☐ CARDIFF TEL 029 2072 9191
☐ LONDON TEL 0207 287 2872
☐ SHEFFIELD TEL 0114 245 6244
☐ EDINBURGH TEL 0131 555 3311

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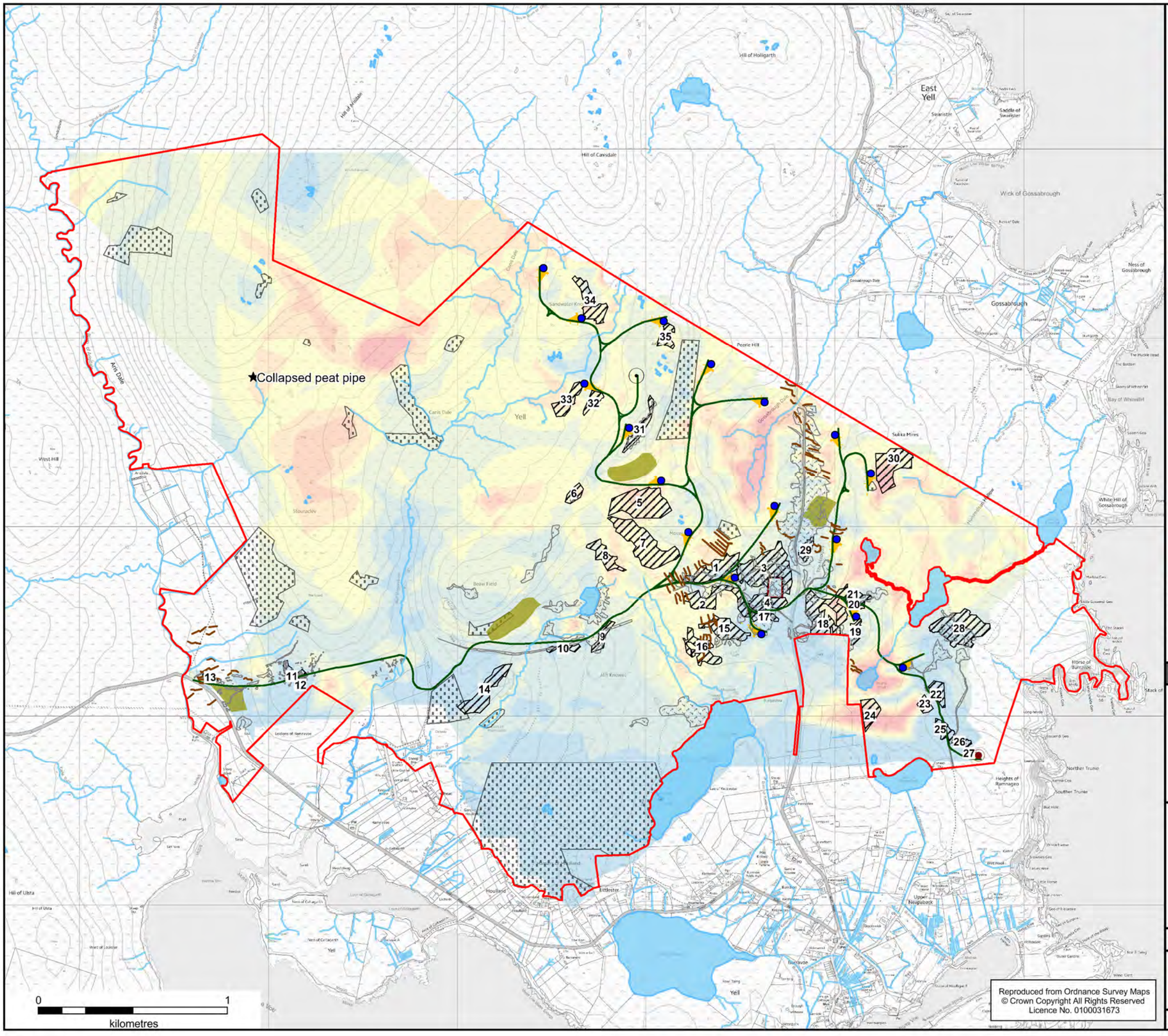
N:\NT\NT12001 – BEAW FIELD WIND FARM – EIA\03 – DESIGN\AUTOCAD\NT12001 FIGURE 3.6.1.6 FILL AREA CROSS SECTION 2016-05-24.DWG

ASMITH



Key

- Application Boundary
- Location of Turbines
- Borrow Pits
- Hardstanding
- Compound during construction
- Substation
- Indicative route of Access track
- Anemometry mast
- Radio Communications Tower
- Peat Cutting
- Watercourses
- Waterbodies
- Bare Ground
- Uneroded Areas
- Targeted infilling areas

Peat Depth (cm)

- 0-50
- 51-100
- 101-150
- 151-200
- 201-250
- 251-300
- 301-450

Note, except for uneroded areas and bare ground, all other peatland areas are heavily gullied and dissected.
(not shown on the map for clarity)

Beaw Field Wind Farm

N

PEEL

TITLE:

Geomorphological Map

Figure 3.6.1.7

Scale: 1:20000 @ A3 Date: 17:06:16

Ordnance Survey Developer Partner

Ref: