Beaw Field Wind Farm

Further Environmental Information (FEI)

June 2016

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ECU Ref: EC00003121
LPA Ref: 2016/098/ECUCON

1 Introduction

1.1 On 7th March 2016 Peel Wind Farms (Yell) Limited ('the Applicant') submitted an application for consent under §36 of the Electricity Act 1989 to the Energy Consents Unit of the Scottish Government. The application seeks permission for the construction and operation of an onshore wind farm consisting of 17 wind turbines and associated infrastructure.

1.2 The application also proposed the implementation of a scheme of Peat Restoration and Management and Habitat Management. These were both presented as Outline documents.

1.3 The application was accompanied by an Environmental Statement (ES).

1.4 The description of the Proposed Development is:

The construction and operation of a wind farm comprising up to 17 turbines with an installed capacity of over 50MW and including associated access tracks, anemometry mast, substation, radio communications tower, underground cabling from turbines to substation, temporary construction compound, lay down area, up to four borrow pits and a scheme of habitat enhancement and mitigation.

1.5 As part of the statutory consultation exercise the Applicant received representations from several organisations, including:

Scottish Environmental Protection Agency (SEPA)
Royal Society for the Protection of Birds (RSPB)
Marine Scotland
Scottish Natural Heritage (SNH)
Visit Scotland
Scottish Water
CH2M (on behalf of ECU)

1.6 These representations invited further clarification on a number of aspects of the application. In addition, we also present our response to issues raised by member of the public. This document is therefore of primary relevance to the aforementioned organisations.

1.7 The Applicant – by way of this Further Environmental Information (FEI) Report – is providing substantive responses, commentary and clarification on these issues in this one document rather than respond individually to each organisation or person. This approach is in compliance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended).

1.8 Copies of this FEI Report can be obtained from:

Ms Bernadette Barry, Development Manager
Peel Wind Farms (Yell) Limited
Peel Dome
Intu Trafford Centre
TraffordCITY
Manchester M17 8PL

1.9 Alternatively, the FEI Report can be downloaded from the project website at www.beawfieldwindfarm.co.uk

1.10 Hard copies of this FEI Report can be inspected during normal office opening hours at the following locations:

Shetland Islands Council
8 North Ness Business Park
Lewick
Shetland ZE1 0LZ

Ulsta Post Office
Yell
Shetland Isles
ZE2 9BD

Scottish Government Library
GD Bridge
Victoria Quay
Edinburgh EH6 6QQ

2 Peat and Groundwater

2.1 On 19 April 2016 SEPA objected to the above application (letter ref. PCS/145605), due to a lack of detailed information on the appropriate reuse and management of peat on site (Section 1 of SEPA's letter) and potential impacts on groundwater abstractions (Section 2 of SEPA's letter). A copy of the letter is Appended (2.1) for reference purposes.

Peat Related Queries

2.2 The restoration of Borrow Pits following completion of construction activities is well established, although methods by which this is achieved can and do vary. If left unrestored the borrow pits will act to break up areas of habitat that might otherwise have been contiguous, or give rise to other unfavourable environmental impacts such as adversely affecting the drainage regime of the locality.

2.3 Following receipt of comments from consultees the Applicant intends to restore borrow pits using translocated peat, in order to create areas of wet blanket bog habitat. This is one of the most valuable habitat types and if successful will ensure that the restored borrow pits contribute to functions such as carbon sequestration and supporting blanket bog specific species.

2.4 The correspondence from SEPA identified a number of issues that relate to peat reinstatement and management, where clarification was sought from the Applicant. The ES included an Outline Peat Reinstatement and Management Plan (OPRMP, Appendix 3.6), and in response to the request for clarification, the OPRMP has been developed to a more advanced stage and is Appended (2.2). It should be recognised however, that the final version of the management plan will not be prepared until post-consent ground investigation (GI) has been completed. Therefore, this plan remains in outline status.

2.5 The aspects of the Proposed Development which would result in disturbance of peat and the associated habitat have been assessed in the hydrology, ecology and soil and peat chapters of the ES. As a consequence of updating the OPRMP, minor amendments have been made to Chapter 12 of the ES: Soils and Peat (Appendix 2.3). It can be confirmed that as a consequence of updating the OPRMP, the assessment and conclusions presented in the ES has not changed and there are no changes to other chapters of the ES.

2.6 To accompany the updated OPRMP, this section also provides the context for the clarification requested by SEPA, particularly with regard to peat handling and reinstatement during the construction phase of the wind farm development. Where appropriate, clarification also includes cross reference to longer term habitat management, based on the

Outline Habitat Management Plan (OHMP) which was submitted with the ES as Appendix 10.4.

2.7 In order to assist the reader, each of the requests made within Section 1 of SEPA's letter have been identified in italics, as a heading, followed by the Applicant's response. The original paragraph numbering of the letter is referred to with the paragraphs listed as bullet points marked consecutively with lower case letters (e.g. first bullet point of paragraph 1.4 is referred to as 1.4a). The Applicant's response cross–references the revised OPRMP and additional drawings that now form part of the OPRMP, which form a minor update to the ES. Where necessary, references to other ES documents are required to further provide context.

Paragraph 1.3 of SEPA's letter related to the reuse of all of the excavated peat within the Site *"[…] While we consider this may be a good approach, we require more information on the techniques to be used to determine whether this will be acceptable and not disposal."*

2.8 In response to SEPA's specific request for additional information on the 'techniques' to be used to reuse peat on site, the applicant has prepared an update to the OPRMP to provide further clarity on this issue. The updated OPRMP provides the basis for many of our subsequent responses to the individual points raised by SEPA. It is therefore recommended that the updated OPRMP is read in conjunction with this section to see exactly how the Applicant has responded to SEPA's individual comments.

2.9 SEPA's Regulatory Position Statement[1] recommends that as much peat as possible should be reused on site and also emphasises that the proposed reuse activities have to be safe for the environment and human health. The peat reuse techniques that are proposed to be used at the Site have been recognised in SEPA's publication[2] as either *"environmentally and ecologically acceptable"*, or as measures that *"may be acceptable in certain settings"* (see paragraph 1.3.6 of the OPRMP). Peat reuse will be achieved through adherence to the principles described in Section 4 of the OPRMP and following specific conditions for each of the techniques, described in Section 5 of the OPRMP. The approach to managing peat slide risk will follow the precautions and mitigation measures described in the PSRA, which will be subject to post-consent review and informed by the findings of post-consent GI, (see paragraphs 1.3.13–1.3.15 of the OPRMP). The final PRMP will be prepared based on the GI to inform the Principal Contractor's Construction Method Statements (CMS, see paragraph 1.3.16 of the OPRMP), which will be submitted to Shetland Islands

[1] SEPA (2010) Regulatory Position Statement – Developments on Peat
[2] SEPA (2011) Restoration Techniques Using Peat Spoil from Construction Works, Report prepared by EnviroCentre Ltd

Council and agreed with SEPA and SNH prior to commencement of the development. Adherence to the approved PRMP and CMS documents will be monitored by the Ecological Clerk of Works (ECoW).

2.10 The Regulatory Position Statement also says that there must be a justified requirement or demonstrable need for the proposed reuse of peat. Briefly, as described in paragraph 1.3.7 of the OPRMP, restoration of the borrow pits is required to mitigate the impact of the construction and to offset some of the potentially adverse effects of the Proposed Development by improving the existing habitat, given the degraded state of the areas where borrow pits 1, 2, and 4 would be located. 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 needed to improve hydrological conditions within the Site and stop ongoing peat erosion. Targeted infilling (peat translocation to some of the most degraded areas of bare and partly eroded peatland) is required to restore blanket bog in areas where the reduction of sheep grazing intensity alone would not suffice. The benefits of restoration to a modified wet blanket bog habitat, ultimately leading to restoration of an active unmodified blanket bogs are described in Section 1.4 of the OPRMP.

Paragraph 1.4 of SEPAs letter contains multiple observations which are addressed sequentially in the following paragraphs. The main body of paragraph 1.4 says: *"[…] The use of excavated peat in borrow pit restoration must be in keeping with the overall habitat and reinstatement objectives; only the quantity of peat necessary to achieve these objectives should be used, up to a maximum thickness of 2 metres. […]"*

2.11 Overall habitat and reinstatement objectives are put forward in the Outline Habitat Management Plan (OHMP, Appendix 10.4 to the ES). Aim 2 of the OHMP is: "*To alleviate ecological impacts arising from past and present land management practices on the Site, by conserving, enhancing and restoring important habitats and species.*" Objective 2a of the OHMP is to: "*Reduce and/or arrest blanket bog/peatland degradation.*"

2.12 The OPRMP supports this aim and objective by prioritising restoration of wet blanket bog habitat, as explained in Section 1.4 of the OPRMP. The main reasons for the prioritisation of this habitat in restoration are:

- Wet blanket bogs have been affected the most by the anthropogenic degradation within the Site, and although they were once dominant in the area, they are now in decline.
- Blanket bogs are a UK Biodiversity Action Plan priority habitat.

- Blanket bogs support bird species not found anywhere else such as those present within the Site e.g. Golden plover and Dunlin, which would benefit from the restoration .
- Blanket bogs support unique flora, such as *Sphagnum* mosses.
- Blanket bogs contain large carbon stocks of international importance; their restoration goes hand in hand with preservation of carbon stocks present in the excavated peat.
- The quantity of peat used (up to 2m in borrow pit voids), will maximise this preservation (see paragraph 5.3.4 of the OPRMP for the justification of this target depth).
- The high water table conditions created in the areas to be restored will be conducive to continued carbon sequestration by promoting peat-forming vegetation.

2.13 It has been recognised in the OHMP that "*not all areas of blanket bog habitat will recover quickly without intervention*" and the example of the Moss Houll area is given (see Photograph 1 in the OPRMP). This is where targeted infilling (peat translocation) techniques will be used (see Section 5.6 of the OPRMP).

2.14 Aim 1 of the OHMP is: "*To enhance habitat conditions for identified species of importance present on or linked to the Site*." Objective 1a of the OHMP is to "*create conditions on former lochans in southern Yell conducive to the enhancement and restoration of breeding Red-throated diver* (Gavia stellata)". Blocking of gullies and targeted infilling will have an indirect effect of reducing the flow of water out of the lochans and aid their restoration. Some of the peat may also be used (subject to detailed design) to create dams close to the former lochans as identified in the OHMP. As mentioned above, the restoration to wet blanket bog will extend the habitats used by Golden plover and Dunlin, which are also present within the Site.

Paragraph 1.4a asks that *"[…] information will need to be provided to demonstrate how the peat will be kept wet and how the water table will close to the reinstated surface."*

2.15 During the construction stage, peat will be kept wet by progressive restoration (concurrent with the construction of infrastructure) to reuse the peat as soon as possible after excavation, and minimise double handling and temporary storage, as storage increases the risk of peat desiccation and loss of structure. The minimal amount of peat that will need to be stored will be kept wet by enclosing temporary storage areas (if required) by boulder clay bunds, in pre-determined locations (see paragraphs 4.3.1–4.3.4 of the OPRMP) and minimising the time of storage through detailed planning and optimisation of peat translocation (OPRMP paragraph 4.1.7).

2.16 After reinstatement, keeping the peat wet will be dependent on maintaining the water table close to the reinstated surface. This will be achieved by not raising the level of reinstated peat above the level of adjacent land (see explanation in OPRMP paragraph 4.1.10). For the tracks, this will be achieved by shaping the sides to take account of the drainage system, so that surface water preferentially gathers on the reinstated turves (OPRMP paragraph 5.1.3). Hydrological conditions of degraded areas will be improved by blocking of the gullies and grips (se Section 5.5 of the OPRMP).

2.17 The stability of peat and condition of the water retention measures such as dams and bunds, water table level, and vegetation will be monitored. The monitoring programme will form a part of the proposed habitat monitoring schedule (OHMP Table 1), and will be agreed with key stakeholders including SEPA, Scottish Natural Heritage and Shetland Islands Council (OPRMP Section 5.7).

Paragraph 1.4b says: ***"We welcome the proposed measures in paragraphs 5.4.6 – 5.4.8. Reinstatement of a previously excavated strip of 2m width on either side of the track is acceptable, assuming that this does not lead to damage to existing bog vegetation – which will need to be demonstrated."***

2.18 The techniques developed for construction of the tracks will be designed to minimise the impact on the hydrology of the adjacent undisturbed peatland habitat following the mitigation measures discussed in Chapter 15 of the ES.

2.19 Measures applied to avoid damage to existing blanket bog vegetation are listed in paragraphs 4.1.4–4.1.7 of the OPRMP. This list will be augmented by a detailed method statement from the Principal Contractor, based on further information obtained through the GI completed post-consent (OPRMP paragraphs 1.3.13–1.3.18). The guiding procedures for the Principal Contractor will be to define the corridor within which the access track will be constructed and ensure that all construction-related vehicles are restricted to this footprint. Peat handling will be undertaken using a long reach, 360^{o} excavator to lift and place turves. Should any work be required outside the footprint of the corridor, a low ground pressure excavator with wide tracks and total weight up to 10 tonnes[3], as well as portable bog mats will be used. The details of haul routes from donor to receptor sites and schedule of peat movements will be set out in the peat translocation plan, as per paragraph 4.1.7, and submitted for consultation with other CMS documents, as per paragraph 1.3.16 of the OPRMP.

Paragraph 1.4c says: ***"As per paragraphs 5.4.19 – 22 we note BP1 and 4 will be reinstated to a 2m depth. However, it is proposed to reinstate BP1 to dry heath habitat which would only require 0.5m***

[3] Yorkshire Peat Partnership Technical Specification 1 - Blocking with peat dams, available at: http://www.yppartnership.org.uk/restoration/technical-guidance-notes/

depth of peat in reinstatement, not 2m. The original peat depth is 0.52m so justification is required for why 2m thickness would be required for ecological benefit. We would consider 0.5m to be a more appropriate depth."

2.20 The original approach to restore BP1 to a dry heath habitat has been reconsidered and as a result the target habitat has changed to a modified wet blanket bog. The reasons why BP1 would benefit from being restored to a modified wet blanket bog habitat include:

- It is a priority habitat, in decline within the Site, supporting unique animal and plant species as discussed in response to paragraph 1.4. A full description of the ecological benefits of blanket bog restoration is provided in OPRMP, Section 1.4.
- Although the habitat has been substantially modified due to anthropogenic influences, there are similar areas of wet modified bog areas approximately 100m west and east of BP1 (see ES Figure 11.3), rehabilitation of peat to a modified wet blanket bog habitat within the borrow pit would therefore improve the connectivity between those areas, through its location in between them.
- The improved connectivity will increase chances of successful dispersal of wet bog vegetation and, together with restoration of wider areas of the Site, as per the OHMP, lead to gradual recovery of the wet blanket bog habitats across the Site.
- The objective of ecological enhancement would be to increase the diversity (mosaic) of habitats local to the borrow pit, which at the moment does not have a strong wet blanket bog component.
- The reinstated void surface will gradually blend into the other areas within the borrow pit footprint, such as void perimeter, the overburden mound and the scree slope, which will be reinstated using a 0.5m (on average) layer of peat.

2.21 The design of BP1 restoration is considered in more detail in the OPRMP (paragraphs 5.3.5–5.3.9 and the enclosed Figure 3.6.1.1), the justification for the target reinstatement depth of 2m in this and other borrow pit voids is provided in paragraph 5.3.4 of the OPRMP.

Paragraph 1.4d says: ***"BP4 – original peat depth 0.52m, proposed reinstatement to 2m. Details of the target habitat is not given so as above justification and details of the target habitat should be provided for the proposed 2m thickness."***

2.22 Similar to BP1, the average measured peat depth of 0.52m is the direct result of human activity as indicated by pockets of deeper peat (up to 1.8m) directly north of the borrow pit footprint, and very deep peat (up to 3m) just 100m north of it (see ES Figure 12.2). Therefore, it is considered that the shallow peat and acid grassland with bare peat was not characteristic of the area, prior to influences such as peat cutting and overgrazing that have resulted in the deterioration in the quality of habitat and depth of the peat horizon. The habitat directly adjacent to the borrow pit from the north and east is unmodified blanket bog (see ES Figure 11.3). Rehabilitation of peat, with the objective of developing modified wet blanket bog in this area would therefore be a logical extension of this high priority habitat, rehabilitating some of the area that has been degraded. It will also form a buffer between this important habitat, the acid grassland, and the road. For further details see OPRMP paragraph 5.3.13 and Figure 3.6.1.4. The overall rationale for the restoration to wet blanket bog is provided in Section 1.4 of the OPRMP, while the justification for the target reinstatement depth of 2m is provided in paragraph 5.3.4 of the OPRMP.

Paragraph 1.4e says: ***"In regard to BP 2 and 3 please note that the proposal to reinstate 2.5 and 3.5m respectively exceeds the maximum allowable in a borrow pit, which is 2 metres and therefore this aspect of the proposal needs to be modified."***

2.23 This requirement is acknowledged; the target depths in the borrow pit voids would be up to 2m, the updated peat balance in Table 1 of OPRMP reflects this change in volume. The restoration profiles of BP2 and BP3 are shown in Figures 3.6.1.2 and 3.6.1.3.

Paragraph 1.4f says: "*BP2 – original peat depth 1.13m, also restoring to dry heath (0.5m) – we would accept a thickness to the original peat depth. We consider 2 metres or more would be excessive. Details of modified proposal should be provided complying with this.*"

2.24 BP2 is located within an area where peat habitat is highly degraded, as a consequence of agriculture (principally overgrazing), traffic and erosion from surface drainage. The habitats adjacent to the footprint of the borrow pit comprise dry modified bog to the north-west (considered to result from degradation over a period of time, see paragraph 1.4.5 of the OPRMP). To the south-east, between BP2 and the Burn of Evrawater, areas of bare ground are evident. However, there are also examples of deeper peat within the immediate vicinity of the borrow pit, as indicated by the presence of wet modified bog and unmodified blanket bog extending from those degraded habitats, e.g. less than 100m east and 100m north of BP2. Therefore, the assessment of the baseline conditions confirms that the whole area around PB2 was unmodified wet blanket bog habitat that has been degraded over many years of anthropogenic influence and management. This finding is corroborated by the presence of deep peat, up to 2m depth in the locality, together with evidence of the current measured peat depths within the borrow pit footprint of up to 1.7m (see Figure 12.2). Therefore, the reinstatement of peat up to 2m in depth, to restore the borrow pit, would be in keeping, even with the current depths in the area around BP2, which result from erosion and peat decomposition.

Details of BP2 restoration are provided in paragraphs 5.3.10 and 5.3.11 of the OPRMP and in Figure 3.6.1.2. The overall rationale for the restoration to wet blanket bog is provided in Section 1.4, while the justification for the target reinstatement depth of 2m is provided in paragraph 5.3.4 of the OPRMP.

2.25 Furthermore, an objective of the HMP is to improve the quality of blanket bog habitats within the Site, which would increase the area of peat forming habitat and, as a consequence, the depth of peat profile. Targeted infilling of gullies and exposed bed rock, as described in section 5.6 of the OPRMP, would also result in an increase in the average peat depth of the habitat around BP2. Therefore, it can be confirmed that the combined use of targeted infilling technique together with the restoration of borrow pit void would result in an increase in average peat depth, as a consequence of the OPRMP implementation. The quality of the habitat will be managed for the operational life of the wind farm through the HMP, with the aim of creating self-sustaining, peat forming habitats in the longer term.

2.26 Figure 3.6.1.2 provides the overview of the restored profile showing how the void remaining after extraction of the rock from BP2 will create conditions conducive to keeping peat wet and stable. The reinstated surface will be horizontal and flush with adjacent land. The perimeter bund will be marginally higher than the reinstated surface to prevent any peat movement outside of the reinstated area, and to control the water table level and drainage by incorporation of filter socks (see OPRMP paragraph 4.1.11 and Figure 3.6.1.5 for an illustration of how these function).

Paragraph 1.4g says: ***"BP3 – restoring to wet modified bog. The original peat depth is not given. 1.5m is around the maximum for modified bog requirements. The maximum original peat depth appears to be 2.5m from the survey map therefore a maximum peat depth of 2 metres would be acceptable. Details of modified proposals should be provided complying with this."***

2.27 The current peat depths for the area surrounding BP3 are given in Figure 12.2, they are between approximately 1 and 2.5m, as is characteristic for this part of the Site. The target restoration habitat will be wet modified bog, which is the habitat currently present in this location and will directly link with the same habitat type north of BP3 (see Figure 11.3) with currently recorded peat depths of up to 2m (see Figure 12.2). Details of BP3 restoration are provided in paragraph 5.3.12 of the OPRMP and in Figure 3.6.1.3 showing the target restoration depth of 2m. The overall rationale for the restoration to wet blanket bog is provided in Section 1.4 of the OPRMP, while the justification for the target reinstatement depth of 2m is provided in paragraph 5.3.4 of the OPRMP.

Paragraph 1.4h says: ***"Anemometry mast – no information has been provided on why 1.5 metres peat depth for reinstatement is required. Justification should be provided on why this depth is needed, what the target habitat for restoration is and how the peat will be kept wet and water table raised to close to surface."***

2.28 The depths recorded in adjacent survey points around the location of the anemometry mast are: 1.73, 1.60, 1.50, 1.36, and 1.45m (see Figure 12.2). Reinstatement of the anemometry mast location as proposed is considered appropriate in the context of the existing surrounding ground levels. As described in paragraph 3.2.7 of the OPRMP, the excavation footprint for the mast would be relatively small ($78m^2$) with a negligible permanent footprint, and thus, no permanent displacement of peat from this area is anticipated. The water table will not be permanently altered and the original habitat is wet modified bog (see Figure 11.3). The reinstatement of peat following installation of the mast is not anticipated to alter this situation. Methods to keep the peat wet and the water table close to the surface which apply for every aspect of peat management are discussed in response to paragraph 1.4a, above.

Paragraph 1.4i states: ***"Gully/ditch blocking and targeted infilling to 1.5m (acrotelm/catotelm) – a large amount of catotelm is to be used in targeted infilling. Justification for this depth should be provided along with more detail on the techniques to be used. This could be a good use of the peat but needs to be done carefully."***

2.29 An infilling depth of 1.5m is a maximum value rather than a definitive level to be achieved in every instance. The estimates of amount of catotelm to be used are based on the large number of gullies present within the Site that would benefit from blocking; their number far exceeds the amount of peat allocated for this purpose. The blocking of gullies and targeted infilling will follow the general principles listed in Section 4 of the OPRMP, with specific requirement for these techniques described in Sections 5.5 and 5.6 of the OPRMP. The areas for targeted infilling, the largest of which are contained around the compound, are between the access tracks and the B9081 which runs north-south dissecting the Site. For the complete list of potential targeted infilling areas see Table 2 in the OPRMP. Those areas contain discontinuous islands of reasonably deep peat (up to 1.5m) surrounded by extensive bare ground (see Figure 12.4). The remaining islands of peat will require intervention if they are to remain, but they are also a good starting point for restoration of a wet bog in this area.

2.30 The areas of targeted infilling and blocking/infilling of gullies/grips will significantly increase the presence of wet bog habitats in areas where they were originally present (see Section 1.4 of the OPRMP for rationale behind prioritising restoration of wet blanket bog habitat). Those areas will eventually link together as the restoration of adjacent land progresses (predominantly through reduction in grazing pressure and/or fencing, as per the OHMP). Blocking of gullies will also create small areas of open water and ponding on the surface, increasing the mosaic of microhabitats, and thus, the biodiversity within the Site.

2.31 Where there is no requirement for peat deeper than 0.3m to be translocated only acrotelm turves will be used, for example where the infilling areas have low boundaries and a deeper layer of peat would not tie with the surface level of adjacent land. Catotelm will be used where the depth of reinstatement required exceeds 0.3m and where the water table can be maintained close to the reinstated peat surface. Additionally, for wider gullies, where damming would not be appropriate, hagg reprofiling[4] will be carried out to stop bank erosion. In any case of peat translocation or in-situ reinstatement within the Site, no bare peat surfaces will be created as they will all be covered with acrotelm turves, flush with the level of adjacent land.

2.32 The total reinstatement area (see Table 1 in the OPRMP) for which the acrotelm will be required is approximately 14.5ha, the total donor area (the development footprint) is 25ha. This gives a potential surplus of 10ha equivalent of acrotelm. This surplus is deliberate because substantial areas within the site are bare, and hence, it will not be possible to source acrotelm from the entire 25ha. In the unlikely situation where there is a surplus of acrotelm, it will be used for reinstatement of additional adjacent bare peat areas, where this would be appropriate.

2.33 Although peat translocation is not commonly employed (usually due to a lack of surplus peat available for this purpose in peatland restoration projects), it has been proven to be successful in other Wind Farm projects, such as Oswaldtwistle Moor (wind farm)[5]. Peel Energy[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; some of these projects also included the rehabilitation of peatland, though infilling of gullies and larger areas, drainage channels and reinstatement of peat over exposed bedrock. The methodology adopted for these operations together with evolving peat best practice has, and will be, used to inform policies and procedures in the PMRP, prior to construction. There are over 46ha within the Site that could potentially benefit from the targeted infilling, as these areas contain bare peat, where peat cutting and extensive erosion has taken place. The OPRMP has identified a sufficient volume of peat, from wind farm construction,

[4] http://www.yppartnership.org.uk/restoration/technical-guidance-notes/
[5] http://www.conservefor.co.uk/case_studies/14
[6] Peel Wind Farms Yell Ltd is part of Peel Energy – see ES para 1.4.1 for details.

to restore approximately 4.5ha out of 46ha of areas potentially suitable for targeted infilling (see paragraph 5.6.10 of the OPRMP). This technique will therefore be targeted at the most suitable areas in terms of technical feasibility and ecological benefits that would result from the technique.

2.34 Stability and moisture of the peat in targeted infilling areas will be predominantly maintained by them being enclosed by the tracks (which will be raised), existing microtopography, exposed peat profiles where cutting has taken place, and additional soil bunds (clayey mineral subsoil, e.g. boulder clay). The Moss Houll area will be enclosed by the existing B9082 road level which is higher than the existing ground surface. Those enclosures will contain the peat and also arrest the drainage of surface water (see Figure 3.6.1.6 for the illustration of this concept). Where necessary, tops of bunds will be constructed with compost filter socks (e.g. Filtrexx[7]) providing control of the water table, should it reach close to the top of enclosures (see paragraph 4.1.11 of the OPRMP and Figure 3.6.1.5 for the illustration of how the filter socks will work). Tops of the bunds will be nearly flush with adjacent land so as not to create protruding landscape features, they will be only high enough to secure the reinstated peat and control the water table and drainage.

2.35 The presence of the 1.5m high peat islands in spite of low water table levels indicates that the rainfall levels are so high and evapotranspiration levels are so low that peat can be preserved in this environment for a long period of time with water much below the surface. This indicates that the translocated peat will remain stable for the period of time until the water table is permanently raised in this area. To re-establish the vegetation in the area, a combination of translocated acrotelm turves and nurse crops (see paragraph 4.4.2 of the OPRMP) would be used.

Paragraph 1.4j says: ***"Compound during construction - justification for the proposed 1m depth (acrotelm and catotelm) should be provided and how this will be kept wet. Paragraph 5.4.23 states that catotelm will be used to create 1.5m high bund. Information should be provided to demonstrate that the catotelm will have the structural strength to support itself in a 1.5 metre bund, how this will re-establish a higher ground water level and what else will be done to keep the peat wet. We may consider this disposal unless justification is given for why this is beneficial, how the reinstated peat will tie in with the adjacent habitat i.e. will there be a smooth sloped profile, sudden discontinuity or will it be flush with ground surface of adjacent habitat (if infilling excavation).***

Paragraph 1.4k says: *Site compound – justification and information* ***should be provided to detail what environmental benefit there will***

[7] See http://www.filtrexx.com/en

be from creating internal soil bunds from mineral soil and filling in between with catotelm, topped with acrotelm turves to 1m depth, as detailed in Paragraph 4.3.2 **[original paragraph numbering, now OPRMP paragraph 5.4.1]*****, how this will be kept wet, and how the 1m depth of reinstated peat ties in with adjacent surface?"***

2.36 Points 1.4j and 1.4k relate to the same area and so to avoid repetition they are addressed together.

2.37 The original OPRMP paragraph 5.4.23 identified that the bunds will be constructed using catotelm; however, taking account of this comment, and the fact that there will be mineral subsoil available during construction, which is generally made of clayey glacial till deposits (see Chapter 13 of the ES) and due to its better geotechnical properties than peat, these materials and not catotelmic peat will be used to form low bunds to contain the reinstated peat. The rationale for using the mineral soil bunds is explained in paragraphs 5.4.1 and 5.4.2 of the revised OPRMP, and it also follows accepted practice[8] and advice from Andrew McBride (SNH, personal communication).

2.38 The ecological benefit of the restoration of the site compound area follows the objectives of the OHMP, as discussed in response to paragraph 1.4 (the benefits of restoration to wet blanket bog habitat are provided in Section 1.4 of the OPRMP). The bunds are required for the reinstatement and restoration to be successful as they join the boundaries of existing enclosures, so that when peat is placed in them, they can hold it and the water inside. The compound area is highly degraded, with bare peat and exposed mineral subsoil. The reinstated peat will be flush with the adjacent areas of targeted infilling as shown in Figure 3.6.1.7 and in examples in OPRMP Photographs 5–7 and Plates 1–3. The land chosen for targeted infilling is nearly flat (slope gradient <3°), thus the surface of the reinstated peat will be nearly flat as well, smoothly merging with adjacent land. This will further extend and support less degraded, modified wet bog habitats north of the Moss Houll area (see Figure 11.3). The reinstated profile will be predominantly flat, as is the existing topography.

2.39 Principles and techniques of keeping peat wet and maintaining the water table are discussed in response to paragraph 1.4a, above. Details of the measures applied in the site compound area do not differ from those used in targeted infilling areas, which are provided in Section 5.6 of the OPRMP and illustrated in Figure 3.6.1.6.

Summary on Peat Related Queries

[8] SEPA 2011 Restoration Techniques Using Peat Spoil From Construction Works. Report 4468 prepared for SEPA by Enviro Centre.

2.40 To summarise, the clarification requested to support the approach to peat reinstatement and management during the construction phase is provided in a revision to the OPRMP. It should be noted that, as identified in Section 3 of the OPRMP, the ES considers the worst case in relation to the volume of excavated peat, because the design and use of floating roads will be undertaken post-consent. In addition, the footprint from the design of crane pads and hardstandings required for construction, and conversely the amounts of construction aggregate (crushed rock) required, were also based on a worst case, in advance of the programme of GI and micrositing to take account of the more detailed information. Therefore, the design of the borrow pits is also a worst case assessment.

2.41 Using the worst case and based upon the conservative estimates of the volume of peat to be excavated (see Section 3 of OPRMP), it is calculated that all excavated peat can be reused onsite. This balance assumes a minimum of 10% loss of volume due to peat settlement. In consequence, it is anticipated that there would be no surplus peat that would have to be disposed of following completion of wind farm construction.

Groundwater Related Queries

2.42 At §2.5 of its letter (Appendix 2,1), SEPA cited a lack of information about groundwater abstractions as contributing to its objection to the Proposed Development. SEPA indicated that it would be prepared to remove this element of its objection if information on groundwater abstractions within 250m of excavations of deeper than 1m in depth and within 100m of excavations shallower than 1m associated with the development were provided.

2.43 The Environmental Statement (ES) for Beaw Field Wind Farm was submitted in March 2016 in which Chapter 15 Hydrology and Hydrogeology presented the findings of data requested from Scottish Water, Shetland Islands Council and SEPA. In preparing the ES Wardell Armstrong undertook a site walkover survey in June / July 2015 and no groundwater abstractions were observed within the study area. For the avoidance of doubt, the study area covered all areas within 100m radius of excavations shallower than 1m and within 250m of excavations deeper than 1m.

2.44 In June 2015, Shetland Islands Council confirmed that they have no records of private water supplies within 5km of the centre of the Site and plans supplied by Scottish Water confirmed that all properties surrounding the Site receive mains water supply.

2.45 The data requested from SEPA identified one CAR licenced surface water abstraction from the Burn of Arisdale, which is undertaken by the Gronidaal Organic Smolts Ltd for use at the Arisdale Smolt Hatchery.

The presence of the surface water abstraction was confirmed during the site walkover survey. No CAR licensed groundwater abstractions were identified. As SEPA does not hold records of groundwater abstractions of less than $10m^3$ per day, and in the interests of completeness, Gronidaal Organic Smolts Ltd and the local crofters were contacted to determine if they abstracted groundwater within the study area. Gronidaal Organic Smolts Ltd and the local crofters confirmed that they do not abstract groundwater, as shown in the appended email (Appendix 2.4).

2.46 We can therefore confirm that there are no groundwater abstractions of less than $10m^3$ per day or more within 250m of excavations deeper than 1m in depth or within 100m of excavations shallower than 1m associated within the development. In relation to paragraph 2.4 of SEPA's letter we can also confirm that **all** abstractions within the aforementioned distances were captured.

3 Ornithology

3.1 This section contains confidential information which may not be disclosed to the general public. It has been deleted from this version but the relevant consultees and the Energy Consents Unit have received the information to allow proper determination of this application.

4 Other Representations

4.1 This section of the FEI deals with the issues raised by the following consultees (All responses presented in Appendix 4.1):

a) Visit Scotland;
b) Scottish Water;
c) MOD/ DIO;
d) Shetland Amenity Trust;
e) Royal Society for the Protection of Birds (RSPB);
f) CH2M on behalf of the Energy Consents Units, Scottish Government;
g) Marine Scotland;
h) 3rd party comments regarding the carbon calculator; and
i) A summary of local community comments and our responses thereto;

j) Shetland Isles Council – Development plans.

Visit Scotland

4.2 Visit Scotland provided its consultation response on 23 March 2016 (Appendix 4.1a) and raised no objections to the Proposed Development. Visit Scotland highlighted the importance of the tourist industry to the Scottish economy and strongly recommended that *'any detrimental impact of the Proposed Development on tourism – whether visually, environmentally and economically – be identified and considered in full'*. In particular, Visit Scotland recommended that full consideration is given to the Scottish Government's 2008 research on 'The impact of wind farms on tourism' study. These comments largely reflect those made by Visit Scotland in its earlier Scoping response to the Proposed Development.

4.3 The ES considered the potential socio-economic and tourism impacts of the Proposed Development in Chapter 6. This chapter makes it clear that the methodology for that study follows good industry practice and the tourism and recreation impact assessment component follows the generally accepted industry standard set out in the recommendations of the 2008 'Economic Impacts of Wind Farms on Scottish Tourism' study research for the Scottish Government. The assessment work carried out therefore followed the advice set out in the document noted by Visit Scotland, amongst other relevant publications (ES, Chapter 6 para. 6.2.3). The assessment considered a range of issues including direct and indirect effects upon local businesses, walking and cycling routes, leisure activities and other visitor attractions.

4.4 Overall, the assessment concludes that residual effects on tourism and business across the Study Area are assessed as being likely overall to be minor and not significant. Some adverse effects upon recreational assets are identified in the ES, predominately resulting from the potential visual impacts of the Proposed Development, however, the ES considers that visitor behaviour will not be significantly adversely affected by the visual presence of the Proposed Development, and that the potential negative behavioural response to such developments i.e. visitors staying away, will not materialise. Hence, these residual recreational effects are assessed in the ES as likely to be minor and not significant.

4.5 It is noted that Visit Scotland does not disagree with these findings in its consultation response and it can be concluded therefore that the recreational and tourism assessment was carried out in accordance with the relevant documents referenced by Visit Scotland and that the impacts of the Proposed Development upon these receptors are not significant.

Scottish Water

4.6 Scottish Water provided its consultation response on 23 March 2016 (Appendix 4.1b) and **raised no objections** to the Proposed Development. It confirmed that there are no drinking water abstraction sources or wider drinking water catchments in the area that may be affected by the Proposed Development. Scottish Water did however, advise that it had infrastructure within the site boundary and it requested that the applicant contact it to discuss whether the presence of this infrastructure would conflict with the infrastructure of the Proposed Development.

4.7 Efforts to contact Scottish Water are ongoing and further updates on this issue will be provided in due course.

4.8 Based upon the information set out in Scottish Water's consultation response, we do not consider that the presence of its infrastructure within the site boundary presents any insurmountable barriers to progression of the Proposed Development. In our experience, either Scottish Water will be able to move its infrastructure (at the Applicant's expense) to ensure there is no conflict with the proposed wind farm infrastructure or some micro-siting of the wind farm infrastructure may be required to satisfy Scottish Water's concerns. Once we have spoken with Scottish Water and agreed on the most appropriate course of action, this will be communicated to all stakeholders in due course, as necessary.

Defence Infrastructure Organisation

4.9 Defence Infrastructure Organisation (DIO) provided its consultation response on 28 April 2016 (Appendix 4.1c) and **raised no objections** to the Proposed Development. In the interests of air safety, the consultation response requested that all perimeter turbines are fitted with a specific type of lighting.

4.10 The applicant is agreeable to the installation of this lighting on the relevant wind turbines and this matter can be dealt with by the imposition of an appropriate condition. The applicant is currently discussing the Proposed Development with the owners of Scatsta Airport to see if it has any specific requirements for the installation of lighting or other mitigation to ensure the Proposed Development does not interfere with the safe operation of the airport. Updates on these discussions will be provided in due course. In all instances it is anticipated that imposition of a suitable planning condition will be sufficient to protect the interests of both organisations.

Shetland Amenity Trust

4.11 Different representatives from Shetland Amenity Trust (SAT) have provided two separate consultation responses (Appendix 4.1d) on the application. The first response, dated 18 April 2016, raised no objections to the Proposed Development but sought clarity on a number of issues including ornithology, ecology, soils and peat, carbon balance and the OHMP.

4.12 We consider that the earlier commentary on response to objections from SNH and SEPA addresses the queries raised by this consultation response, and these comments should be read in tandem with the relevant appendices for a fuller explanation of our position on the various technical points raised.

4.13 The second response dated 28 April 2016 (4.1d) also raised no objections to the Proposed Development. SAT did however, raise three points on archaeological issues in that letter that merit comment and these are addressed below.

Qualified Personnel

4.14 We accept the requirement to undertake archaeological works in advance of and during construction and will appoint a suitably qualified archaeological contractor to undertake these works in consultation with the SIC and SAT.

Written Scheme of Investigation

4.15 Prior to the commencement of development (including enabling works such as geotechnical test pitting) a programme of archaeological works incorporating a Written Scheme of Investigation (WSI) will be prepared by the archaeological contractor and submitted to SIC for approval and will be copied to SAT for reference.

Undertaking LiDAR surveys

4.16 We thank SAT for its comments on LiDAR survey and its views on the risks associated with only maintaining a watching brief as mitigation against the possibility of uncovering hitherto unknown remains. We discussed and considered numerous possibilities for archaeological mitigation strategies with SAT's archaeological contractor during the EIA process including the potential benefits of undertaking LiDAR survey. It was concluded that due to the peat covered nature of the Site, LiDAR survey (which can only detect surface features) would not significantly reduce the risk of discovery of hitherto unknown features and that a watching brief remained the most appropriate mitigation option in this case. It is noted that many archaeological discoveries in Shetland have been discovered beneath the peat including at the TOTAL Gas Plant site referenced by SAT. LiDAR survey cannot detect remains buried beneath the surface and we remain of the view that a LiDAR survey as requested by SAT would not be necessary, reasonable or proportionate in this instance, with the development of and adherence to a watching brief being most appropriate.

Royal Society for Protection of Birds (RSPB)

4.17 to 4.39 This section contains confidential information which may not be disclosed to the general public. It has been deleted from this version but the relevant consultees and the Energy Consents Unit have received the information to allow proper determination of this application.

CH2M on behalf of Energy Consents Unit, Scottish Government

4.40 CH2M was appointed by the Energy Consents Unit to *'technically assess the peat stability report submitted by the developers'*, and provided its written response in a report format dated April 2016 (Appendix 4.1f). CH2M did not raise any objections regarding the peat slide risk assessment (PRSA) prepared by the applicant and noted that the PRSA was prepared in accordance with the relevant best practice guide published by the Scottish Executive.

4.41 Notwithstanding, CH2M did identify some matters that it felt needed to be addressed to make the PRSA more 'robust'. Our response to the issues raised by CH2M is set out in the following paragraphs under the same sub-headings as the consultation response from CH2M.

4.42 Section 4.2 of the CH2M report provided several recommendations for additional work that the Applicant may wish to undertake. These have been considered and relevant responses are detailed below. Conditions have also been recommended with respect to mitigating peat slide risk. These have been reviewed and amended (see Annex 4.2). For example, the scope of some conditions has been extended to include a provision for undertaking the further site investigation recommended by CH2M, which will be included in the post-consent ground investigation (GI) programme as described in paragraphs 1.3.13–1.3.15 of the revised OPRMP, with the findings informing revised PSRA, geotechnical risk register, and final PRMP.

Recommendation 4.2a: ***The report should clearly state the relevant third party data sources used to inform the assessment. This should include, but not necessarily be limited to, guidance, reports, maps, imagery/photographs and digital data.***

4.43 The relevant third party data sources used to inform the assessment included:

- British Geological Survey (2016) Superficial and bedrock geology digital GIS datasets
- Carbon- rich soil, deep peat and priority peatland habitats map (2014). (Online) http://www.snh.gov.uk/docs/A1495150.pdf
- NEXTmap 5m digital terrain model (topography)
- OS VectorMap Local (road network, major inland water and watercourses)
- OS MasterMap Imagery Layer (aerial imagery)
- Orkney & Shetland, Soil Survey of Scotland (1:250,000, Sheet 1). (Online) http://soils-sotland.gov.uk/documents/19141006_39-ORKNEY_AND_SHETLAND_1.pdf
- The Macaulay Land Use Research Institute, 2014 Land Capability for Agriculture Map. (Online) http://www.macaulay.ac.uk/explorescotland/lca_map.pdf

4.44 The field work that contributed to the PSRA included:

- A preliminary survey carried out by specialist peat surveyors between 22nd and 25th January 2015 recording details of peat depths taken on a 250m grid with record of erosion features, drainage, peat cutting, grazing pressure and vegetation cover (see ES Appendix 12.1);
- Following the initial turbine layout and design of infrastructure, a further detailed survey, discussed and approved by SEPA, was carried between 5th and 9th August 2015, where peat depths were recorded on a 50m to 100m grid where access tracks, turbine bases, hardstandings and other infrastructure would be potentially located (see ES Figure 12.2).
- From 29th June to 1st July 2015, Wardell Armstrong team, comprising: soils, geological, hydrology and engineering disciplines, completed site walkovers to identify constraints in relation to geotechnical conditions and hydrology, in order to inform the site design and identify potential sources of construction aggregate.
- Ecological surveys, including vegetation surveys, have been undertaken during 2015, updating and extending upon baseline data from previous years.

- The observations and photographic records of these surveys were used to inform the multidisciplinary team that contributed to the PSRA.

Recommendation 4.2b: ***The body of literature on peat instability relating specifically to Shetland should be consulted, and the learning gained from this demonstrated and applied to the assessment of peat instability hazard and risk at the site.***

4.45 The available literature relating to peat instability on Shetland has been reviewed and from this it can be concluded that the explanation detailed in paragraph 3.1.4 of the PSRA is valid and supported by conclusions available in the literature. Paragraph 3.1.4 of the PSRA that:

'Peat degradation is widespread across the Site (see Chapter 12: Soils and Peat) resulting in numerous surface features such as gullies, hags, extensive areas of bare peat and underlying bedrock. The characteristics of these forms of peat degradation are not considered conducive to peat slide. This is because the gullies are generally wide and their network is intensive which provides channels for rapid runoff, not allowing for the water to flow to a failure plane which could facilitate internal erosion of the slopes through subsurface piping. The gullies are generally stable as indicated by their revegetation (see Plate 1 and Plate 2 in the PSRA).'

. For the sake of completeness the relevant sources are:

Dykes, A.P., Warburton, J. (2008) Characteristics of the Shetland Islands (UK) peat slides of 19 September 2003, Landslides, Volume 5, Issue 2, pp 213-226.
Veyret Yvette, Coque-Delhuille Brigitte. Réflexions préliminaires sur les phénomènes catastrophiques affectant la tourbièrecouverture des îles Shetland. In: Norois, n°160, Octobre-Décembre 1993. pp. 653-664;
Halcrow Group Ltd (2003) Shetland A970 Channerwick Peat Slides - Interpretative Report, Report No. R5917, Shetland Islands Council.
Moore, R., Carey, J., Mills, A.J., Trinder, S., Kerry, L., Leask. G. and Simmons, G. (2006) Recent landslide impacts on the UK Scottish road network: investigation into the mechanisms, causes and management of landslide risk. In bin Mohamad, A. et al (Eds) International Conference on Slopes, Malaysia, Proceedings of Conference, Malaysia, 2006.

4.46 Dykes and Warburton (2008) conclude that the peat slides of 19 September 2003 have resulted *"[…] from the combined influences of several key factors: (1) blanket peat having apparently very high (tensile) strength throughout its depth (not a causal factor) but with (2) spatially variable occurrences of pre-storm cracks and fissures, peat pipes up to 1 m in diameter around and above the failure sites, and other macropores and seepage zones within the peat ('preparatory' factor sensu Crozier 1986); (3) an apparently weak and possibly disconnected* *interface between the base of the peat and an effectively impermeable mineral substrate ('preparatory' factor) and (4) extreme rainfall that generated high and sometimes artesian water pressures at the interface ('trigger' factor). The high peat strength throughout deep (e.g. >1.5 m) blanket peat is a characteristic of the Shetland peat slides. This has contributed to the observed widespread movements and failure of the peat blanket involving a 'slope-wide' mechanism of detachment with the whole peat slope moving en masse."*

4.47 Condition (1) is only fulfilled where peat has not been subject to extensive erosion processes, of which a few are present within the Site (see Figure 3.6.1.7). The majority of the peat within the Site, as evidenced by the aerial imagery and the surveys, is intensively gullied and dissected. Therefore, many surface drainage channels are available for the water to be quickly transported away from the potential zones of infiltration deeper into the peat and cause its instability.

4.48 Condition (2) refers to features that enable the water to infiltrate under the peat and result in pressure at the interface of peat and impermeable underlying substrate (e.g. clayey glacial till), high enough to destabilise the peat. Peat surveys, hydrological surveys, and geotechnical Site walkovers have not identified such features within the Site, as summarised in para 3.1.3 of the PSRA:

Peat condition is of particular importance for peat slide risk assessment, in particular the presence of potential indicators of peat instability. Generally, there were few such indicators present within the Study Area. The main indicator identified during baseline surveys were collapsed piping features evident on the slopes in the Burn of Aris Dale catchment, between Arisdale and Sundrabister. This area is to the west of the turbines and associated infrastructure required for the Proposed Development and will not be disturbed during the construction phase. Therefore, there is no risk of construction related peat slide in this area.

4.49 For the sake of completeness the field data obtained from surveys and site walkover observations, photographic evidence, and the aerial imagery was re-evaluated. It can be confirmed that no features such as compression ridges, thrusts, cracking, historic landslide scars or debris were found near locations of the proposed infrastructure and are generally absent from entire Site. Therefore, condition (2), is not present on the Site. At this stage, comments on condition (3) cannot be provided, because this data is to be obtained during the post-consent ground investigation (GI), as explained in paragraphs 1.3.13–1.3.15 of the revised OPRMP. However, while this condition may increase the risk of peat slide, it has to be present in combination with conditions (1) and (2), which are not present at the Site. Condition (4) requires the necessary precautions are put in place, which will be a requirement of the CEMP, to regularly assess the condition of the peat surface during dry periods, to identify areas of drying and cracking, so that additional control measures can be designed and implemented in the case of heavy rainfall.

Recommendation 4.2c: ***A geomorphological map should be produced for the site.***

4.50 It can be confirmed that the PRSA took into account all available geomorphological features, which are included on Figure 3.6.1.7 of the OPRMP.

Recommendation 4.2d: ***The report should clarify the equipment used for peat probing and how it was verified that the soft deposits being probed were peat.***

4.51 It can be confirmed that a standard peat depth probe was used in the field surveys. The standard utility probe with extensions[9] typically overestimated peat depth by 0.2m, when the underlying mineral soil is soft. Therefore, the data in the PRSA can be confirmed as 'worst-case', in terms of peat depth.

Recommendation 4.2e: ***The resolution of peat probing, and its spatial coincidence with access track alignments and infrastructure locations should be improved.***

4.52 It can be confirmed that there are relatively few locations where the survey grid exceeded 50m for depth probing data used to inform the design of turbine foundation and other infrastructure (see ES Figure 12.2). Those additional areas will be included in the post-consent GI, required by proposed condition 1 (see Appendix 4.2). The GI methodology (agreed in advance with the LPA) would include further intrusive investigation to be provide site specific data on the geotechnical propertied of peat and further data on morphology and structure.

Marine Scotland

4.53 Marine Scotland provided its initial consultation response on 31 March 2016 (Appendix 4.1g). It raised no objections to the Proposed Development but sought clarity on several issues relating primarily to the proposed water quality monitoring programme. Via a letter dated 1st June 2016 (Appendix 4.3) we sought to address the comments raised by Marine Scotland including the suggestion of a planning condition to address Marine Scotland's requirement for further surface water monitoring associated with the Proposed Development.

4.54 Marine Scotland provided a subsequent consultation response dated 9 June 2016 (Appendix 4.3) which commented upon our letter dated 1st

[9] http://www.vanwalt.com/pdf/fact-sheets/Utility-Probe-Fact-Sheet.pdf

June 2016, including the proposed planning condition. Marine Scotland did not object to the proposed imposition of a planning condition to address the various issues but maintains the requirement for a water quality monitoring programme to be implemented, prior to commencement of development. We do not consider it is necessary or prudent to undertake this now prior to determination of the application, but we do agree that it would be necessary to implement this in advance of construction works commencing. Therefore, the proposed condition has been amended to pick up on this requirement to ensure that 12 months' of water quality monitoring takes place in advance of construction commencing, at locations to be identified and agreed in advance with Marine Scotland. Furthermore, we are agreeable to Marine Scotland's request that at least 12 months post-construction monitoring be carried out with associated monthly reporting.

4.55 To address these requirements, the suggested condition to address Marine Scotland's requirements for a SWMS has been amended as follows:-

'No less than 14 months prior to the commencement of development, a detailed Surface Water Monitoring Scheme (SWMS) shall be submitted to and approved in writing by the LPA, in consultation with Marine Scotland. The SWMS will form an appendix to the CEMP and shall inform the CEMP. The SWMS must include:

1. *A plan showing the monitoring positions and national grid references for all monitoring locations;*
2. *A detailed methodology for the gathering of baseline surface water quality information, including provision for the sampling of macro-invertebrates, as well as details of equipment to be used and reporting procedures to be followed;*
3. *A programme that shall extend to:*

    (i) twelve months of monitoring & reporting before construction starts;
    (ii) monitoring & reporting throughout the entire construction period;
    (iii) twelve months of post-construction monitoring & reporting.

The SWMS shall be implemented as approved unless any revision thereto is first agreed in writing by the LPA in consultation with Marine Scotland.'

4.56 Marine Scotland has requested that there should be a requirement for a water quality monitoring programme associated with site decommissioning activities. We are also agreeable to this suggestion but consider it would be more appropriate for any monitoring requirement to be addressed as part of a later site decommissioning plan, rather than as part of the CEMP associated with site construction activities.

Third party comments (including carbon calculator concerns)

4.57 A consultation response from a member of the public dated 15 April 2016 (Appendix 4.1h) raised two queries regarding (1) the location of the site and infrastructure relative to carbon rich soils and (2) the carbon calculations and use of appropriate software. A copy of this response is appended and our responses to these two issues are set out below.

Issue 1

4.58 There are numerous examples in the Environmental Statement of how the impact on peat and peatland habitats would be avoided:

a) Figures 12.1 and 12.2 show that larger and continuous areas of very deep peat (more than 2m) would be avoided by design.
b) Figures 12.4 and 12.5 show that the infrastructure would be located in areas of extensive bare ground and high grazing pressure, i.e. where the vegetation cover has been damaged and modified. Conversely, less degraded, higher biodiversity value areas to the west of the site would be avoided.
c) All excavated peat will be reused on site in restoration of borrow pits and targeted infilling of bare ground areas which used to be functioning blanket bogs (see updated OPRMP for details).
d) Majority of the infrastructure would be located in very low peat slide risk areas.
e) Floating roads would be used (subject to detailed ground investigation) where the gradient and microtopography allows.

4.59 Further clarification on techniques to be used in the reuse of peat is detailed in Section 2 of the updated OPRMP (Appendix 2.2).

4.60 In the context of comments regarding Scottish Planning Policy (SPP), Table 1, it should be noted that Group 2 areas (including carbon rich soils, deep peat and priority peatland habitat) are described in SPP as ‘areas of significant protection’. SPP states that wind farms in these areas may be appropriate in some circumstances where any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation. This categorisation does not therefore function as a ‘blanket ban’ on development in such areas.

4.61 We maintain that areas of deep peat were avoided where possible through site design. In addition, it is a fact that the peat resource across the site is highly degraded in places, as a result of over grazing. A key objective of the Proposed Development, as set out in the OHMP and updated OPRMP, is to conserve and improve the condition of the moorland and blanket bog habitats, which would result in positive residual effects across the site, with associated ecological gain. In terms of the SPP test therefore, we consider that the Proposed Development performs positively assessed against the requirements of SPP and the Spatial Framework set out in Table 1. This matter has been addressed in detail in the Planning Statement accompanying the application.

Issue 2

4.62 The use of version 2.9.1 of the carbon calculator and justification for the values used in row 10 of tab 5b has been provided in paragraph 14.3.3 of the Carbon Balance chapter of the ES. The official tool version for use in planning applications is 2.9.0, but version 2.9.1 was used instead. This is because version 2.9.0 does not allow for changing values in cell C10, tab 5b – CO_2 loss from removed peat (% C contained in disturbed peat that is lost as CO_2), even though it contains a note that if the peat is permanently restored, a lower percentage should be entered here. All excavated peat will be reused on site to restore of extensive degraded areas, as originally described in Annex 1 of Appendix 3.6: Outline Peat Reinstatement Management Plan and the updated OPRMP. The correct use of the calculator can be confirmed by downloading the 2.9.1 version from the Scottish Government website and using input values provided in Appendix 14.1. The results will be unchanged. A locked version of the unprotected spreadsheet has been included in this FEI submission (Appendix 4.4).

4.63 The heading in tab 5b states: “Note: If peat is treated in such a way that it is permanently restored, so that less than 100% of the C is lost to the atmosphere, a lower percentage can be entered in cell C10”. It is only possible to perform this adjustment if version 2.9.1 (unprotected) is used.

4.64 The value for the Beaw Field Wind Farm efficiency factor was questioned. The capacity factor is the estimated annual output (provided in Appendix 3.4) divided by the annual output at rated capacity, hence: 234MWh ÷ (57.8MW × 24h × 365) = 46.2. The methodology for the estimation of annual output has been provided in section 1.2 of Appendix 3.4.

4.65 In relation to discussion around core data cell G27, we confirm that site specific figures were not available due to the heterogeneity of the site in relation to existing surface features that affect water table levels, such as erosion gullies and extensive peat cutting. If the measurements were performed in an undisturbed area, it would not have been representative for the site. A reasonable worst-case assumption of 10m was used as the expected value (5m and 20m for minimum and maximum respectively) based on the fact that the site is heavily degraded. It was inferred that the water table would have been lowered already in many locations. Even if it was not the case, typical extents of drainage are much lower than the third party suggests. For example, Stewart and Lance (1991) in their study of water-table depths on a blanket bog found that the mean water table levels lowering due to artificial drainage "was slight and confined to a zone only a few metres wide on either side of the drain" (up to a distance of 3m).

4.66 This parameter has proven difficult to obtain in practice and it is rarely measured for the purpose of planning applications, as observed by SEPA itself:

Drainage extent around drainage features: although the payback time is highly sensitive to this parameter (see Table 4), the majority of data inputs to the tool are based on general site observations and default literature values, as this parameter is difficult and laborious to measure directly. The development of a simpler measurement method based on factors that influence drainage extent but are easier to measure (e.g. hydraulic conductivity, site slope) could provide more accurate site-specific data for this parameter (Sebastian et al. 2014).

4.67 In relation to core data cell 41, we are unable to verify the claim that an appropriate value would be 0.394tCO_2. Defra 2015 values are from the UK government website which says that: "These factors are suitable for use by UK based organisations of all sizes, and for international organisations reporting on UK operations". We do not contest that the ±10% values for max. and min. are arbitrary as there are not published errors for these estimates. We maintain that our assessment is nevertheless robust.

4.68 Regarding the use of counterfactual values for the coal, fossil fuel, and grid emissions, we have followed relevant guidance in our consideration of this element of the calculator. The issue of use of future counterfactual values has been considered but has not been resolved among users of the calculator. No reliable future predictions are available and so the most recent values have to be used.

4.69 Regarding the result in cell E38 of the "Payback Time and CO2 emissions" of the calculator tab, it exceeds the decarbonisation target only for the maximum value, which would only be the case if *all* of the input parameters were equal to their worst case estimates, simultaneously. In reality it is highly unlikely, if not impossible, that all the inputs would be at their worst case (max. or min.) values. For some parameters, like the drainage extent (see point 3, above), the values may actually be better than the expected input. It is also true that substituting values from the official protected version 2.9.0 at tab 5b row 10 results in the expected carbon intensity exceeding the 2030 target. This however, would only be the case if all carbon from the excavated peat was released to the atmosphere. This is not going to be the case as all peat would be used in site restoration. Simple substitution of the values in tab 5b shows that more than 67% of the carbon from excavated peat would have to be lost to reach the decarbonisation threshold. Our change in the value of the cell in question is according to the guidance provided within the calculator.

4.70 An additional point has been raised in the Sustainable Shetland response regarding peat removal values. SIC has queried why the volume of peat removed (360,241m³) is higher than that stated in chapter 12 (252,486m³).

4.71 In brief the calculator uses different methods to estimate the volumes. While the estimates in Chapter 14 use a 3D model of the peat surface, the calculator uses average depths and the footprint only.

Summary of local community comments and our responses thereto

4.72 According to the Energy Consents Unit website, a total of 50 representations were received from members of the public in response to the application. This includes one objection from Sustainable Shetland (dated 19 April 2016), a voluntary group comprising 850 members, who oppose the presence of large scale industrial wind farms on Shetland Island.

4.73 Of these 50 representations, 42 are in support of the Proposed Development and 8 are objecting to the Proposed Development. A summary of the key reasons for objecting and supporting the application is provided in the table in Appendix 4.5 of this letter with our summary response to each point included too.

Landscape and Visual Effects

4.74 Consultation responses have been received from both SNH and Shetland Island Council (SIC) in respect of the Landscape and Visual Impact Assessment for the Proposed Development. Both consultation responses broadly accept the findings of the LVIA and neither formally object to the Proposed Development on landscape and visual grounds. However, they do highlight areas of concern in respect of the significance of landscape and visual effects assessed at certain locations, cumulative effects and wind farm design. These issues are discussed further under the following headings.

National Landscape Designations

4.75 Both SNH and SIC consultation responses agree with the LVIA that there would be **no significant impact** on the special qualities of the Shetalnd National Scenic Area (NSA).

Local Landscape Designations

4.76 SNH does not comment on the effects on the local landscape designations, but the SIC consultation response states that it does not disagree with the conclusions in the LVIA that the Proposed Development would not lead to a significant effect on the special qualities of the Ronas Hill, Lunna Ness and Lunning Local Landscape Areas.

Wild Land

4.77 SNH agrees with the LVIA findings that there would be no significant impact on the Ronas Hill and North Roe Wild Land Area. The SIC response points out that the proposed wind farm would add to the 'arc of human artefacts and evidence of contemporary land use outside the WLA' and contends that this may not be covered in the EIA. The SIC response goes on to state that the wind farm would have further negative impact of the sense of remoteness and sanctuary.

The ES (para 7.4.26) states that:

'*In 2014, SNH published a new map identifying Wild Land Areas (WLAs)*[10]*, which are considered to be important in a national context. The mapping is the result of a two-stage study. Phase 1 of this work mapped relative wildness; Phase 2 identified and defined Core Areas of Wild Land more precisely. In a document collating consultation responses to Phase 1*[11]*, SNH responded to a series of comments regarding the visibility of wind farms, stating that:*

"the mapping of viewsheds up to 30km does not mean that areas from which turbines are visible cannot be considered as wild land".

4.78 The ES (para 7.4.28 & 7.4.29) goes on to state that:

'*Views towards the Site would be available from the east facing slopes of Ronas Hill. The visual context of these views is already influenced by large scale telecommunications masts at the edge of the WLA, views to the more distant Sullom Voe Oil Terminal and the more settled coastal landscapes to the east. As such the Proposed Development would not introduce manmade features into the visual context of the WLA where these are currently wholly absent.*

Given the distance between the WLA and the proposed turbines (in excess of 15.8km), the existing visual context of manmade features to the east and the limited extent of visibility from the wilder areas of the WLA to the north and west it is considered that significant effects upon wild land character would not occur.'

4.79 It is true to say that the Proposed Development would add to the arc of man-made features in views from the east side of the Wild Land Area.

[10] *Scottish Natural Heritage, (2014). Core Areas of Wild Land Map, SNHs Advice to Government – 16 June 2014*

[11] *Scottish Natural Heritage, (2014). Analysis of Responses on Phase One Wildness Mapping April 2012.*

However, at distances in excess of 15.8km and in the context of other man-made features at closer proximity this would not fundamentally alter the sense of remoteness or sanctuary in the Wild Land Area. This sense of remoteness and sanctuary is more associated with wilder areas to the north and west, where views of man-made features do not already influence the landscape context.

Landscape Character

4.80 The SNH response would appear to agree with the LVIA that there would be localised significant effects on the immediate site (Yell Peatlands) and the transitional areas with the adjacent crofting (Scattered Settlements/Crofting and Grazing Land) and coastal areas (Coastal Edge). It should be noted that wind farm development will always have a significant effect on the landscape character of its immediate environment due to the introduction of large scale structures, movement and associated infrastructure.

4.81 The LVIA concludes (para 7.9.3) that:

'In all cases the likely significant effects on landscape character would occur in a localised area c.2.5km from the proposed turbines in the southeast corner of the island of Yell, as illustrated on Figure 7.12. In this area the proposed wind farm and associated infrastructure would redefine a localised area of each LCA, with turbines becoming a key characteristic. These effects would influence a relatively small area of Yell due to the screening effects of topography to the north west of the Site.'

Viewpoints

4.82 The LVIA (para 7.9.4) concludes that:

'Of the twenty three viewpoints considered the assessment has determined that there would potentially be likely significant visual effects at ten of these viewpoints. Significant visual effects would generally be experienced by people within 5km of the Proposed Development on the island of Yell. In addition, there is potential for some significant visual effects from coastal areas on adjacent islands within c.12km, where the landform of Yell forms the key component of the views available. This would also include the ferry crossing from Toft to Ulsta and the ferry crossing from Vidlin to the Out Skerries, as well as the northern tip of Lunna Ness, southeast coast of Fetlar and the coastal area between Mossbank and Toft.'

4.83 This is consistent with the SNH response which considers that there would be significant visual effects out to 12km for some high sensitivity receptors in some local communities. However, it should be noted that this would be the case for any wind farm development on Yell due to coastal communities on adjacent islands looking across the sounds to the landform of Yell as a backdrop/ focal point.

4.84 The SIC response reviews a number of viewpoints and is broadly in agreement with the LVIA in respect of where significant visual effects would occur. The SIC response suggests that the LVIA does not comment on the reversibility of visual effects. However, this is not the case as Appendix 7.6 clearly states that the visual effects predicted are reversible and would not occur following decommissioning. This is particularly the case for some of the more distant viewpoints in coastal communities on adjacent islands.

4.85 The SIC response in relation to a number of the viewpoints comments that the turbines would not have any hills to form a backdrop, so would be prominent. This is not the case as backclothing of wind turbines against a landscape backdrop rather that the sky is recognised as increasing the prominence of wind turbines, rather than the other way around.

4.86 There have been a number of studies in respect of the backclothing of turbines and one particular study states that:

'Light-coloured wind turbines seen against a dark-coloured backcloth will typically have greater prominence than either light or dark-coloured wind turbines seen against the sky' (Caroline Stanton CMLI, (2012), The backclothing of wind turbines in the Scottish landscape - A report to the Cairngorms National Park Authority).

4.87 This is consistent with earlier guidance produced for SNH in 2002 University of Newcastle (2002) Visual Assessment of Windfarms Best Practice . SNH Commissioned Report F01AA303A which indicates in Figure 2 (page 63) that backgrounding of turbines tends to increase the apparent magnitude of the visual impact.

4.88 The SIC response indicates that there would be significant visual effects from the pier, marina and caravan site at Burravoe. However, the ZTV on Figure 8.1b illustrates that there would be limited visibilty of turbines due to intervening tompography. This is supported by the appended wireframe (4.6) which has been generated from the caravan site/marina.

Cumulative Effects

4.89 Whilst the cumulative baseline plan (ES Figure 7.10) shows the Proposed Development located between Viking and Garth there is significant physical and visual separation between each of the proposed schemes as set out below:

- Viking to Beaw Field 20.7km
- Beaw Field to Garth 16.9km

4.90 The SNH response suggests that at a strategic level the Proposed Development could intrude upon an “area of respite” between the Viking and Garth schemes, sequentially linking the two developments.

4.91 Whilst at a strategic plan level this conclusion could be drawn, a review of the visibility from sequential routes and the representative viewpoints does not support this proposition

4.92 Firstly, it should be noted that there is very limited visibility of the Proposed Development from A roads on the mainland, Yell or Unst. As set out in the cumulative sequential visual assessment (Paras 7.7.15 – 7.7.22) this would be limited to

- c. 700m on the A970 near Green Ward (west of Sullom);
- c.1.2km on the A970 at Colla Frith, and
- c.1.2km on the A970 at North Roe
- c.900m on the A968 at the Hill of Swinster
- c.2km on the A968 on the approach to Toft ferry terminal
- c. 600m on the A968 immediately after leaving the Ulsta ferry terminal.

4.93 Once leaving the ferry at Ulsta on the A968 views of the Proposed Development are not possible due to landform until passing over the Hill of Basta to the north of Mid Yell, some 11km north of the Proposed Development. Beyond the Hill of Basta there would be no further views of Beaw Field turbines from this route until Unst. The main visibility in this area being the wind farm at Garth.

4.94 Given the limited extent of visibility from the main A roads in Shetland cumulative sequential effects with other schemes would not be significant and the development would not intrude on any “area of respite” for the majority of travellers along the A road network of Shetland.

4.95 Secondly, as set out in the cumulative visual effects assessment, viewpoints within 5km of the proposed development would only have views of the distant Viking development and not the Garth turbines. The only locations where the Proposed Development would be seen between the Viking and Garth turbines would be those from elevated locations to the north, east and west and coastal edges on the adjacent islands to the east. Whilst the Proposed Development would increase the frequency of wind farms on the distant horizon there would be no coalescence of schemes and each scheme would remain a distinct feature on the distant horizon in different landscape character types. As such cumulative effects would not be significant.

Wind Farm Design

4.96 SNH recommends further refinement of the wind farm design and the siting and design of borrow pits and grid connection to mitigate landscape, visual and cumulative effects.

4.97 The ES sets out the design process in Chapter 5, which explains the iterative approach that has been undertaken to arrive at the layout submitted. Landscape advice was included in this iterative approach and Table 5.2 in the ES summarises that:

'The layout was revised to reduce the number of turbines, with the final design achieving a near even spacing, thus reducing the footprint of the wind farm. The eastern turbines have been removed thereby increasing the distance from the nearest turbine to the coast line. In addition, there are no turbines located on the higher ground to the west of the Site'

4.98 The submitted layout represents the optimum layout and due to site constraints there is limited, if any, scope to relocate turbines.

4.99 Borrow pits have been located to exploit suitable mineral deposits and will be restored to minimise long term significant landscape and visual effects. The substation has been located to utilise degraded peat areas and its visibility would be subsidiary to the much taller turbines. As set out in the LVIA these views would be limited to the south east corner of Yell and as such effects would not be widespread.

4.100 In summary SNH and SIC do not formally object to the Proposed Development on landscape or visual grounds. SNH and SIC broadly accept the findings of the LVIA, but raise a number of concerns/comments that have been addressed above.

4.101 All large scale wind farm developments would have significant landscape and visual effects in their immediate vicinity. The significant effects of the Proposed Development would be localised due to topography and would be limited to c. 2.5km for landscape effects and 5km for most significant visual effects. There would be some isolated significant visual effects extending to 12km for coastal communities on adjacent islands where the south of Yell forms a skyline to views.

5 Noise

5.1 During consideration of this application the Applicant was made aware of a single small-scale turbine that had been erected (with the benefit of planning consent) in Gossabrough. To establish whether this made any material difference to the predictions and conclusions presented in Chapter 16 Noise of the ES, it was included in a fresh iteration of the noise assessment.

5.2 We considered the consented turbine using the coordinates included within the Planning Application. The location for the turbine and its location relative to nearby noise sensitive receptors are shown on the plan below.

5.3 The relevant data for the Gossabrough turbine was included in the noise models and the cumulative noise predictions were updated. A set of revised noise graphs are appended (Appendix 5.1). To assist the reader, the updated graphs have been labelled the same as those included within the Environmental Statement. The closest noise sensitive receptor to the proposed Beaw Field Wind Farm and the Gossabrough turbine is Whirliegarth (H2 in the ES) where the inclusion of the Gossabrough turbine was found to have **a negligible impact** (maximum 0.4dB increase in cumulative predictions).

5.4 The inclusion of the turbine results in a very minor change to the Beaw Field Site Specific Noise Limits which would reduce by 0.1dB (at 9-10ms^{-1}) and 0.2dB (at 11-12ms^{-1}) but ultimately this must be considered 'negligible' as wind farm noise limits are frequently rounded to the nearest whole number. If this approach were adopted for the Proposed Development, then due to the rounding of the noise limits within the noise conditions the 0.1dB reduction in the site specific limits would result in the change of the noise limit during the daytime period at Whirliegarth at 9ms^{-1} which would reduce from 41 to 40dB. Accordingly a set of updated noise limits is also appended (Appendix 5.2).

5.5 The main reason, other than the distance to the receptor, that the impact is negligible is due to directivity. As a worst case, noise predictions are usually calculated considering downwind conditions, which have the effect of applying no directivity attenuation. In this circumstance, due to its location the receptor Whirliegarth (H2) cannot be downwind of the Gossabrough wind turbine and proposed Beaw Field Wind Farm at the same time, as a result a certain degree of directivity attenuation has been accounted for which has had the effect of reducing the predictions more than they would if 'downwind' only is considered at the property. The inclusion of directivity has been undertaken in accordance with the guidance outlined in the IOA GPG.

5.6 This additional assessment shows that the inclusion of the consented turbine has a negligible impact on the cumulative noise assessment. The conclusions presented in the ES therefore remain unchanged; there are no likely significant effects.

5.7 For completeness a revised series of noise conditions has also been appended (Appendix 5.3).

6 Summary

6.1 This FEI has been prepared in response to the request on 22nd June 2016 from the Scottish Ministers for further environmental information in line with regulation 13 of the Environmental Impact Assessment (Scotland) Regulations 2000 as amended.

6.2 This FEI has sought to provide the clarification requested by several organisations on different aspects of the Proposed Development and now forms part of the application documentation. The purpose of the FEI is not to respond to every issue raised; rather it addresses only those that are – in the view of the Applicant – material to the ECU's ability to provide a recommendation to the Scottish Ministers.

6.3 In the event that further requests for clarification arise as a consequence of consultation on this FEI, they will be dealt with on an individual basis and – depending upon their nature – may not warrant further publication by the Applicant.

Schedule of Appendices

Appendix 2.1

SEPA Letter

SEPA
Scottish Environment Protection Agency

Our ref: PCS/145605
Your ref:

Joyce Melrose
Local Energy and Consents
The Scottish Government

If telephoning ask for:
Alison Wilson

19 April 2016

By email only to: EconsentsAdmin@scotland.gsi.gov.uk

Dear Ms Melrose

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000
Planning application:
The construction and operation of a wind farm comprising up to 17 turbines with an installed capacity of over 50MW and including associated access tracks, anemometry mast, substation, radio communications tower, underground cabling from turbines to substation, temporary construction compound, lay down area, up to four borrow pits and a scheme of habitat enhancement and mitigation
Beaw Field Wind Farm, South Of The Island Of Yell

Thank you for your consultation email which SEPA received on 15 March 2016. Unfortunately we **object** to this planning application on the grounds of a lack of information on the appropriate reuse and management of peat on site and potential impacts on groundwater abstractions. However, we will be pleased to review this objection if the issues detailed in Sections 1 and 2 below are adequately addressed.

We also ask that the planning **conditions** in Sections **4, 5, 6 and 9** be attached to the consent. If any of these will not be applied, then please consider this representation as an **objection**. Please also note the advice provided below.

Advice for the determining authority

1. Disturbance and re-use of excavated peat

1.1 We note that "Habitats within the Site are blanket bog, degraded blanket bog and moorland pasture with areas of deep peat. Across the Site, peat depths vary from 0m to a maximum depth of 4.35m with an average depth of 1.25m" and that in total it is estimated that approximately 252,496m^3 of peat will be disturbed as a result of the Proposed Development proceeding.

1.2 Given the large volume of peat to be excavated and reused we have concerns regarding this aspect of the proposal, specifically in regard to the reuse of peat for restoration of the borrow pits, and therefore **object** due to a lack of information on the appropriate reuse and management of peat on site. In addition aspects of this part of the proposal will require an exemption under the Waste Management Regulations and currently they do not meet the requirements of the relevant exemption. To address our concerns we would ask that further details of the peat management and re-use plans are agreed prior to any granting of consent. Further advice on how to address our concerns is provided below.

1.3 The Environmental Statement (ES) details that all of the excavated peat would be reused for the reinstatement of construction areas (including access tracks, borrow pits and cable trenching) or as part of the Peat Reinstatement Management Plan (PRMP) mitigation measures. It goes on to state that "Given the presence of bare eroded peat habitat across the Site, the most appropriate mitigation measure to manage excavated peat is to progressively reinstate areas of bare eroded habitat in order to reduce areas of exposed peat. Restoration of the large gullies present across the Site can be mitigated against by creating peat plugs/dams." While we consider this may be a good approach we require more information on the techniques to be used to determine whether this will be acceptable and not disposal.

1.4 We note the statement "Dependent on the final borrow pit design, unconsolidated peat would be used at depths between 2 and 3.5m to create a saturated mire type habitat. Turves formed from acrotelm would be used on the surface to promote succession to habitats of equivalent value and those defined in the baseline environment." The use of excavated peat in borrow pit restoration must be in keeping with the overall habitat and reinstatement objectives; only the quantity of peat necessary to achieve these objectives should be used, up to a maximum thickness of 2 metres. In regard to this and the information in the Outline Peat Reinstatement and Management Plan in the outline Construction Environmental Management Plan we advise:

- Access tracks, turbine bases & hardstandings perimeter, reinstated depth 0.3m, all acrotelm. The max height of 0.3m (i.e. thickness of the acrotelm turf) is acceptable. However, information will need to be provided to demonstrate how the peat will be kept wet and how the water table will close to the reinstated surface.
- We welcome the proposed measures in paragraphs 5.4.6 – 5.4.8. Reinstatement of a previously excavated strip of 2m width on either side of the track is acceptable, assuming that this does not lead to damage to existing bog vegetation – which will need to be demonstrated.
- As per paragraphs 5.4.19 – 22 we note BP1 and 4 will be reinstated to a 2m depth. However it is proposed to reinstate BP1 to dry heath habitat which would only require 0.5m depth of peat in reinstatement, not 2m. The original peat depth is 0.52m so justification is required for why 2m thickness would be required for ecological benefit. We would consider 0.5m to be a more appropriate depth.
- BP4 – original peat depth 0.52m, proposed reinstatement to 2m. Details of the target habitat is not given so as above justification and details of the target habitat should be provided for the proposed 2m thickness.
- In regard to BP 2 and 3 please note that the proposal to reinstate 2.5 and 3.5m respectively **exceeds** the maximum allowable in a borrow pit, which is 2 metres and therefore this aspect of the proposal needs to be modified.
- BP2 – original peat depth 1.13m, also restoring to dry heath (0.5m) – we would accept a thickness to the original peat depth. We consider 2 metres or more would be excessive. Details of modified proposal should be provided complying with this.
- BP3 – restoring to wet modified bog. The original peat depth is not given. 1.5m is around the maximum for modified bog requirements. The maximum original peat depth appears to be 2.5m from the survey map therefore a maximum peat depth of 2 metres would be acceptable. Details of modified proposals should be provided complying with this.

- Anemometry mast – no information has been provided on why 1.5 metres peat depth for reinstatement is required. Justification should be provided on why this depth is needed, what the target habitat for restoration is and how the peat will be kept wet and water table raised to close to surface.
- Ditch/gully blocking and targeted infilling to 1.5m (acrotelm/catolem) – a large amount of catotelm is to be used in targeted infilling. Justification for this depth should be provided along with more detail on the techniques to be used. This could be a good use of the peat but needs to be done carefully. Innovative effective techniques for restoring eroded peat gullies has emerged from the Peatland Action programme – there is a short video about reprofiling on the SNH website, and they direct the reader to http://www.yppartnership.org.uk/userfiles/File/100709%20Technical%20Guidance%20Note%202%20Specification%20for%20%20Large%20grip_gully%20blocking%20TT.pdf on gully blocking. The applicant may wish to contact Andrew McBride, the Peatland Action programme manager for SNH, for advice.
- Compound during construction - justification for the proposed 1m depth (acrotelm and catotelm) should be provided and how this will be kept wet. Paragraph 5.4.23 states that catotelm will be used to create 1.5m high bund. Information should be provided to demonstrate that the catotelm will have the structural strength to support itself in a 1.5 metre bund, how this will re-establish a higher ground water level and what else will be done to keep the peat wet. We may consider this disposal unless justification is given for why this is beneficial, how the reinstated peat will tie in with the adjacent habitat i.e. will there be a smooth sloped profile, sudden discontinuity or will it be flush with ground surface of adjacent habitat (if infilling excavation).
- Site compound – justification and information should be provided to detail what environmental benefit there will be from creating internal soil bunds from mineral soil and filling in between with catotelm, topped with acrotelm turves to 1m depth, as detailed in Paragraph 4.3.2, how this will be kept wet, and how the 1m depth of reinstated peat ties in with adjacent surface?

1.5 If the applicant requires further advice on our information requirements to address our concerns, detailed in Sections 2.3- 2.5 above, they are advised to contact a member of the local Operations team in our Shetland office, contact details are provide in Section 11 below.

2. Existing groundwater abstractions

2.1 The Environmental Statement (ES) states "SEPA requested that all groundwater abstractions are identified within 250m of excavations deeper that 1m in depth and 100m of excavations less than 1m in depth. A data request to SIC confirmed that there are no groundwater abstractions within the Site." However Section 15.5.19 of the Environmental Statement (ER) states "SIC confirmed that there are no known private water supplies within 5km of the centre of the Site via email 15th June 2015 (Appendix 15.3)." Section 15.5.20 details the SEPA Controlled Activities Regulations (CAR) regulated sites within 1km of the site and these are shown on Figure 15.2.

2.2 In our scoping response of 8 May 2015 (PCS/139717) we advised the applicant to "refer to Sections 2.6-2.9 and Appendix 3 of guidance note Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems".

2.3 Section 2.8 of this guidance states "Information on all groundwater abstractions must be obtained by a site walkover with additional information from SEPA, local authorities and local residents" and that "The following information for each identified water supply source should be submitted:

• Source location (including National Grid co-ordinates);
• Source type eg spring, borehole etc;
• Use eg domestic water supply for house, water troughs for livestock, supply to industrial/commercial premises;
• Abstraction rate (this could be estimated from, for example, the number of people/animals using the supply).

This section of the guidance also details that "we do not hold information on abstractions of less than 10m3 a day as this is covered by General Binding Rules".

2.4 Therefore while the applicant has obtained information from SEPA and the local authority on known abstractions it is not clear if all groundwater abstractions within the following distances of development have been identified, in order to assess potential risk:

a) within 100m radius of all excavations shallower than 1m
b) within 250m of all excavations deeper than 1m

2.5 We therefore **object** to this aspect of the proposal due to a lack of information. To enable us to remove our objection the applicant should confirm if all groundwater abstractions within the above distances have been identified and provide the information, including mapping, detailed in Section 5 of our scoping response in accordance with our guidance note Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems.

3. Impacts on groundwater dependant terrestrial ecosystems (GWDTE)

3.1 We accept the assessment that the proposed development has been designed to avoid potential GWDTE as far as possible and appropriate mitigation, such as that detailed in Section 11.7.20 of the ES, is proposed. We therefore have **no objection** to the proposed development on the grounds of potential impacts on GWDTE. However we ask that the finalised CEMP includes details of the full range of measures to be put in place to protect surrounding groundwater dependant habitats including micrositing and mitigation measures.

4. Micro-siting

4.1 We note the proposed 50m radius micro-siting distance shown on Figures 3.21 A and B and referenced in Section 11.7.12-13. We consider that micro-siting can play an important role in avoiding small pockets of deep peat or other sensitive features on the site. We therefore request a **condition** is applied enabling the applicant to micro-site the built elements of the scheme.

5. Pollution prevention and environmental management

5.1 We welcome the submission of the outline construction environmental management plan CEMP, prepared by Wardell Armstrong for the Proposed Development (Appendix 3.6), and note the details of the proposed measures to be incorporated into the construction CEMP to protect the environment.

5.2 To ensure that the development does not significantly negatively impact upon the environment we request that a **condition** is imposed requiring that a full site specific Construction Environmental Management Plan (CEMP), is submitted for approval of the planning authority prior to the proposed commencement of the development (or relevant phase). We recommend this is submitted at least two months prior to the proposed commencement of development in order to provide consultees with sufficient time to assess the information. To assist, the following wording is suggested:

Condition: No development shall commence on site until a site specific Construction Environmental Management Plan (CEMP) has been submitted to, and approved in writing by, the Planning Authority in consultation with SEPA. All works on site must be undertaken in accordance with the approved CEMP unless otherwise agreed in writing with the Planning Authority.

Reason: In order to minimise the impacts of necessary construction works on the environment.

5.3 This document should address all pollution prevention and environmental management issues related to the development and operation of the site. We have provided further advice to the applicant on this matter in section 10 below.

6. Engineering activities in the water environment

6.1 Section 11.7.12 of Chapter 11 of the ES states "As a matter of course, a 50m marked exclusion zone would follow all at-risk watercourses and water bodies, whenever possible. Where exclusion is not possible, such as at crossing points, access to the watercourses by personnel and machinery would be kept to an absolute minimum and would follow agreed plans and methods." We welcome this approach and in order to ensure that the water environment is adequately protected, we request that a **condition** is applied to ensure that all new infrastructure (with the exception of any proposed watercourse crossings and directly related tracks) occurs outwith the 50m buffer area from water features on site unless justification is provided and it is agreed in writing with the planning authority, in consultation with SEPA.

6.2 We note the details of the proposed watercourse crossings in Appendix 3.1. The proposed burn crossings will require authorisation under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 and the modification of existing road bridge across Burn of Arisdale will require a simple CAR licence. Based on the information provided we consider these aspects of the proposal are likely consentable and therefore have no concerns from a planning perspective. If the applicant requires further advice on CAR or how to apply for CAR consent they are advised to contact a member of the local operations team in our Shetland office.

7. Borrow pits

7.1 We note the proposal includes four borrow pits – we have **no objection** to the location or use of the borrow pits on site, however please note the advice in Section 1 above regarding our concerns with the reuse of peat for the restoration of the borrow pits.

8. Flood risk

8.1 Further to our scoping advice, "we have reviewed the information provided in this consultation and it is noted that the application site lies out with the medium likelihood

(0.5% annual probability or 1 in 200 year) flood extent of the SEPA Flood Map, however there are several small watercourses and waterbodies in close vicinity.", we welcome receipt of the Flood Risk Assessment (FRA) dated March 2016.

8.2 We note that the site is characterised by hilly uneven terrain with the majority of the site situated between 80 and 150m Above Ordnance Datum (AOD). From Figure 15.3 we also note that a buffer has been applied to all watercourses and that the turbines will be situated out with this buffer.

8.3 As there are no sensitive receptors in close vicinity and given that the site has a steep gradient, it seems unlikely that the development would have an adverse impact on local flood risk. As such we have **no objection** on flood risk grounds.

8.4 Any associated access tracks and laydown areas should be situated at least 6m from any watercourse where possible. Where this is not possible, the tracks should not result in an elevation in ground levels.

8.5 We note from the FRA that "Watercourse crossings will be designed to convey 1 in 200 year flood event." We welcome this commitment and strongly **advise** that any water course crossings should follow good practice guidelines and should be adequately sized to enable them to convey the 1 in 200 year design flow at each point without causing constriction of flow or exacerbation to flood risk elsewhere.

9. De-commissioning and site restoration

9.1 Appendix 22.1 includes a Schedule of suggested changes. Within this a decommissioning condition is suggested under item 39. We welcome the commitment from the applicant to produce a statement for the decommissioning of the wind farm and the restoration of the land. Full details will be required, including detailed plans and method statements and our advice will be dependent on the rules and regulations in place at the time of decommissioning.

9.2 In light of the above, we request that a **condition** is applied seeking a Decommissioning and Restoration Plan. The Plan should be submitted at least two years prior to the end of the design life of the development and be based on the best practice current at the time of submission.

9.3 We note the condition wording suggested includes "requirements to identify any elements to be retained on site". We would take this opportunity to highlight that any proposal to discard materials that are likely to be classed as waste would be unacceptable under current waste management licensing and under waste management licensing at time of decommissioning if a similar regulatory framework exists at that time. Further guidance on this may be found at www.sepa.org.uk/waste/waste_regulation/is_it_waste.aspx. Decommissioning of the site should be in line with all regulatory requirements existing at the time of decommissioning.

Detailed advice for the applicant

10. Pollution prevention and environmental management

10.1 Please note that we have requested that a planning condition is attached to any consent granted requiring the submission of a site specific and detailed Construction Environment Management Plan (CEMP).

10.2 Measures should be included to ensure that there is no impact upon the environment and particular consideration should be given during the construction and operation works to the protection of the water environment in and adjacent to the site. The CEMP should incorporate detailed pollution prevention, site waste management and mitigation measures for all elements potentially capable of giving rise to pollution or causing environmental harm.

10.3 For the avoidance of doubt the finalised CEMP should, as a minimum, consider and address/include the issues set out on our Pollution prevention and environmental management webpage (www.sepa.org.uk/planning/construction_and_pollution.aspx). In addition, the following should also be addressed:

a) Wetland protection: we ask that the finalised CEMP includes and details the full range of measures to be put in place to protect surrounding groundwater dependant habitats. As highlighted in section 3 above, we would like to see consideration given to micrositing and mitigation measures to protect wetlands in the CEMP.
b) Waste management: developers may need to dispose of significant quantities of waste during the construction and operation of a development. This can include waste soils, peat, refuse from welfare facilities or surplus construction materials. Wherever possible the waste hierarchy of reduce, reuse and recycle should be encouraged.
c) Surface water drainage during construction: a construction surface water management plan should be submitted as part of the CEMP. As a minimum, this should include a map of all watercourses and ditches on site and all proposed infrastructure, mitigation proposals and justification of appropriateness, a map of all proposed mitigation locations (i.e. silt fences, straw bales, cross drains, settlement lagoons), details of emergency procedures, a map of spill kits, an inspection checklist, procedure and schedule (i.e. weekly, after events, etc.), details of the staff training in the surface water plan, emergency procedures and use of the spill kit.
d) Surface water drainage during operation: details should be submitted detailing how surface water drainage will be managed during operation of the development. Please note that SEPA only considers water quality aspects of surface water drainage. Water quantity aspects of surface water drainage fall within the remit of the local authority.
e) Adverse weather: a site specific wet weather working plan should be submitted which should include an action plan – *i.e.* stop working, when to re-attend, assess potential damage, contact downstream users, *etc.*, an inspection checklist/procedure to check sediment mitigation after wet/adverse weather, details of the location of any lagoons and areas of vegetation for potential over-pumping, list of appropriate equipment on site and training in use – pumps, geotextile, etc.
f) Water abstraction –The CEMP should include details of any abstraction/dewatering, proposed quantities, uses and discharges. This may require CAR authorisation.
g) Dewatering
Any dewatering, e.g. at the borrow pits or excavations, should be in compliance with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) GBR 2 and GBR 15 and detailed in the CEMP. Abstraction of groundwater in quantities greater that $10m^3$/day may require CAR authorisation depending on the scope and duration of the works. Prior to any dewatering commencing, groundwater quality must be adequately characterised such that disposal of the abstracted water can be appropriately managed. More information on these regulations can be found at www.sepa.org.uk/water/water_regulation/regimes/engineering.aspx or by contacting a member of the operations team in our Shetland office.
h) Habitat Management Plan (HMP): we note that the applicant proposes to include a habitat management plan within the CEMP and an outline HMP has been provided. The finalised HMP should include but not be limited to:

- Any measures proposed to restore peatland (blanket mire) to recover historic damage initiated by burning, drainage and overgrazing.
- Any measures to restore peat haggs and gullies as well as any areas of bare peat.

Regulatory advice for the applicant

11. Regulatory requirements

11.1 Various aspects of the proposal may require authorisation from SEPA. As on site borrow pits are proposed it is likely a crusher of some description will be used for crushing/grading of rock. This should have a mobile plant Pollution Prevention and Control (PPC) Permit and depending on dust suppression requirements may also need CAR authorisation. In addition the borrow pits may also require CAR authorisation if there is a discharge from any settlement lagoon. If the applicant requires further advice in regard to our regulatory remit or how to apply for authorisation they are advised to contact the local operations team in our Shetland office.

11.2 For toilet facilities guidance and best practice advice for the applicant can be found in PPG4 Disposal of sewage where no mains drainage is available. If a discharge to land or the water environment is proposed CAR authorisation will be required.

11.3 Details of regulatory requirements and good practice advice for the applicant can be found on the Regulations section of our website. If you are unable to find the advice you need for a specific regulatory matter, please contact a member of the operations team in your local SEPA office at: The Esplanade, Lerwick, Shetland, ZE1 0LL, Tel: 01595 696926.

If you have any queries relating to this letter, please contact me by telephone [redacted] or e-mail at planning.aberdeen@sepa.org.uk.

Yours sincerely

Alison Wilson
Senior Planning Officer
Planning Service

ECopy to: Bernadette Barry, Peel Energy [redacted]

Disclaimer
This advice is given without prejudice to any decision made on elements of the proposal regulated by us, as such a decision may take into account factors not considered at the planning stage. We prefer all the technical information required for any SEPA consents to be submitted at the same time as the planning application. However, we consider it to be at the applicant's commercial risk if any significant changes required during the regulatory stage necessitate a further planning application and/or neighbour notification or advertising. We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue. If you did not specifically request advice on flood risk, then advice will not have been provided on this issue. Further information on our consultation arrangements generally can be found in How and when to consult SEPA, and on flood risk specifically in the SEPA-Planning Authority Protocol.

Appendix 2.2

Updated OPRMP

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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

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

your earth our world

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your earth our world

DATE ISSUED:	June 2016
JOB NUMBER:	**NT12001**
REPORT NUMBER:	**R001 - Annex 1**
VERSION:	**V0.1**

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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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David Brignall	Regional Director

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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

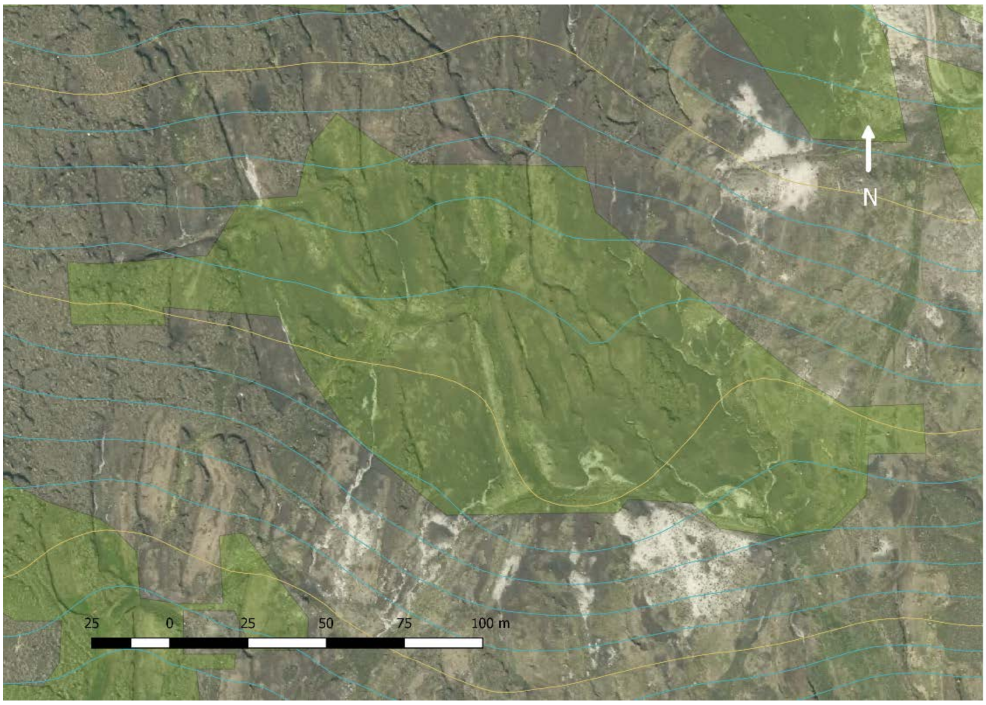
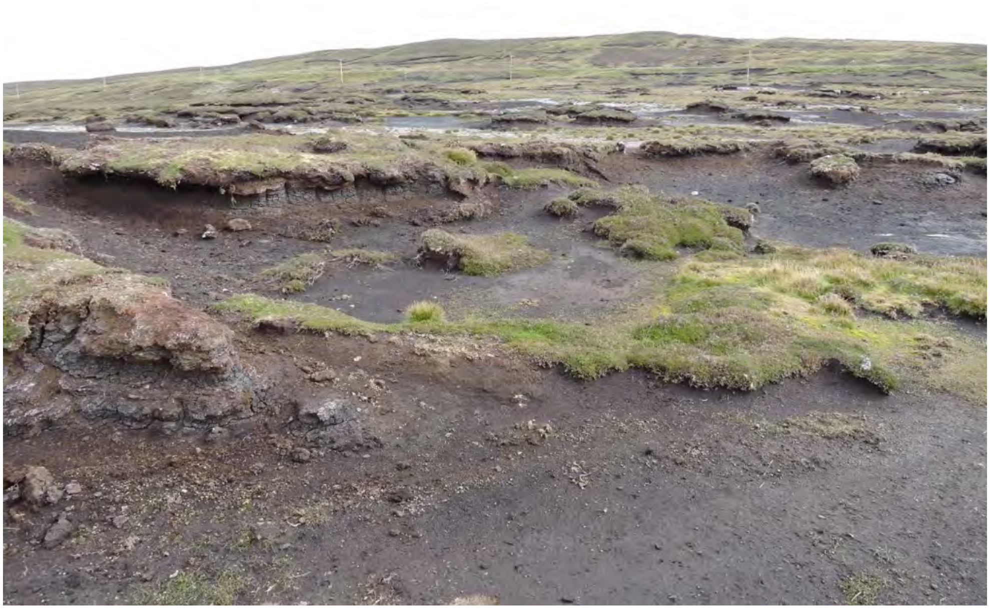


Plate 1 Potential targeted infilling area no. 15



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

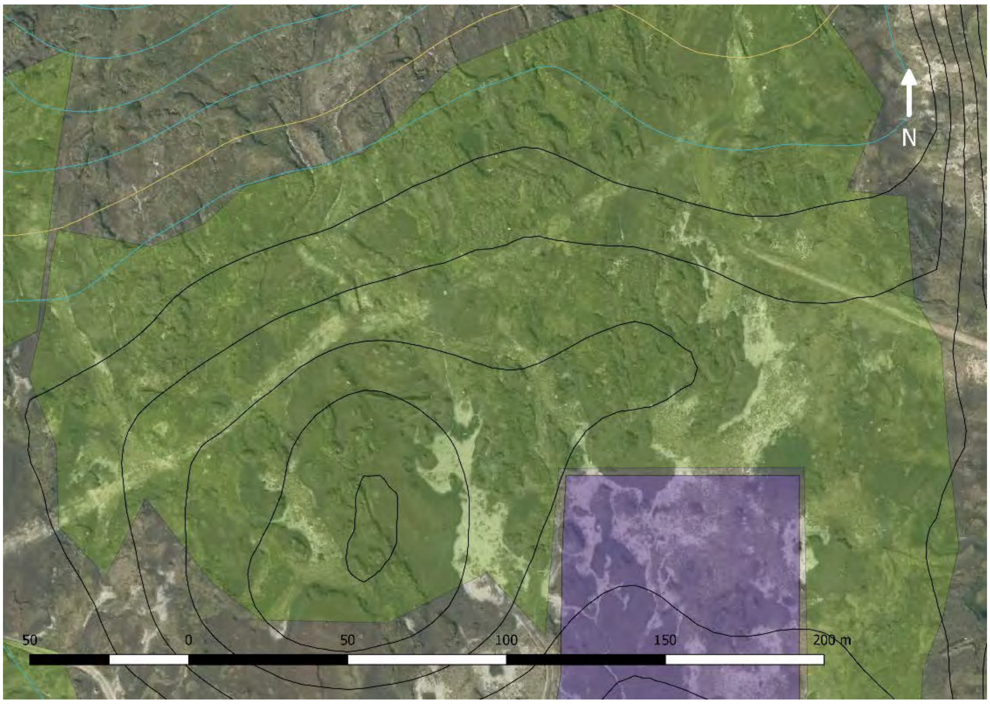


Plate 2 Potential targeted infilling area 3, with site compound (bottom right)

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

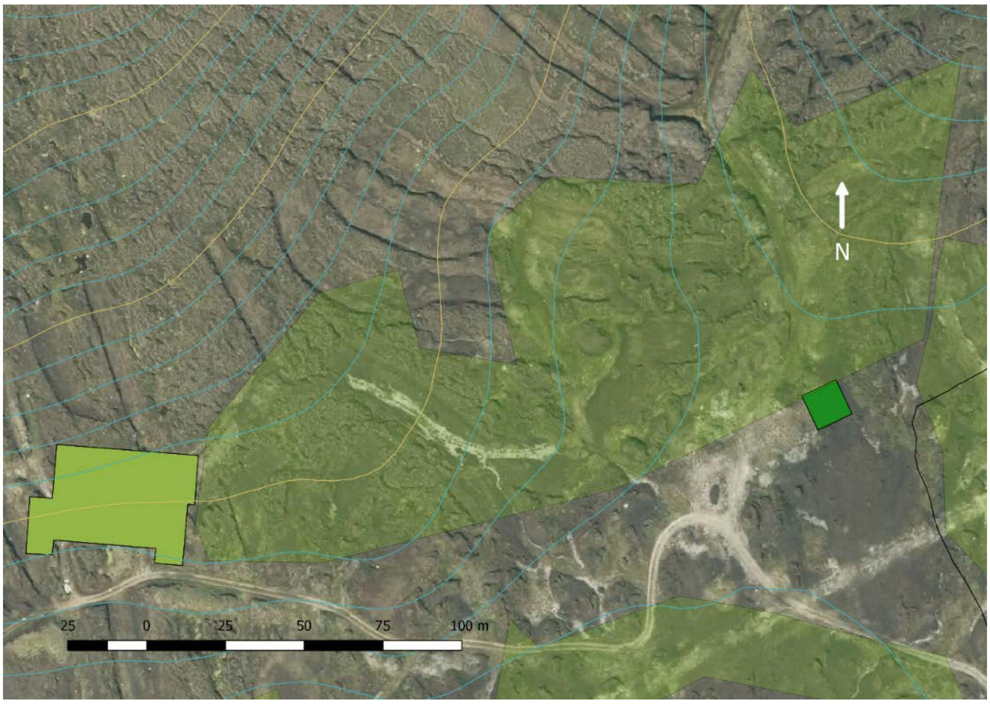


Plate 3 Potential targeted infilling area no. 1, between the substation (left) and T14 (right)

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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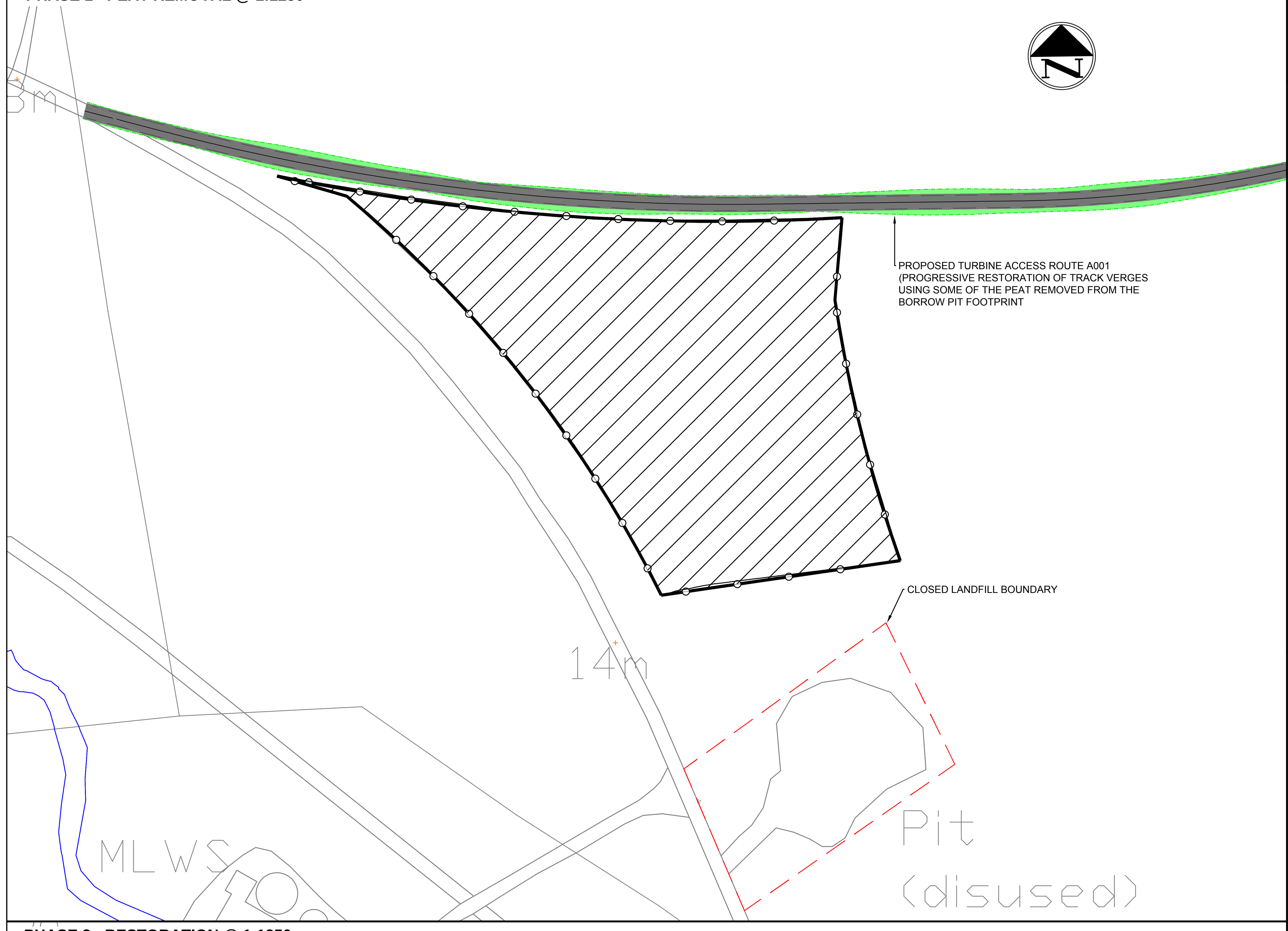
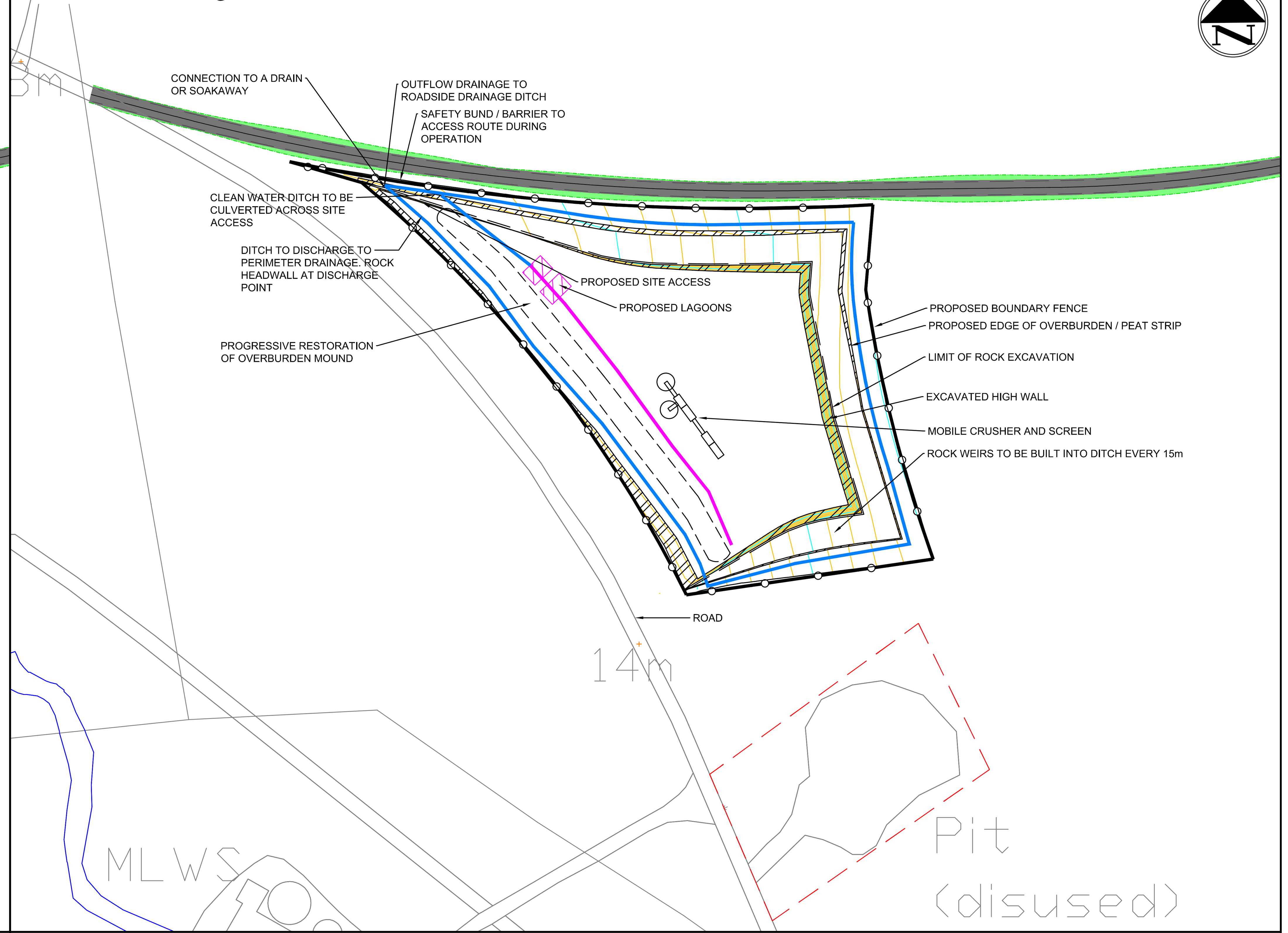
[i] SEPA (2011) Restoration Techniques Using Peat Spoil From Construction Works, Final Report, Prepared by EnviroCentre Ltd.
[ii] UK BAP list of priority habitats, available at: http://jncc.defra.gov.uk/page-5706
[iii] Scottish Natural Heritage (2014) Managing and restoring blanket bog to benefit biodiversity 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



NOTES

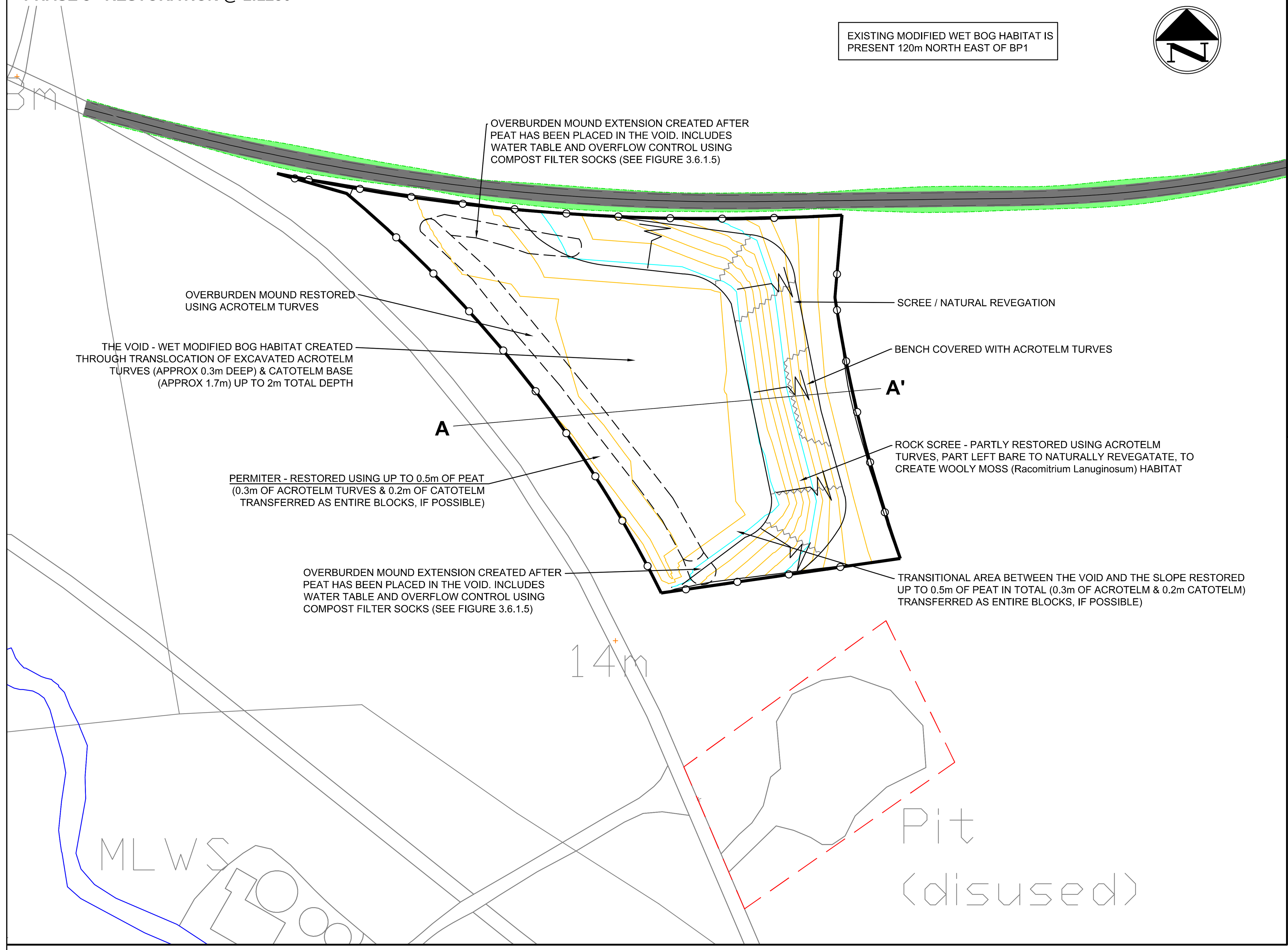
ALL WORKS SHOWN ARE INDICATIVE FOR PLANNING PURPOSES ONLY AND SUBJECT TO DETAILED DESIGN.

SCOUR PROTECTION NEEDED IF VELOCITY EXCEEDS 1 M/S

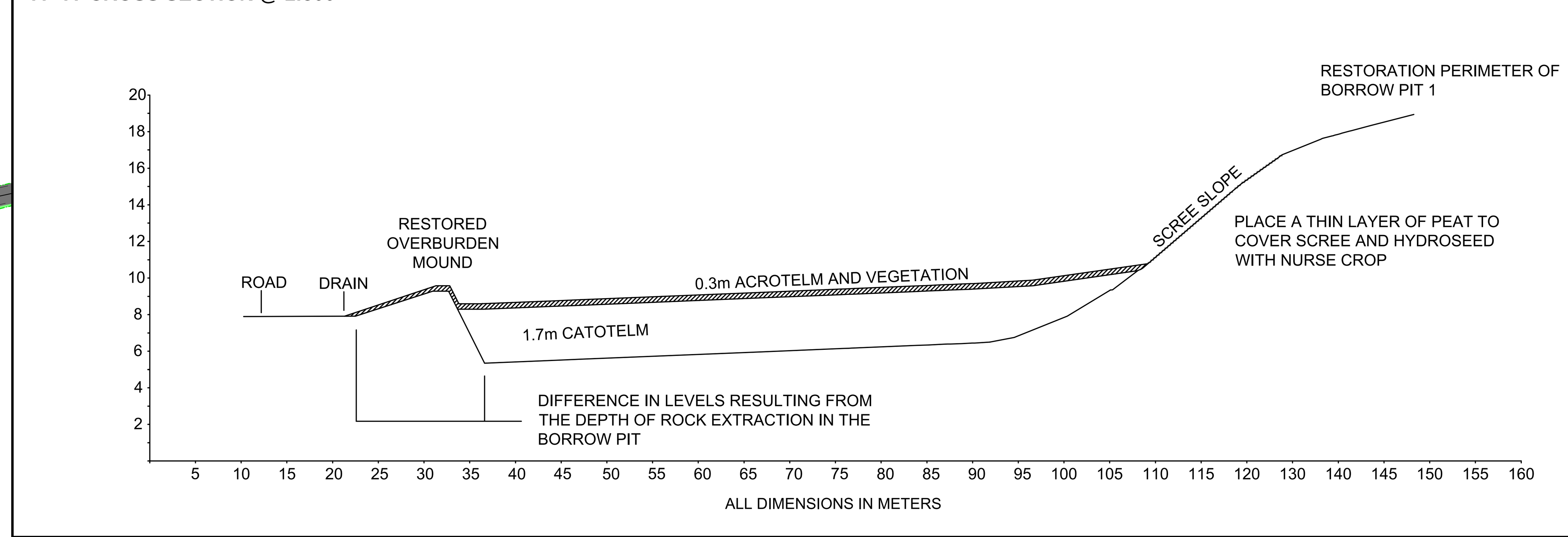
KEY

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



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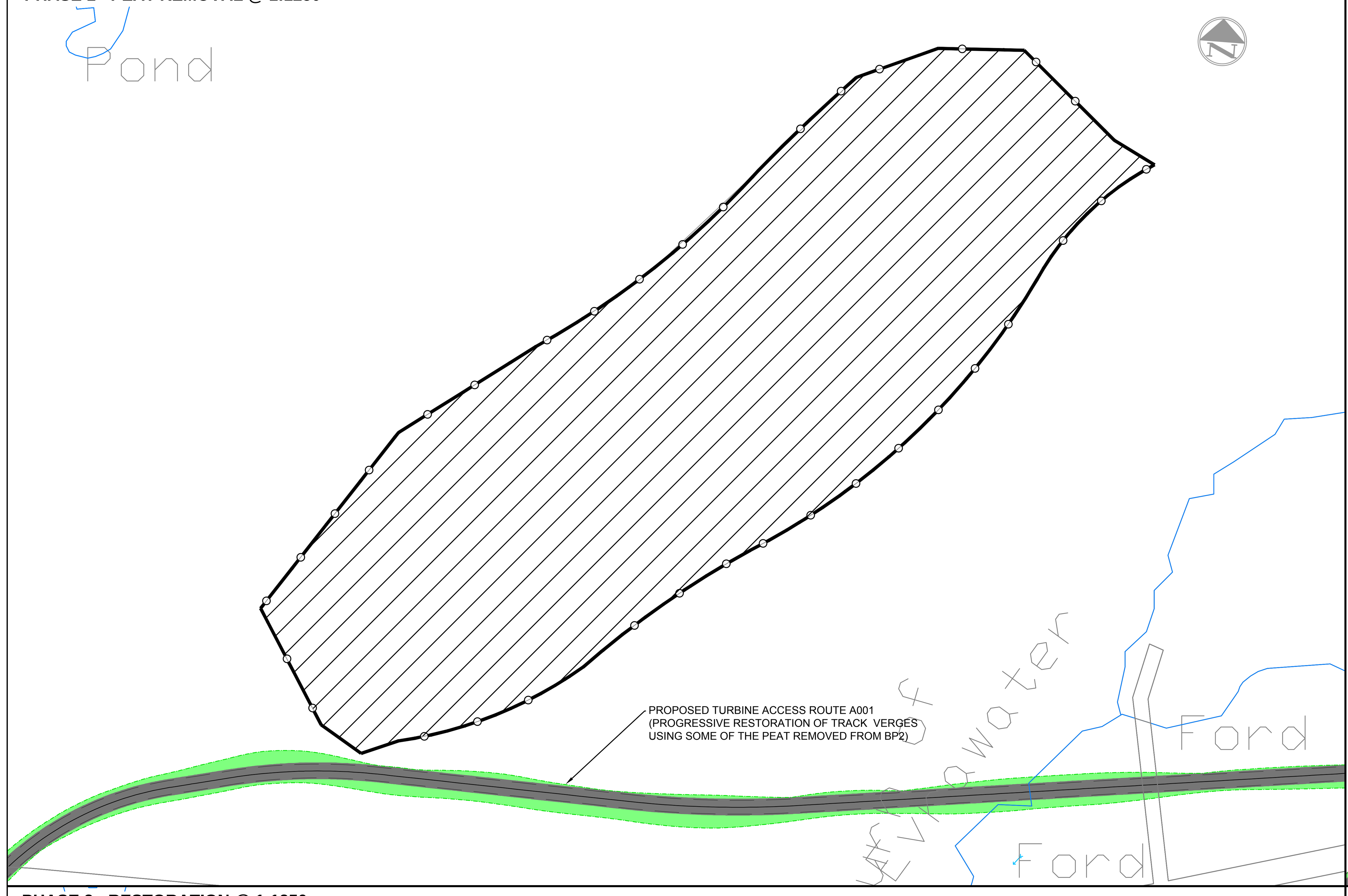
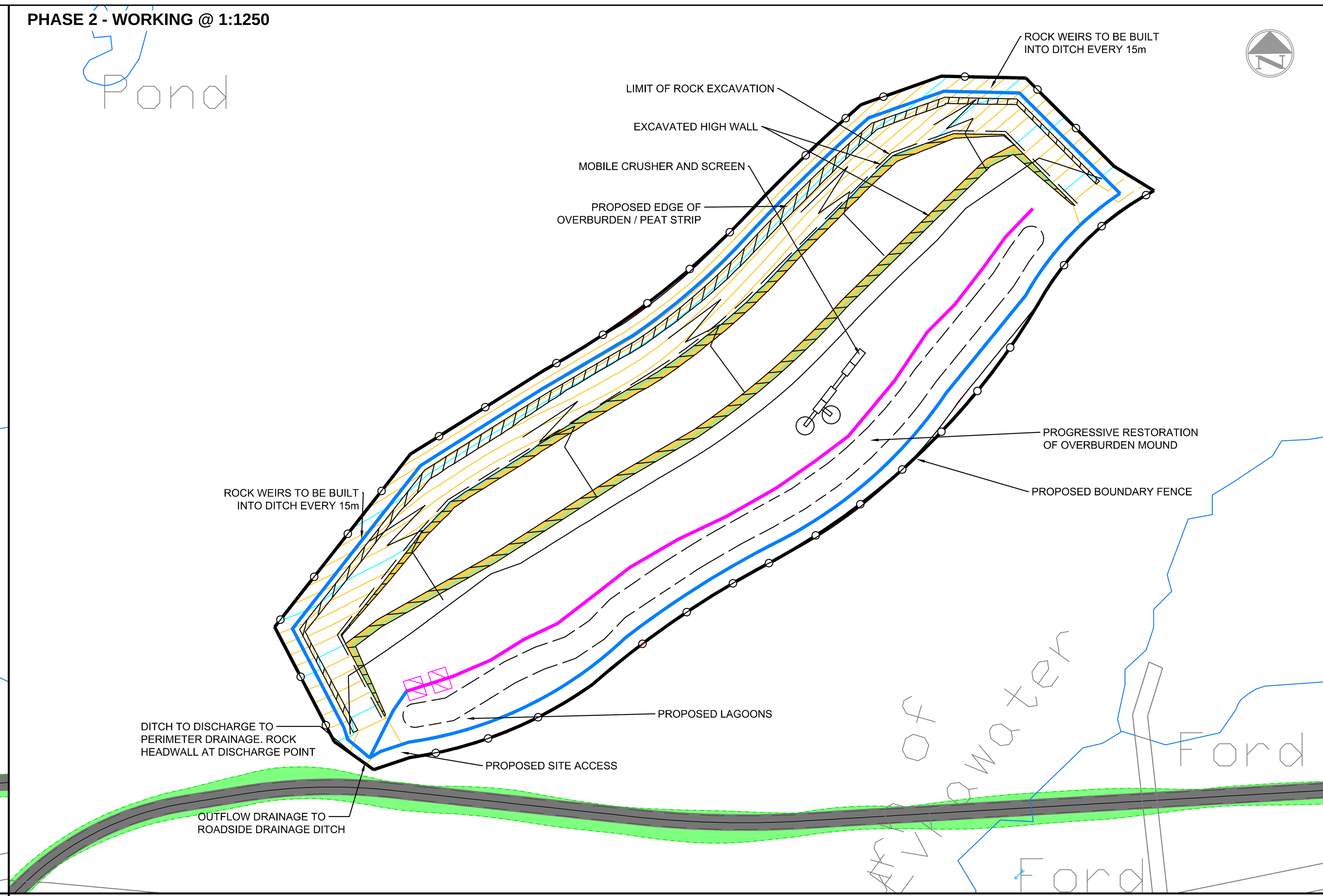
N:\NT\NT12001 - BEAW FIELD WIND FARM - EIA\03 - DESIGN\AUTOCAD\NT12001 FIGURE 3.6.1.1 BORROW PIT RESTORATION PLAN 2016-05-24.DWG

A1MTH

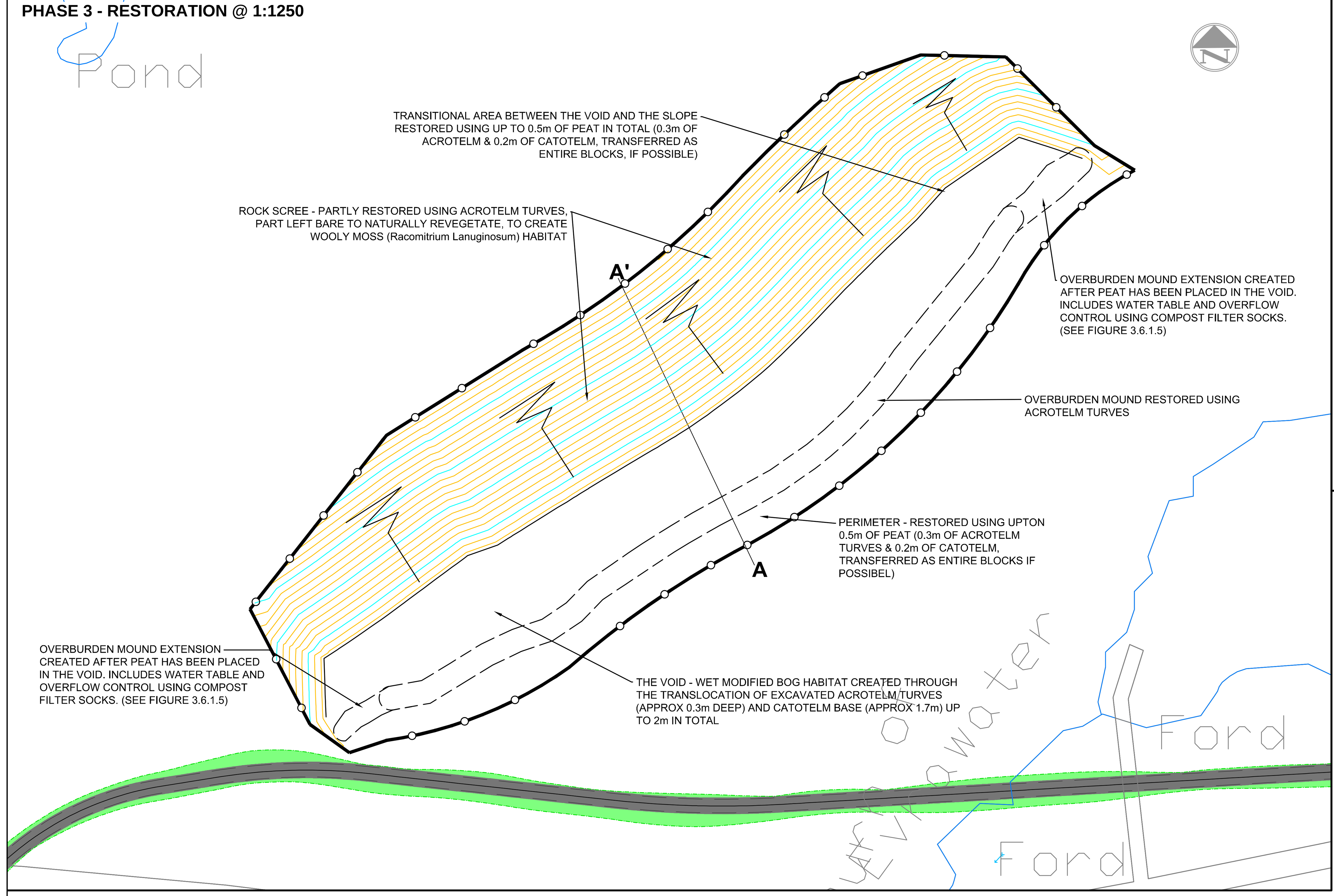
PHASE 1 - PEAT REMOVAL @ 1:1250



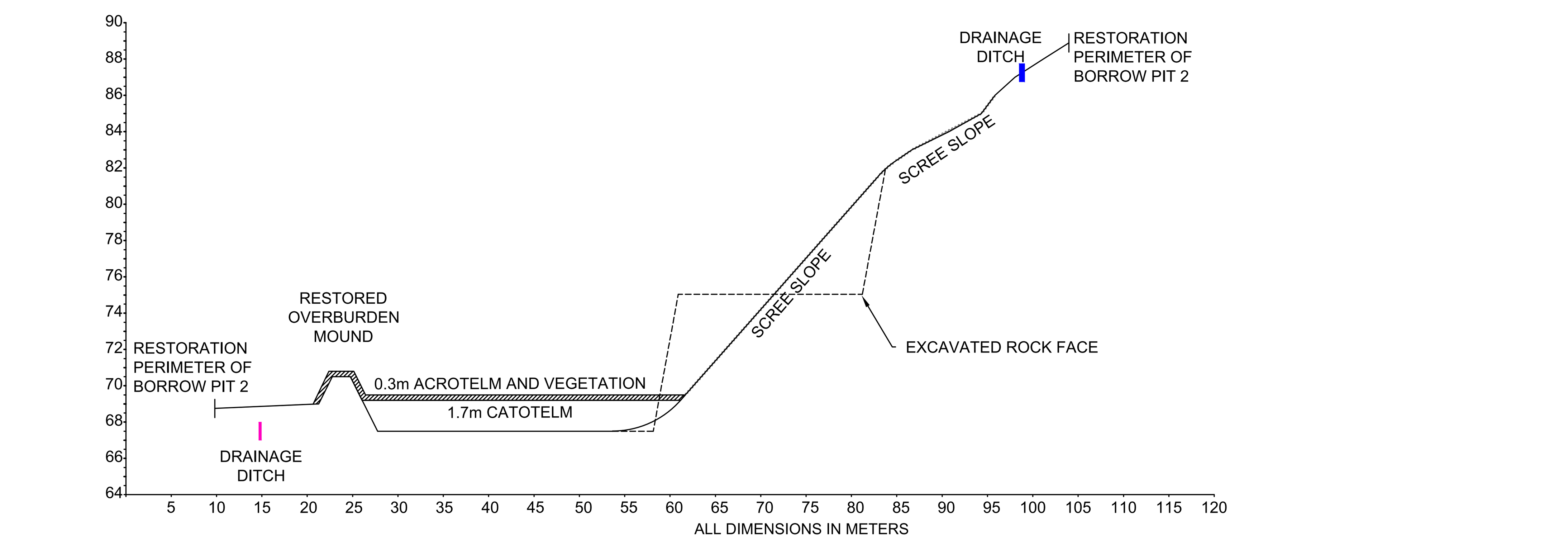
PHASE 2 - WORKING @ 1:1250



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	CHECKED BY	APPROVED BY
AS	JO	DB

☐ STOKE-ON-TRENT (HEAD OFFICE)	TEL 01782 276700	☐ CARDIFF	TEL 029 2072 9191
		☐ LEIGH	TEL 01942 260101
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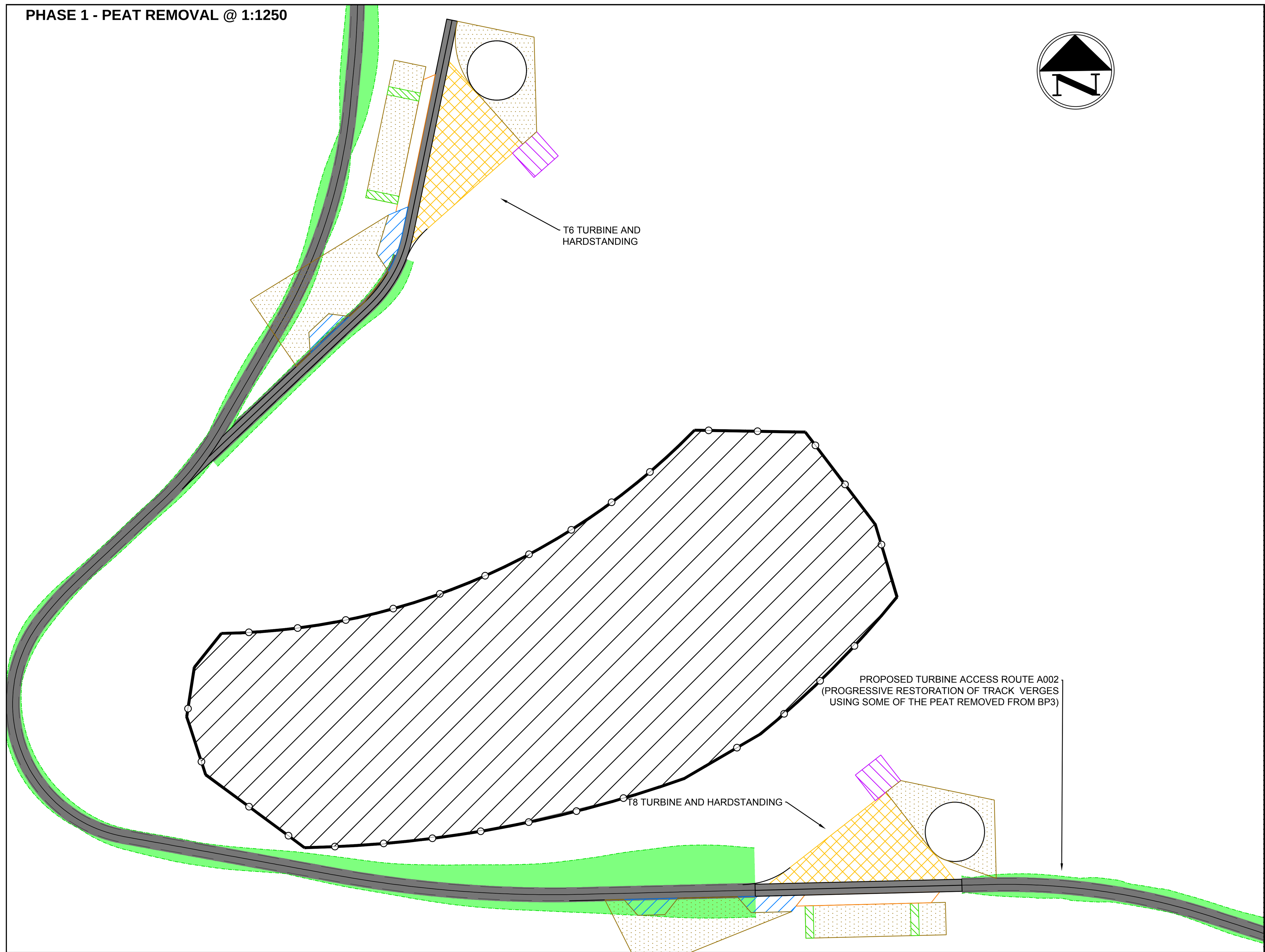
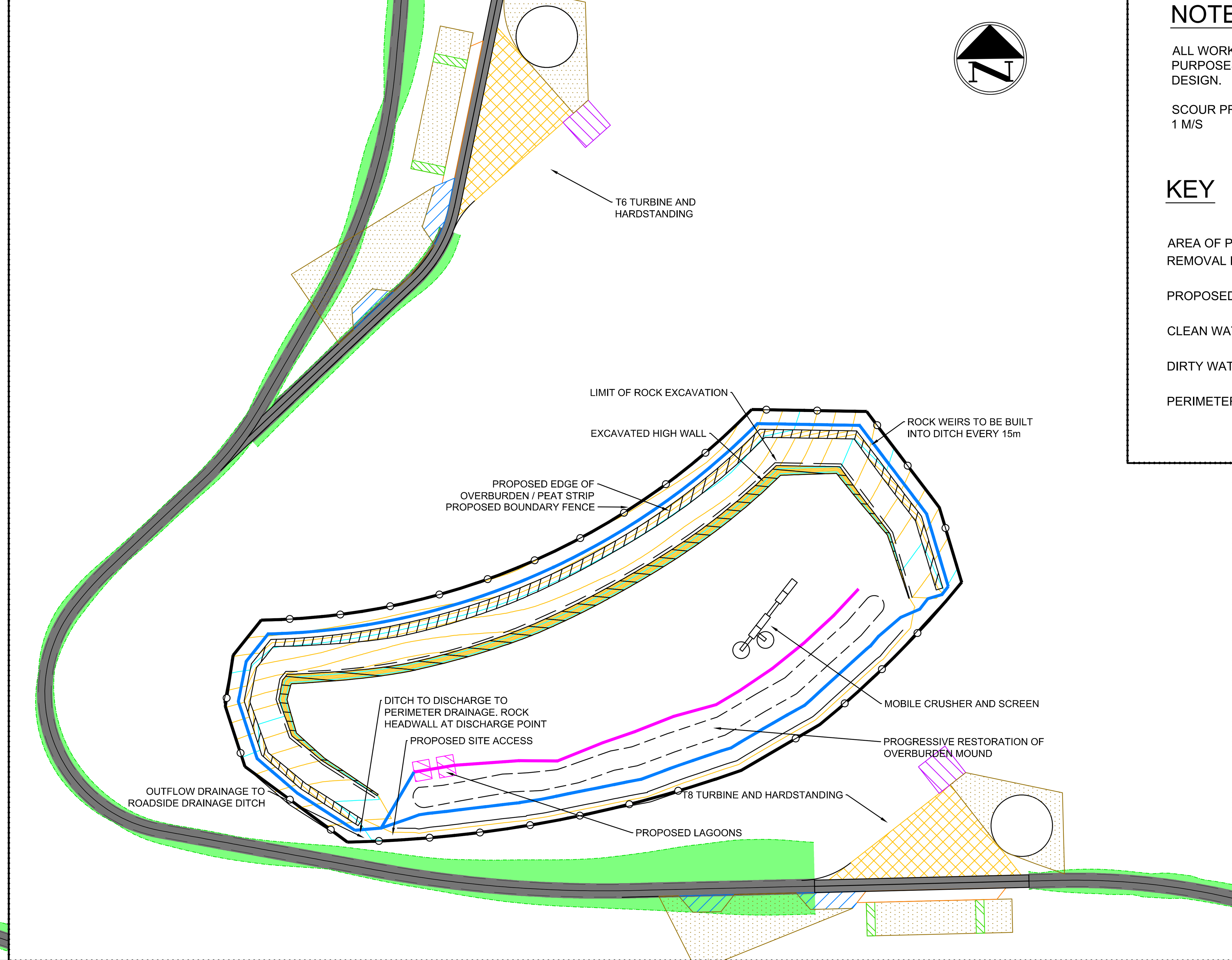
N:\NT\NT12001 - BEAW FIELD WIND FARM - (EA)\03 - DESIGN\AUTOCAD\NT12001 FIGURE 3.6.1.1 BORROW PIT RESTORATION PLAN 2016-05-24.DWG

ASMITH

PHASE 1 - PEAT REMOVAL @ 1:1250



PHASE 2 - WORKING @ 1:1250



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

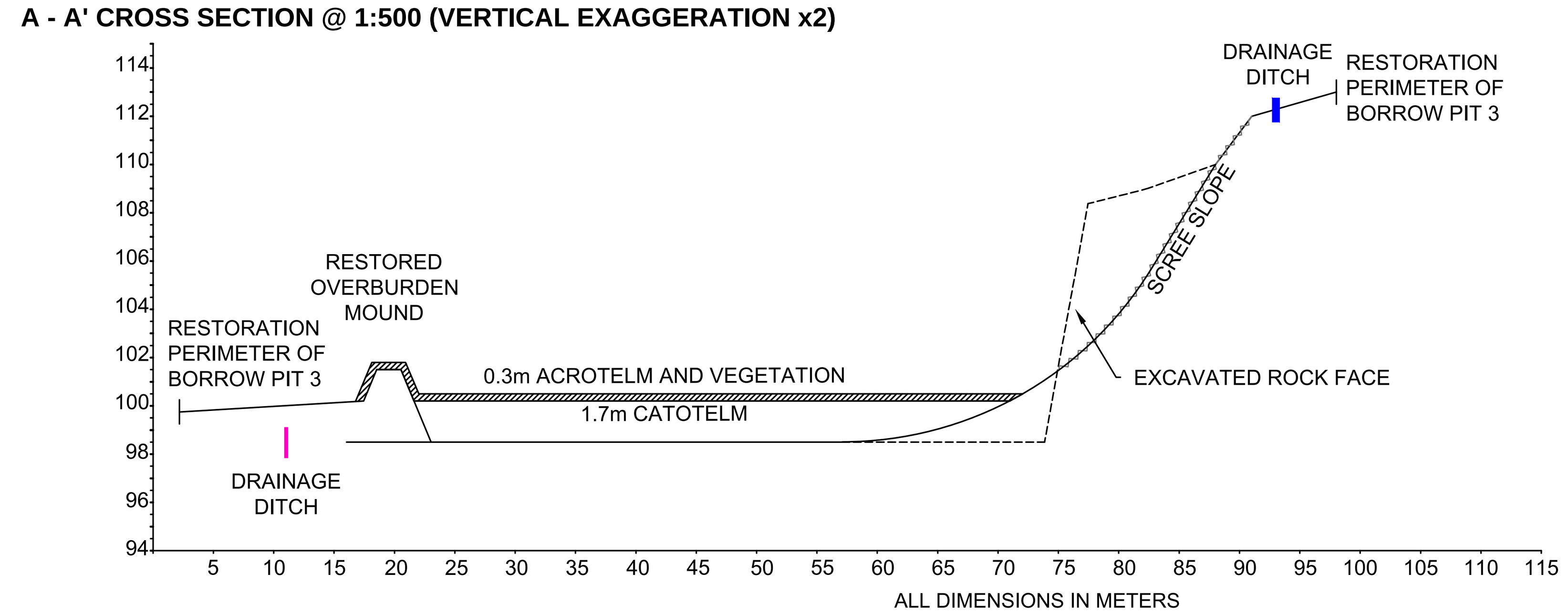
PROPOSED CONTOURS

CLEAN WATER DITCH

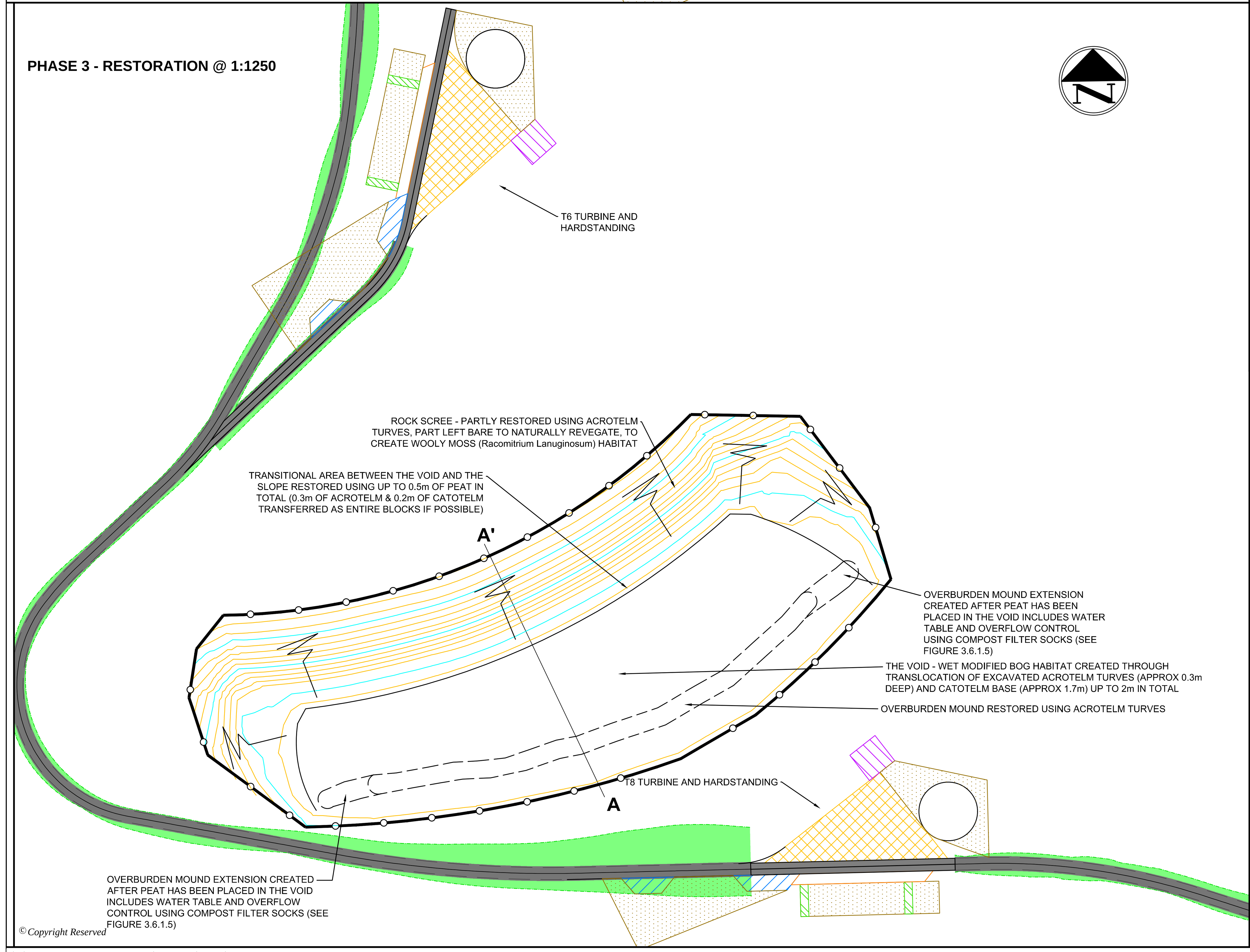
DIRTY WATER DITCH

PERIMETER FENCE

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



PHASE 3 - RESTORATION @ 1:1250



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

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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	CHECKED BY	APPROVED BY
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☐	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
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N:\NT\NT12001 - BEAW FIELD WIND FARM - (DA)\03 - DESIGN\AUTOCAD\NT12001 FIGURE 3.6.1.1 BORROW PIT RESTORATION PLAN 2016-05-24.DWG

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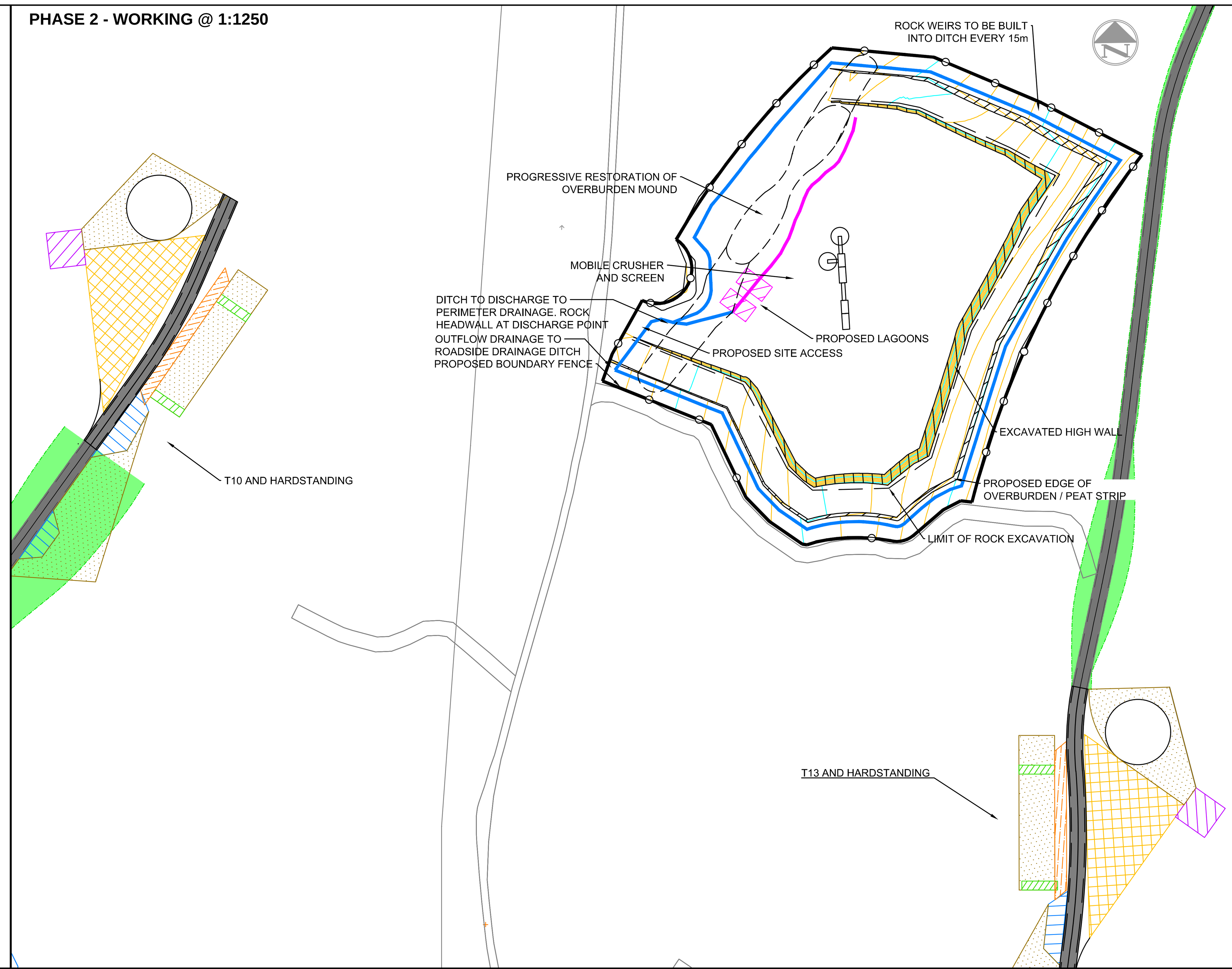


NOTES

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

SCOUR PROTECTION NEEDED IF VELOCITY EXCEEDS 1 M/S

KEY

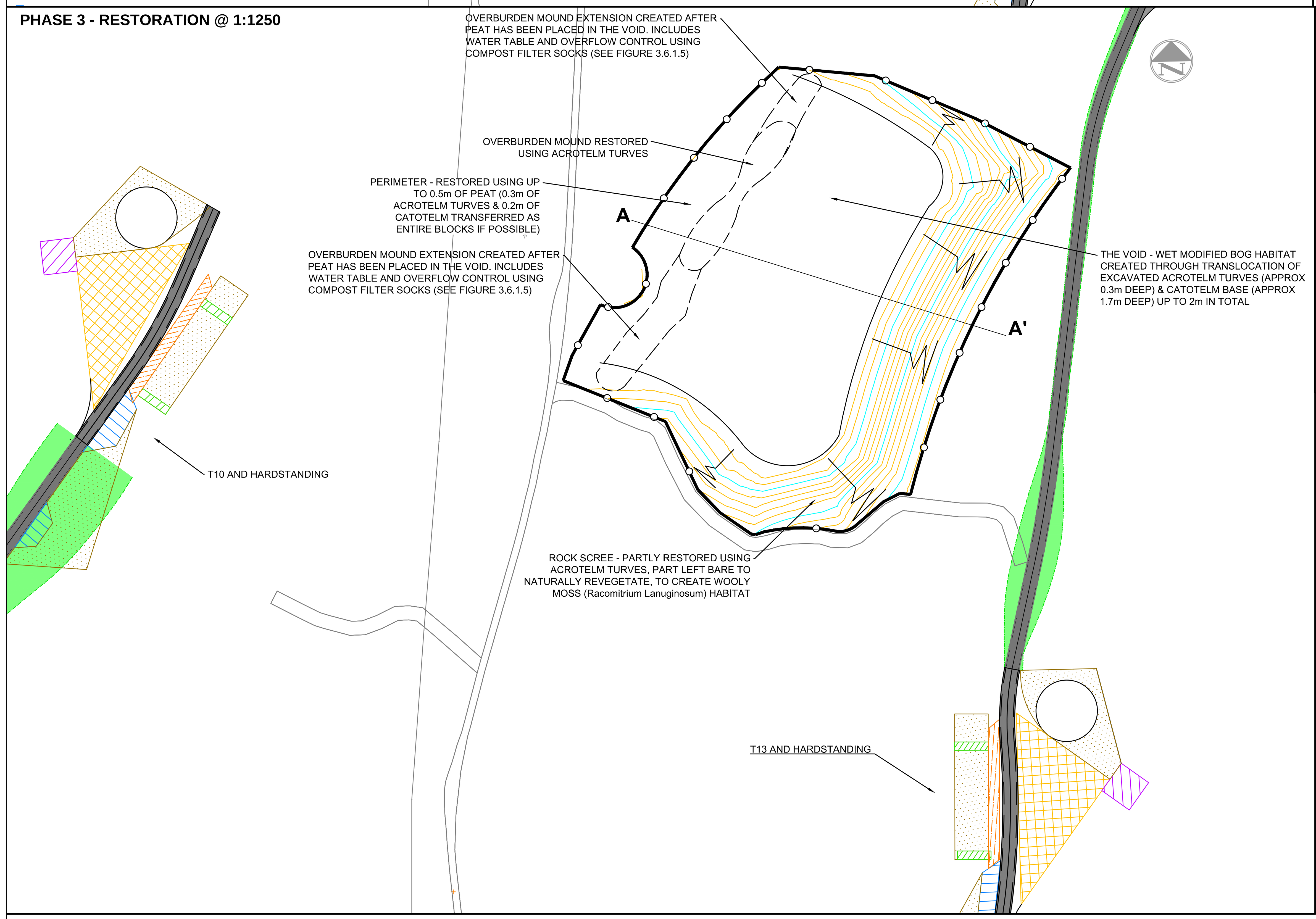
AREA OF PROPOSED PEAT REMOVAL FOR STONE ACCESS

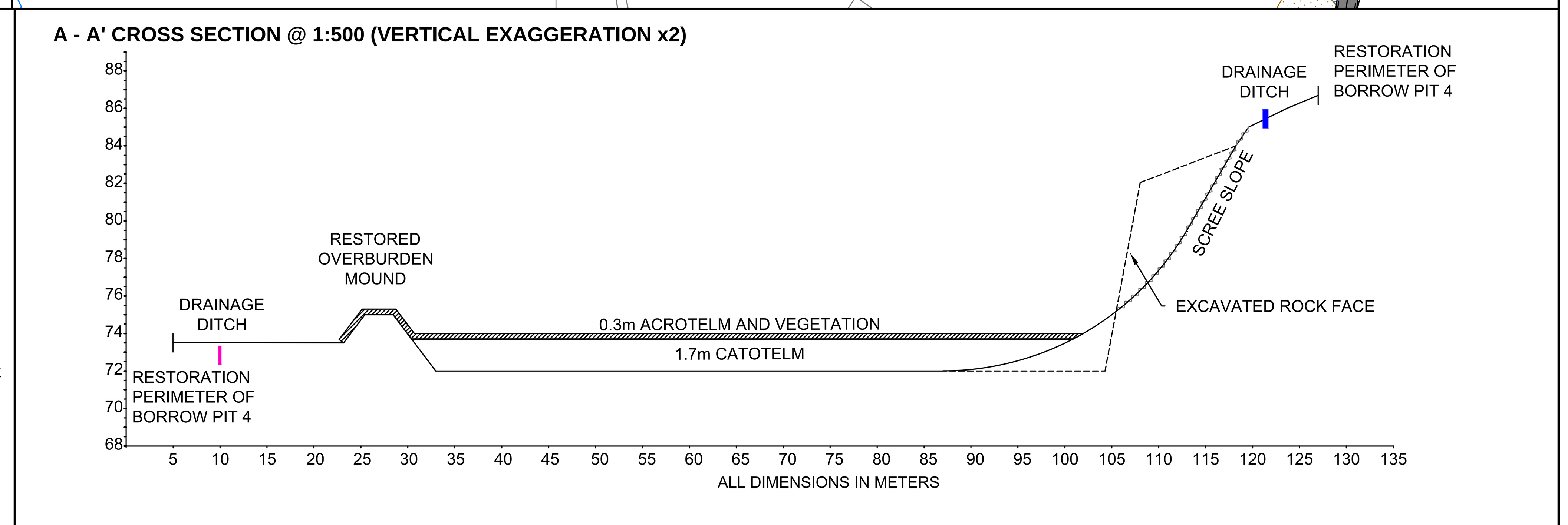
PROPOSED CONTOURS

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

PEEL 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	CHECKED BY	APPROVED BY
AS	JO	DB

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☐	BIRMINGHAM	TEL 0121 580 0909	☐	EDINBURGH	TEL 0131 555 3311
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N:\NT\NT12001 - BEAW FIELD WIND FARM - (DA)\3 - DESIGN\AUTOCAD\NT12001 FIGURE 3.6.1.1 BORROW PIT RESTORATION PLAN 2016-05-24.DWG

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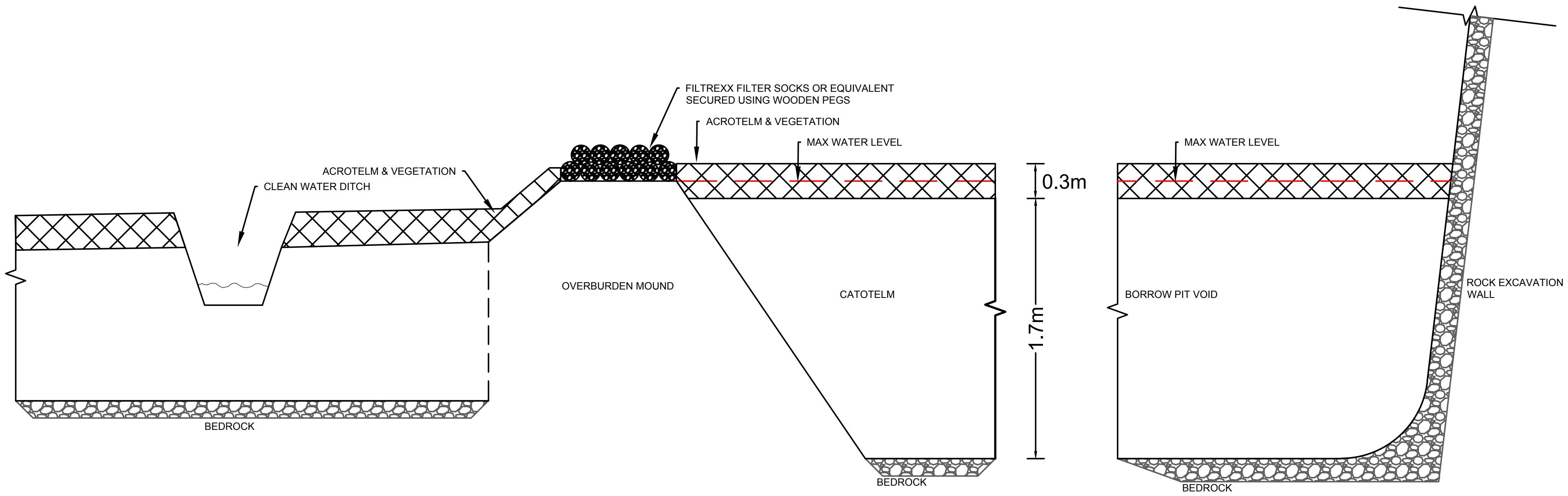

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	J	

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Peel 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
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AS	JO	DB

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☐	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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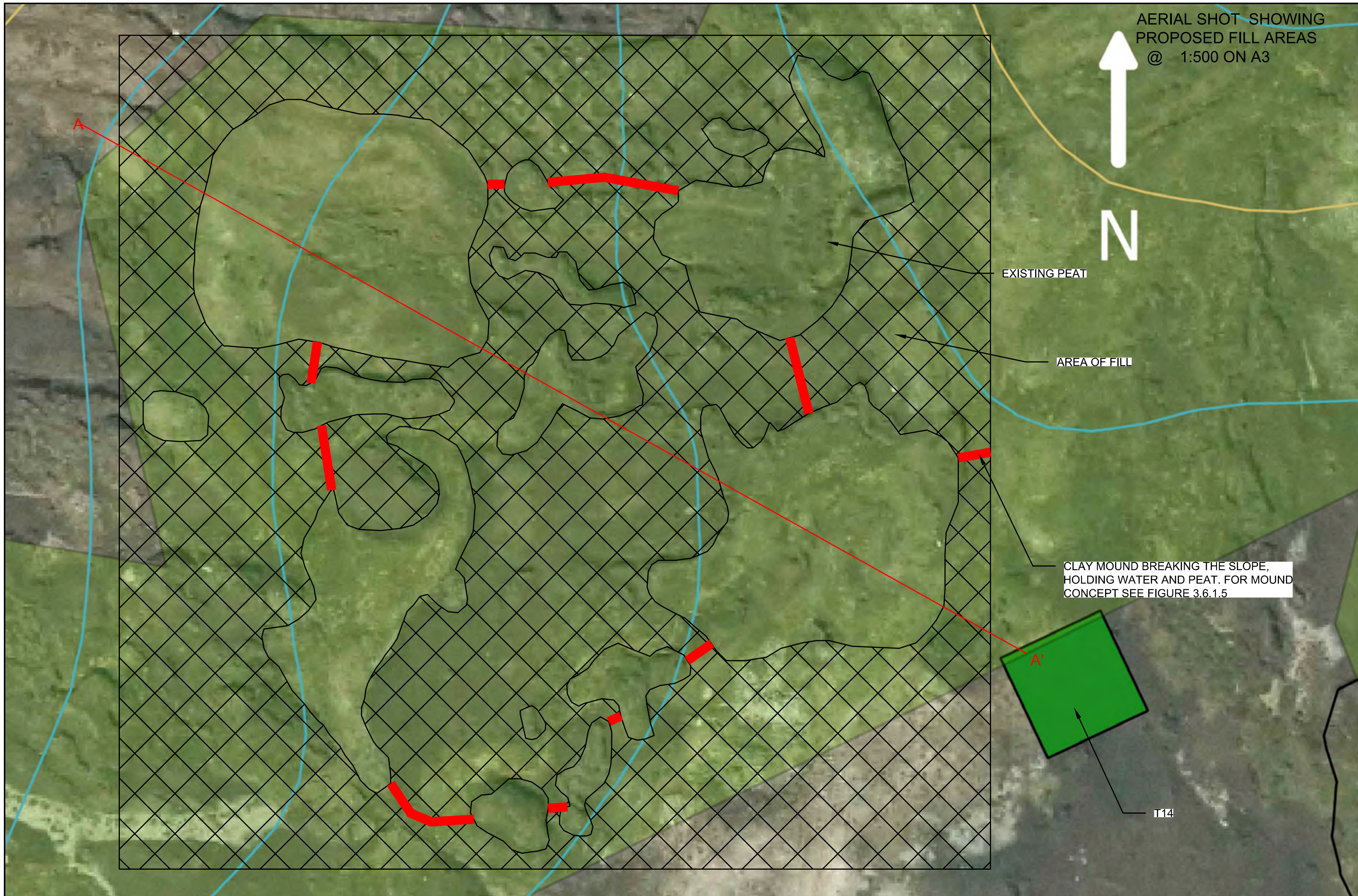

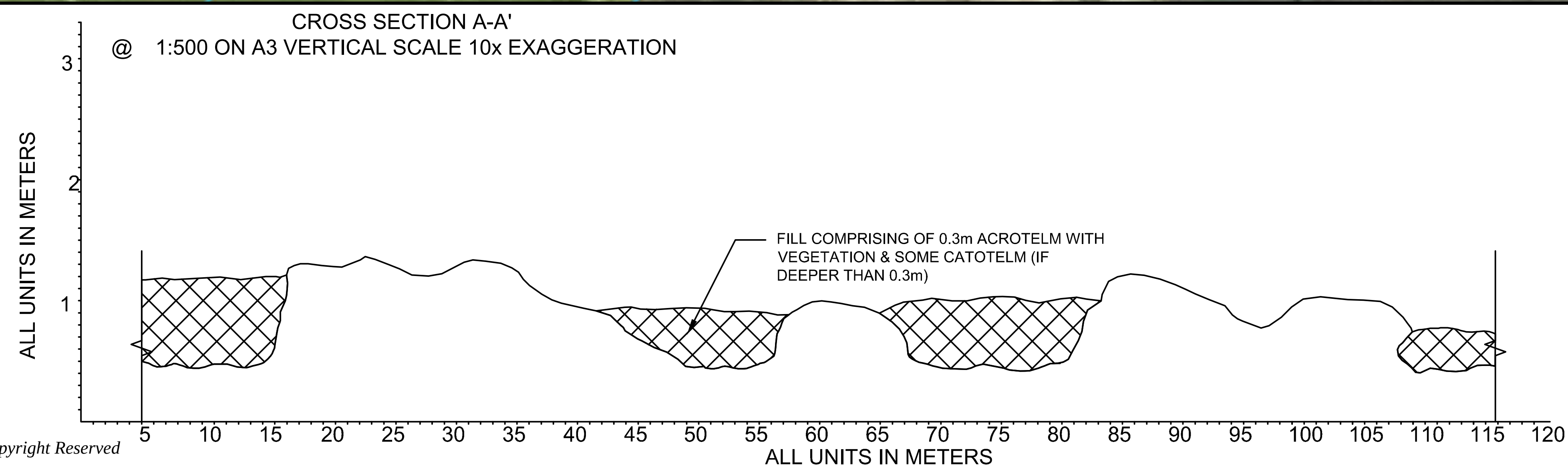

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	MINOR CHANGES FOLLOWING CLIENTS COMMENTS	17/06/16	AS	JO	DB

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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

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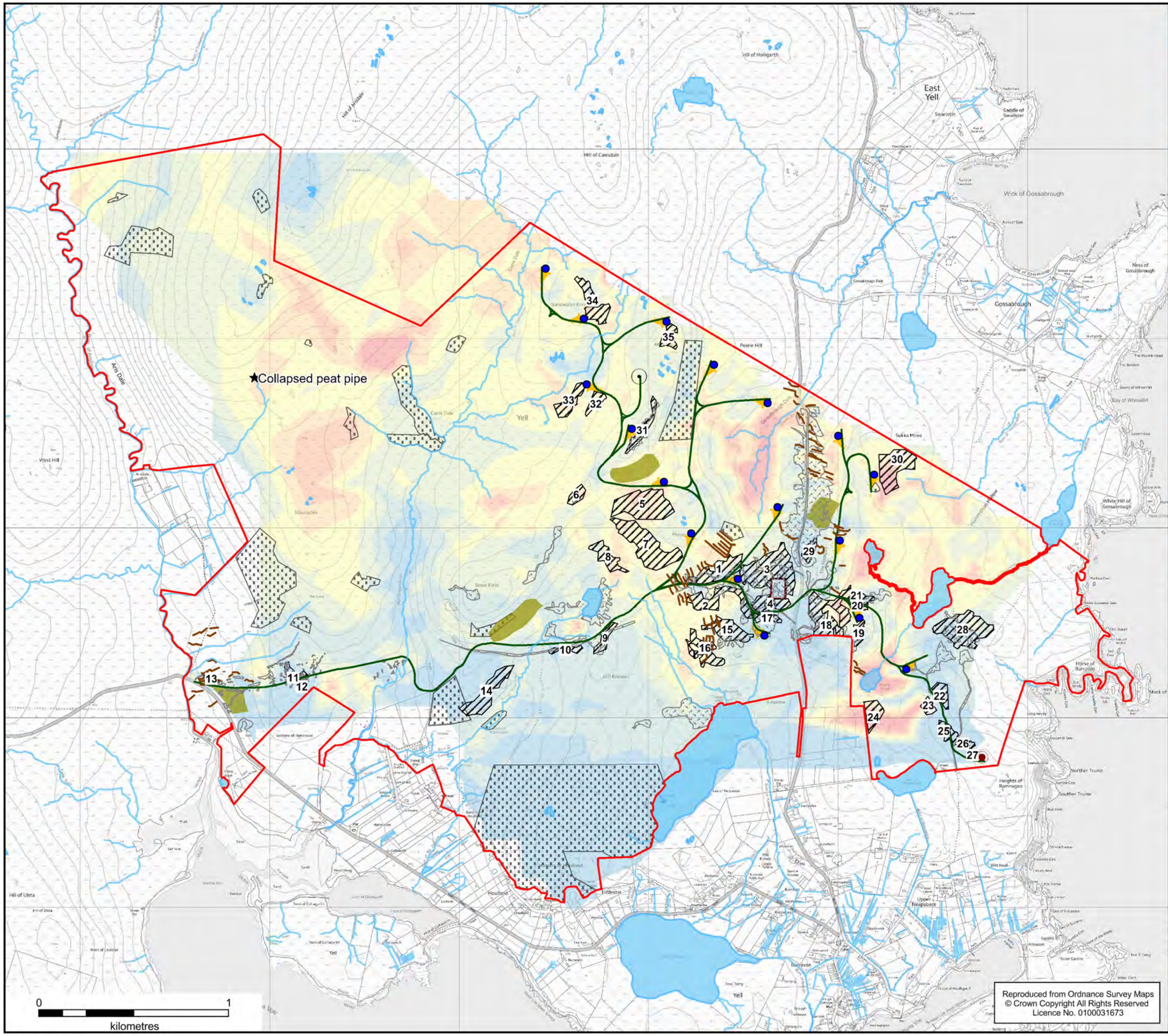
■	NEWCASTLE UPON TYNE	TEL 0191 232 0943	☐	LONDON	TEL 0207 287 2872
☐	WEST BROMWICH	TEL 0121 580 0909	☐	SHEFFIELD	TEL 0114 245 6244
☐	GREATER MANCHESTER	TEL 0194 226 0101	☐	EDINBURGH	TEL 0131 555 3311

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:

Appendix 2.3

Updated ES Chapter 12 Soils and Peat

12 Soils and Peat

12.1 Introduction

12.1.1 In a letter dated 19 April 2016 (19 April 2016 (ref. PCS/145605) SEPA objected the planning application for Beaw Field Wind Farm due to lack of detailed information on the appropriate reuse and management of peat during construction. To respond to this objection, the Outline Peat Reinstatement and Management Plan (OPRMP, attached as Annex 1 to Appendix 3.6) has been reviewed and extended. As a result, minor amendments, immaterial to the impact assessment, had to be made to this chapter. The following paragraphs of the chapter have been amended: 12.9.7, 12.9.9–12.9.14, 12.9.17–12.9.20, 12.9.22, 12.9.24–12.9.27, 12.10.2, 12.10.3; two entries in Table 12.8 (for borrow pit 3 and access track A001) have been modified as well.

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

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

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

12.2 Methodology

Study Area

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

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

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

Desk study

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

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

Field survey

12.2.5 The field surveys consisted of:

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

Peat depth mapping

12.2.6 The purpose of the peat surveys was to:

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

- To assess the potential risk of peat landslide during construction of the Proposed Development (Appendix 12.2);
- To inform the infrastructure design and minimise the depth and volume of excavated peat;
- To characterise the nature and condition of the peatland habitat; and
- To enable an estimate of the volume of peat that would be excavated for each component of the Proposed Development.

Impact assessment methodology

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

Table 12.1: Sensitivity classification

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

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

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

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

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

Table 12.2: Magnitude of change from the baseline

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

Table 12.2: Magnitude of change from the baseline

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

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

Table 12.3: Scale of Impact

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

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

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

Assessment of Cumulative Impacts

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

12.3 Consultation

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

- SIC, RSPB and SNH requested that the ES should include an appropriate HMP to include detailed descriptions of measures to conserve the blanket bog habitat and peat-forming vegetation. Appendix 10.4 provides information on the HMP for the Proposed Development including the consideration of restoring degraded bog areas for habitat improvement.

- SEPA requested that all groundwater abstractions are identified within 250m of excavations deeper that 1m in depth and 100m of excavations less than 1m in depth. A data request to SIC confirmed that there are no groundwater abstractions within the Site.
- SEPA requested that any proposals must be in accordance with the Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste and the regulatory position statement with Developments on Peat[9]. SIC further supports the views of SEPA in respect of the methods of proposed peat management. The guidance has been used to identify appropriate mitigation measures, which will be used to direct the Peat Reinstatement and Management Plan (PRMP) that would be prepared and agreed prior to the commencement of development, see Annex 1 of Appendix 3.6.
- SNH and SWT requested the Site be identified in a Phase 1 habitat survey and further classified according to the NVC system. Details of the survey techniques used to establish the baseline condition are described in Chapter 11: Ecology.

12.4 Policy, legislation & guidance

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

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

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

Construction good practice guidance

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

12.4.4 This assessment considers the following:

- Description of peat and mineral soils within the Site;
- Evaluation of peat slide risk throughout the operation (Appendix 12.2);
- Estimated volumes of excavated peat and predicted volumes for reuse (Annex 1 of Appendix 3.6);
- Mitigation measure embedded into the design of the Proposed Development; and

- Mitigation measures required to manage the peat resource and maintain good practice techniques, including the methodology for the handling of excavated peat (Annex 1 of Appendix 3.6).

12.5 Legislative context

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

The National Planning Framework 3

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

Scottish Planning Policy

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

Shetland Local Development Plan (LPD)

12.5.4 The Shetland Local Development Plan (LDP) 2014 was adopted by the Council on 26th September 2014 and is the established planning policy for Shetland. The document sets out the Council's land use strategy, promoting sustainable economic growth whilst conserving Shetland's natural and built environment. Policy NH5: Soils states that development will only be permitted where appropriate measures are taken to maintain soil resources and functions to an extent that is considered relevant and proportionate to the scale of the development.

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

12.6 Baseline

Site description

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

Soil association

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

Preliminary peat survey

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

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

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

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

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

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

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

Agricultural land capability

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

Habitat

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

Assessment of impacts

Construction phase

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

- Loss and fragmentation of peatland due to disturbance at the location of turbines and wind farm infrastructure;
- Destabilisation of the peat resource, resulting in an increased risk of peat slide during construction (see Appendix 12.2);
- Water discolouration and increased sediments in water courses, as a consequence of drainage from areas of construction related operations; and

- Loss of carbon store, contained within the undisturbed peat that has the potential to be released as CO_2, it should be recognised that degraded peat exhibits lower levels of sequestration, due to loss of habitat function and within the Site, because of the widespread occurrence of degraded peatland habitat, the function of peat as a carbon store is likely to be limited.

12.6.12 Direct negative impacts on the peat resource include:

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

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

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

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

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

Project component	***Construction footprint (m^2)***	***Approximate volume of peat disturbed (m^3)***	***Average depth of peat (m)***
T1	3,690	7,370	2.00
T2	3,670	5,260	1.43
T3	3,700	4,380	1.18
T4	4,800	6,670	1.39
T5	3,680	6,840	1.86
T6	3,580	5,650	1.58
T7	4,010	5,690	1.42
T8	3,510	6,940	1.97
T9	3,640	6,670	1.84
T10	3,980	5,010	1.26

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

Project component	*Construction footprint (m^2)*	*Approximate volume of peat disturbed (m^3)*	*Average depth of peat (m)*
T11	3,840	5,500	1.43
T12	4,150	6,450	1.55
T13	3,830	5,860	1.53
T14	4,180	2,010	0.48
T15	3,740	5,940	1.59
T16	4,410	520	0.12
T17	3,960	2,410	0.61
Sub Total	**66,370**	**89,170**	-
BP 1	14,790	5,590	0.52
BP 2	27,670	26,390	1.13
BP 3	23,410	35,730	1.86
BP 4	17,930	8,130	0.62
Sub Total	**83,800**	**75,840**	-
Compound	7,670	3,810	0.48
Substation	1,520	1,380	0.90
Anemometry Mast	78	117	1.5
Radio Communications Tower	30	9	0.30
A001 (4360m)	35,670	21,400	0.55
A002 (2120m)	24,100	23,730	0.98
A003 (730m)	9,700	9,450	0.97
A004 (310m)	2,510	3,130	1.25
A005 (310m)	3,190	2,100	0.66
A006 (400m)	4,140	4,370	1.06

Energy

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

Project component	*Construction footprint (m^2)*	*Approximate volume of peat disturbed (m^3)*	*Average depth of peat (m)*
A007 (110m)	1,170	120	0.10
A008 (670m)	8,660	8,760	1.01
A009 (230m)	2,990	3,460	1.16
A010 (50m)	420	300	0.71
A011 (100m)	780	810	1.04
A012 (270m)	2,210	2,420	1.10
A013 (790m)	4,950	2,120	0.43
Sub Total	**100,490**	**82,170**	-
Total of all Project Components	259,958	252,496	n/a

Notes:

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

Summary

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

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

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

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

12.7 Embedded mitigation

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

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

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

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

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

3) Provide ongoing habitat management during the operational phase.

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

Construction phase

Turbine layout

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

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

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

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

Access tracks

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

Access track during construction

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

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

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

Use of B9081 during construction phase

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

Table 12.5 Access track design options and volume of peat handled

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

Table 12.5 Access track design options and volume of peat handled

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

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

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

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

Construction compound

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

Substation

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

Anemometry mast

12.7.15 The anemometry mast is located within an area of degraded wet modified bog with an average peat depth of 1.5m. The footprint of the tower is 78m^2 with an approximate peat excavation volume of

117m^2. This area was selected as a representative location to monitor the wind speeds across the Site.

Telecommunications tower

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

Borrow pits

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

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

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

Access tracks

Floating roads

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

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

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

12.7.21 Floating roads could be used to reduce the amount of peat required for removal (refer to Figure 12.2). Areas where there is further potential to reduce the volume of peat excavated have been identified; two stretches on the main access route to the Site, an area close to turbine 14, and a stretch of access track leading to turbine 15. The construction of floating roads is possible at these locations as the land has a slope angle of less than 5%. The use of floating roads on these sections of track would reduce the amount of peat used in the access track construction to 76,000m^3. Whether floating roads can be used will be dependent on the results of further ground investigation. As a consequence this assessment has been based on the worst case for handling of peat, which therefore does not include the use of floating roads.

Operational phase

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

Decommissioning phase

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

12.8 Potential impacts

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

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

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

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

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
T3	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T4	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T5	Green Burn and Burn of Holligarth	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T6	Burn of Hamnavoe	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T7	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T8	Green Burn and Burn of Holligarth	Wet modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T9	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T10	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate
T11	Green Burn and Burn of Holligarth	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T12	Green Burn and Burn of Holligarth	Unmodified blanket bog (>0.5m deep peat supporting blanket bog habitat)	High	Low	Moderate

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

Project Components	*Catchment*	*Phase 1 habitat classification and peat depth (see Table 12.2)*	*Sensitivity*	*Change of magnitude at a Site level*	*Scale of Impact*
T13	Burn of Horsewater and Burn of Hummelton	Unimproved acid grassland/bare peat (>0.5m deep peat supporting acid grassland)	Low	Low	Minor
T14	Burn of Green Burn and Burn of Holligarth	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T15	Burn of Horsewater and Burn of Hummelton	Dry modified bog (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
T16	Burn of Kettlester	Unimproved acid grassland/bare peat (<0.5m shallow peat and peaty topsoil)	Low	Low	Minor
T17	Burn of Horsewater and Burn of Hummelton	Dry dwarf shrub heath (>0.5m deep peat supporting degraded blanket bog)	Medium	Low	Minor
BP 1	Burn of Arisdale	Dry modified bog, acid grassland (>0.5m deep peat supporting acid grassland)	Low	Medium	Minor
BP 2	Burn of Hamnavoe	Dry modified bog/bare ground (>0.5m deep peat supporting acid grassland)	Low	Medium	Minor
BP 3	Burn of Hamnavoe/ Green Burn and Burn of Holligarth	Wet modified bog (>0.5m supporting degraded blanket bog)	Medium	Medium	Moderate
BP 4	Green Burn and Burn of Holligarth	Unimproved acid grassland/bare peat (>0.5m deep peat supporting acid grassland)	Low	Medium	Minor

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

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

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

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

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

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

Assessment of potential impacts by component

Turbines

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

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

Access tracks

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

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

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

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

Site compound

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

Substation

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

Anemometry mast

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

Telecommunications/Radio communications tower

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

Borrow pits

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

Total disturbance of peat resource

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

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

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

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

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

12.9 Mitigation measures

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

12.9.2 The proposed Peat Reinstatement Management Plan (Annex 1 of Appendix 3.6) provides a summary of the peat reuse and management and will specify operational procedures required to maximise the reuse of peat, for the duration of the construction programme. The purpose of mitigation measures is to address the potential impacts of the Proposed Development on the peat resource. In addition, peat management techniques have been defined to minimise the loss of the peat resource during construction and reinstate peat to the widespread areas where peat erosion has taken place on land adjacent to the main construction footprint. As a consequence, it is possible to deliver minor positive benefits for the wider peat resource within the Site that can be secured and maintained during the operational phase through the HMP (Appendix 10.4).

Construction phase

Peat landslide hazard and mitigation

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

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

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

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

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

- Detailed geotechnical site investigation to inform a Quantitative Risk Assessment to reduce the uncertainty, as per the SE guidance. This would involve trial pits, shear strength measurements and factor of safety (FOS) calculations.
- Further avoidance (micro siting), which is limited and subject to detailed geotechnical site investigation.
- Engineering measures, such as catch fences and ditches, slope buttressing.

Peat management and reinstatement

Peat handling

12.9.7 All aspects of peat management and reinstatement during the construction are described in the Outline Peat Reinstatement and Management Plan (OPRMP), provided as an Annex 1 to Appendix 3.6. Where practical, excavated peat would be re-used onsite close to the construction footprint of each component. Reinstatement of peat to receptor areas would also take place progressively, such that areas of existing, but degraded habitat would be rehabilitated during construction. Progressive extraction and placement of peat would be undertaken using a 360º excavator, with a maximum reach of 23m, from the edge of the construction footprint. Therefore, taking account of all components an area up to 64ha around the construction footprint, but within the Site, is potentially available for peat reinstatement (Figure 12.6). This area has been revised to 46ha of areas potentially suitable for targeted infilling, not necessarily located directly next to the tracks (see OPRMP and associated addendum Figure 3.6.1.7). Because the extent of degraded peatland and, as a consequence eroded peat resource, is widespread throughout the footprint of the Proposed Development the receptor areas for reinstated peat are available and can be reinstated with excavated peat on a progressive basis. Using this technique would allow translocation of peat to take place in advance of the main earthworks required for each of the components of the Proposed Development, without encroachment on unaffected areas of peat. Where reinstatement of peat would be beneficial in other areas of the Site, low ground pressure machinery and bog mats would be used to reinstate peat and perform targeted infilling to areas where extensively erosion has previously taken place. An Ecological Clerk of Works (ECoW) would supervise the construction activities defined in the Construction Environmental Management Plan (CEMP, see Appendix 3.6 for the OCEMP).

Peat turves

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

12.9.9 For areas where the reinstatement of whole turves is not practical, or suitable, the peat will be lifted to take account of the main horizons that make up the peat profile. The acrotelm peat layer (approximately 0.3m thick) is defined as the top layer of peat associated with any vegetation and seeds. The removal of this horizon would avoid the cross contamination of acrotelm, catotelm layers, and the mineral subsoil (see Annex 1 of Appendix 3.6). 360º excavators would remove the acrotelm in turves (approximately 200-300m thick depending on maximum rooting depth) and place the turves to one side. The turves would be cut with a flat bottom surface so that they can be placed within receptor sites. All turves would be placed to adjoin other turves within the receptor area, or the edge of bare exposed peat, in order to maintain the water content of the peat profile.

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

Peat storage

12.9.11 An approximate excavation volume for each infrastructure location is given in Table 12.4 and Appendix 12.3. The estimates of reinstatement volumes and consideration of the methods used are provided in the OPRMP.

12.9.12 Temporary storage of peat would be required to hold excess peat that would be used for reinstatement, after construction has been completed. The storage requirements and suitable areas will be determined as per the OPRMP.

Reuse / reinstatement of peat

Turbines

12.9.13 The final design and type of turbine foundation would be informed by detailed ground investigation (GI) post-consent (see OPRMP). The extent of extracted peat has been calculated for each turbine (see Table 12.4 and Appendix 12.3). The proposed method of constructing the turbines will be detailed in the Construction Method Statement (CMS) provided by the Principal contractor. The displaced peat and vegetation at each turbine base would be reused for reinstatement of the turbine bases, track edges and crane pad edges.

Access Tracks

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

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

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

Borrow Pits

12.9.17 Borrow pits design and locations has been selected to best avoid disturbance of deep / unmodified blanket bog peat. Additional mitigation measures are identified (see summary Table 12.8 and further description in the OPRMP) to maximise the long-term preservation of the excavated peat material whilst ensuring minimal storage time during construction.

12.9.18 Peat would be reused within borrow pit reinstatement providing the method of reuse and final reinstatement profile is in accordance with overall habitat and environmental reinstatement objectives. Use of temporary fencing for borrow pit reinstatement sites would control grazing pressures and allow vegetation to establish in accordance with the HMP (see Appendix 10.4 for OHMP). Dependent on the final borrow pit design, unconsolidated peat would be used at depths up to 2m (0.3m of acrotelm and up to 1.7m of catotelm) to create a saturated mire type habitat. The acrotelm turves would be used on the surface to promote succession to habitats of equivalent value and those defined in the baseline environment.

12.9.19 The reinstatement of the peat profile depth would be variable, depending on slope and surface conditions. For details of individual borrow pit restoration see the OPRMP. For an overview of peat reinstatement for each borrow pit, see Table 12.8.

Site compound

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

Substation

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

Anemometry mast

12.9.22 The method of reinstatement of this area is similar to that described for turbine base reinstatement (see Paragraph 12.9.12). Due to the small footprint of the excavation for the foundations of this component and minimal peat displacement, it is not anticipated that any significant volumes of peat would need to be translocated from this area.

Telecommunications tower

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

Degraded peat areas / gully restoration

12.9.24 Throughout the Site, the peatland consists of a degraded moorland habitat, which is predominantly a result of overgrazing and peat cutting. The damage to vegetation has resulted in the erosion and decomposition of peat (peat wasting), leading to decreased depths of peat cover.

12.9.25 Peat excavated during construction is a suitable material for restoring the eroded gullies within the Site, and targeted infilling of suitable larger areas (see Table 12.8). In addition, catotelmic peat would be used for ditch blocking as ‘peat plugs’ as part of wider peatland restoration within the Site to raise water levels locally and improve the hydrological conditions of adjacent blanket bog habitat. The success of peat plugging is weather dependent and the OPRMP provides advice on targeting this operation to avoid poor weather conditions. This restoration measure would also require some acrotelm in order to promote the revegetation with sphagnum moss species.

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

Management of peat during the construction phase

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

Operational phase

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

Decommissioning phase

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

12.10 Assessment of residual effects

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

Table 12.8 Assessment of residual effects after mitigation

Project Components	***Scale of Impact before mitigation***	***Mitigation measures***	***Scale of Impact after mitigation measures included***
T1	Minor, negative	Excavated peat from the construction of T1 would be used to restore the turbine base and other disturbance from infrastructure. Reinstatement of peat would consist of acrotelm turves that would create a subtle tie-in to the surrounding area. Catotelm peat would also be required for this reinstatement. Details of further use of excavated peat from turbine construction are provided in Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant**.
T2	Minor, negative	Similar to T1, excavated peat would be used for reinstatement around the turbine bases and other infrastructure. Similar reinstatement measures as T1 would be implemented, details in Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant.**
T3	Minor, negative	Turbines 3, 4 and 5 have the same habitat type of wet modified bog. Turbine bases once construction is complete would be restored using excavated peat.	Scale of impact is likely to become **Minor, positive and not significant.**
T4	Minor, negative	Turbines 3, 4 and 5 have the same habitat type of wet modified bog. Turbine bases once construction is complete would be restored using excavated peat.	Scale of impact is likely to become **Minor, positive and not significant.**
T5	Minor, negative	Turbines 3, 4 and 5 have the same habitat type of wet modified bog. Turbine bases once construction is complete would be restored using excavated peat.	Scale of impact is likely to become **Minor, positive and not significant.**
T6	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T6 construction.	Scale of impact is likely to become **Minor, positive and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	***Scale of Impact before mitigation***	***Mitigation measures***	***Scale of Impact after mitigation measures included***
T7	Moderate, negative	Turbines 7, 9, 10 and 12 are located on an area of unmodified blanket bog, so it is likely these areas would contain a substantial layer of acrotelm peat. Some of these acrotelm turves would be required for use in turbine base reinstatement.	Scale of impact is likely to become **Minor, negative and not significant.**
T8	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T8 construction. Similarly to T6, T8 is next to BP3. Peat would be used for gully restoration. Any excess peat would be appropriately stored in BP3 for use in the final reinstatement profile.	Scale of impact is likely to become **Minor, positive and not significant.**
T9	Moderate, negative	Like T7, T9 would be restored using excavated peat from turbine construction, with some remaining acrotelm used for borrow pit reinstatement, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, negative and not significant.**
T10	Moderate, negative	Similarly to T7 and T9, T10 would involve peat excavation on unmodified blanket bog. This turbine would involve using excavated peat from turbine construction.	Scale of impact is likely to become **Minor, negative and not significant.**
T11	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T11 construction. See Annex 1 of Appendix 3.6 for additional reinstatement proposals.	Scale of impact is likely to become **Minor, positive and not significant.**
T12	Moderate, negative	Like T7, T9 and T10; T12 reinstatement would include using the excavated peat from turbine construction, with some remaining acrotelm used for borrow pit reinstatement, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, negative and not significant.**
T13	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T13 construction. Reinstatement of T13 would be an improvement on the current habitat (unimproved grassland / bare peat).	Scale of impact is likely to become **Minor, positive and not significant**.
T14	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T14 construction.	Scale of impact is likely to become **Minor, positive and not significant**.

Table 12.8 Assessment of residual effects after mitigation

Project Components	***Scale of Impact before mitigation***	***Mitigation measures***	***Scale of Impact after mitigation measures included***
T15	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T15 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
T16	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T16 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
T17	Minor, negative	Turbine bases and associated hardstanding areas would be restored using excavated peat from T17 construction.	Scale of impact is likely to become **Minor, positive and not significant.**
BP 1	Minor, negative	BP1 would be restored within the first 3 to 6 months of the construction programme. Depending on the design of the borrow pit, a suitable reinstatement profile would be created using acrotelm turves and catotelm, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant.**
BP 2	Minor, negative	BP2 would be restored within the first 12 months of the construction programme. Depending on the design of the borrow pit, a suitable reinstatement profile would be created using acrotelm turves and catotelm, see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, positive and not significant.**
BP 3	Moderate, negative	As BP3 is the largest of the borrow pits within the Proposed Development. Depending on the findings from further detailed surveys post consent, BP3 has the potential to be restored using peat from construction areas to its current habitat (wet modified bog), see Annex 1 of Appendix 3.6.	Scale of impact is likely to become **Minor, negative and not significant.**
BP 4	Minor, negative	The current habitat of BP4 is unimproved acid grassland / bare peat. BP4 would be restored a higher quality of habitat using reinstated peat from construction areas and acrotelm turves from nearby turbines located on unmodified blanket bog.	Scale of impact is likely to become **Minor, positive and not significant.**
Site Compound	Negligible, negative	Located on bare peat at Moss Houll, the Site Compound would be restored using excess peat from Turbines 14 and 16. Restoring this area would be an improvement on the current degraded habitat.	Scale of impact is likely to become **Negligible, positive and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	***Scale of Impact before mitigation***	***Mitigation measures***	***Scale of Impact after mitigation measures included***
Site Substation	Negligible, negative	Reinstatement of this area would involve using excess peat from Turbines 11 and 14. Restoring this area would be an improvement on the current degraded habitat, similarly to the Site Compound.	Scale of impact is likely to become **Negligible, positive and not significant.**
Anemometry Mast	Minor, negative	The base of this component would be reinstated in a similar way to the Turbine bases as described in Table 12.8.	Scale of impact is likely to become **Minor, positive and not significant.**
Telecommunications Tower	Minor, negative	The average peat depth for this location is 0.30m with a surrounding area of degradation and erosion. This area would be reinstated in a similar way to that described for the Turbine bases.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 625m)	Minor, negative	The peat depth for this location is 0-0.17m, suggesting that the peat present is of minimal quality. Excavated peat from the construction of this track would be used for creating ‘shoulders’ for the track to reduce any visual impact.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 602m)	Minor, negative	Excavated peat from the construction of this track would be used for creating ‘shoulders’ for the track to reduce any visual impact.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 2, 013m)	Minor, negative	This length of track passes through semi-improved acid grassland, wet modified bog and predominantly through unimproved acid grassland / bare peat and dry modified bog / bare ground. Excess peat from this section of A001 would be used for landscaping the completed track by creating shoulders that are in keeping with the surrounding habitats mentioned.	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 854m)	Minor, negative	Excavated peat from the construction of this track would be used for creating ‘shoulders’ for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A001: 465m)	Minor, negative	Excavated peat from the construction of this track would be used for creating ‘shoulders’ for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**

Table 12.8 Assessment of residual effects after mitigation

Project Components	***Scale of Impact before mitigation***	***Mitigation measures***	***Scale of Impact after mitigation measures included***
Access Track (A002)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A003)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A004)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A005)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**
Access Track (A006)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A007)	Negligible, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact remains **Negligible, positive and not significant.**
Access Track (A008)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A009)	Moderate, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, negative and not significant.**
Access Track (A010)	Minor, negative	Excavated peat from the construction of this track would be used for creating 'shoulders' for the track to reduce any visual impact. see Annex 1 of Appendix 3.6	Scale of impact is likely to become **Minor, positive and not significant.**

Table 12.8 Assessment of residual effects after mitigation

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

Summary of the residual effects resulting from the Proposed Development

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

12.10.3 The project components where the resultant impact is minor and positive (Turbines 1-6, 8, 11 and 13-17, Access Tracks A001, A002, A004, A005, A007, A010, A011, A012 and A013 (see Figure 3.1), BP1, BP2 and BP4 and the Site compound, substation, anemometry mast and telecommunications tower), the positive residual effects are a consequence of the mitigation measures that have been directed at reuse of peat within receptor areas located around the construction footprint. The area available to reinstate peat, based on peat receptor areas that can be reached from within the construction footprint using a long-reach excavator was originally estimated to be 64ha in total (Figure 12.6). Since the submission of the original ES, this has been refined to a total of 46ha of areas potentially suitable for targeted infilling within the Site, not necessarily near the tracks (see the ES addendum Figure 3.6.1.7). Because the incidence of bare and eroded peat is extensive throughout the construction footprint and the adjacent areas, a maximum of 46ha can be reinstated through infilling erosion gullies and areas of bare eroded peat. In addition, through use of peat plugs to slow the movement of surface water in the wider areas, the construction has the potential to deliver minor positive residual effects, subject to the requirements of the HMP that would take effect during the operational phase (see Appendix 10.4 for the OHMP). The residual effects after mitigation identified in Table 12.8 are on the basis that the HMP is fully implemented for the duration of the operational phase of the Proposed Development.

12.11 Cumulative impacts

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

12.12 Summary and conclusions

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

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

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

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

12.12.5 During the operational and decommissioning phases, the potential impact on peat is minimal, and considerably less than that during the construction phase. The implementation of a proposed HMP has been identified to promote active management of the habitat within the Site and reverse the current degradation of peatland habitats associated with overgrazing, erosion from drainage of surface water and to a lesser extent peat cutting.

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

1 Scottish Renewables and Scottish Environmental Protection Agency (SEPA), (2012) (Online) http://www.gov.scot/Resource/0045/00455955.pdf [Accessed September 2015]

2 Scottish Natural Heritage (SNH) (2014) (Online) http://www.snh.gov.uk/docs/A1495150.pdf [Accessed September 2015]

3 The Scottish Government (2007) (Online) http://www.gov.scot/Resource/Doc/161862/0043972.pdf [Accessed September 2015]

4 IEMA, Guidelines for Environmental Impact Assessment. (2006)

5 Orkney & Shetland, Soil Survey of Scotland (1:250,000, Sheet 1). (Online) http://soils-sotland.gov.uk/documents/19141006_39-ORKNEY_AND_SHETLAND_1.pdf

6 Carbon- rich soil, deep peat and priority peatland habitats map (2014). (Online) http://www.snh.gov.uk/docs/A1495150.pdf [Accessed October 2015]

7 Joint Nature Conservation Committee 2011. Towards an assessment of the state of UK Peatlands, JNCC Report No. 445. (Online) http://jncc.defra.gov.uk/pdf/jncc445_web.pdf [Accessed September 2015]

8 Yell Community Council Area Statement, Shetland Local Plan.

9 SEPA Regulatory Position Statement – Developments on Peat. http://www.sepa.org.uk/media/143822/peat_position_statement.pdf

10 Good Practice during Wind Farm Construction', Scottish Renewables, SNH, SEPA, Forestry Commission Scotland and Historic Environment Scotland (2015) (Online) http://www.snh.gov.uk/docs/A1168678.pdf [Accessed September 2015]

11 The Scottish Government, 2014. Scotland's Third National Planning Framework. (Online) http://www.gov.scot/Resource/0045/00453683.pdf [Accessed October 2015]

12 The Scottish Government, 2014. Scottish Planning Policy. (Online) http://www.gov.scot/Resource/0045/00453683.pdf [Accessed October 2015]

13 Shetland Local Development Plan, 2014. http://www.shetland.gov.uk/planning/documents/ShetlandLocalDevelopmentPlanAdopted26_09_2014.pdf

14 Scottish Natural Heritage (SNH). Scotland's National Peatland Plan. (Online) http://www.snh.gov.uk/docs/A1697542.pdf [Accessed October 2015]

15 The Scottish Government, 2013. Low Carbon Scotland: Meeting the emissions reductions targets 2013-2027, The Second Report on Proposals and Policies. (Online) http://www.gov.scot/Resource/0042/00426134.pdf [Accessed October 2015]

16 The Macaulay Land Use Research Institute, 2014. (Online) http://www.macaulay.ac.uk/explorescotland/lca_map.pdf [Accessed October 2015]

17 IIEM, 2002 and 2006. Guidelines for Ecological Impact Assessment in the United Kingdom. Chartered Institute of Ecology and Environmental Management. See: http://www.cieem.org.uk/ecia/index.html

18 Scottish Natural Heritage, Floating Roads on Peat, 2014. (Online) http://timbertransportforum.org.uk/attachments/article/126/FCE%20SNH%20Publication%202010%20Floating%20Roads%20on%20Peat.pdf [Accessed October 2015]

19 Scottish Executive (2006) Peat Landscape Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments. (Online) http://www.gov.scot/Publications/2006/12/21162303/5 [Accessed January 2016]

Appendix 2.4

Correspondence concerning Groundwater

Graham, Rachel

From:	Bernadette Barry <BBarry@peel.co.uk>
Sent:	03 May 2016 13:32
To:	Graham, Rachel
Cc:	Brignall, Dave
Subject:	FW: Groundwater extraction
Follow Up Flag:	Follow up
Flag Status:	Flagged
Categories:	Saved

Rachel

Please see below from the Arisdale hatchery confirming that they do not abstract groundwater. I have asked the other crofters and there are no groundwater abstraction on site.

Kind Regards, Berni

From: JAMES SMITH
Sent: 02 May 2016 12:05
To: Bernadette Barry
Subject: Groundwater extraction

Peel Energy,
Bernadette.

I got an email from Bertie, here is my reply.

Gronidaal Organic Smolts Ltd,.Do not use borehole groundwater, we do have SEPA consent to use runoff from the burn of Arisdale.
Our CAR/Licence number/1002361. Our daily consent is to abstract 9500 meters cubed. Abstraction point **HU 4865 8095. WPC/N/0062306.**

We also have SEPA Consent for the Loch of Littlester **WPC/N/70067.**

The only problem I see is we are going to put our business on the market and it may have new owners shortly.

Best regards,
Jim Smith

Bernadette Barry
Development Manager

Peel Energy Limited
Peel Dome, intu Trafford Centre, TRAFFORD**CITY**,Manchester M17 8PL

Telephone: 0161 629 8361

E-mail: BBarry@peel.co.uk **Web:** www.peel.co.uk

Appendix 3.1

SNH Letter

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Joyce Melrose
Admin Officer
Local Energy and Consents
The Scottish Government

Dear Ms Melrose

The Electricity Works (EIA) (Scotland) Regulations 2000.
Section 36 Application: Beaw Field Wind Farm, Yell, Shetland

Thank you for consulting us over this application and for agreeing to an extension to the response deadline.

1. Summary

1.1 This proposal is likely to have a significant effect on the protected features of Otterswick and Graveland Special Protection Area (SPA). At present there is insufficient information to determine that the proposal would not adversely affect the integrity of the SPA and **we therefore object to this proposal until further information is obtained from the applicant**. This is set out in our appraisal below and in Annex 1. Once this information has been provided we will be able to give this proposal further consideration.

1.2 We consider that further information is required fully to assess the cumulative impact of this proposal together with others on the Shetland populations of a number of important bird species, as detailed below and in Annex 1.

1.3 We also offer advice with regard to reducing the landscape and visual impact of the proposal and on measures to mitigate impacts on other natural heritage interests as far as is possible and to secure the delivery of compensatory benefits should this proposal receive consent. It is for the Scottish Ministers to determine, within the context of their own policies, whether conditions are necessary to secure these measures.

2. Background

2.1 The proposal is for the construction and operation of a wind farm comprising seventeen turbines, 145 metres to tip, together with associated infrastructure, in the south-eastern corner of the island of Yell, Shetland.

3. Appraisal of impacts and advice

<u>Otterswick and Graveland Special Protection Area (SPA)</u>

3.1 The proposal is close to Otterswick and Graveland Special Protection Area (SPA) classified for its breeding red-throated divers. The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") or, for reserved matters, the Conservation of Habitats and Species Regulations 2010 as amended apply. Consequently, Scottish Ministers are

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Tel 01595 693345 Fax 01595 692565 www.snh.gov.uk

required to consider the effect of the proposal on the SPA before it can be consented (commonly known as Habitats Regulations Appraisal). The SNH website has a summary of the legislative requirements (http://www.snh.gov.uk/docs/A423286.pdf).

3.2 In our view, from the information available, it appears that in this case the proposal is not connected with or necessary for the conservation management of the site. Hence, further consideration is required.

3.3 In our view, this proposal is likely to have a significant effect on the red-throated diver population of Otterswick and Graveland SPA. Consequently, Scottish Ministers are required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest. On the basis of the assessment provided in the Environmental Statement and the relevant Technical Chapter and appendices, it cannot be concluded that there will not be an adverse effect on site integrity.

3.4 We consider that the following additional information is required to enable a full assessment of the implications of the proposal for the SPA:

i. A clearer exposition of the survey work carried out on each of the diver pools with breeding pairs that were watched.

ii. An assessment of the potential lack of information from the early part of the breeding season, when pairs may have established but failed early on.

iii. An assessment of the diurnal distribution of flight activity, particularly with respect to diver flights early and late in the day.

iv. Incorporation of data on loch occupancy from outwith the restricted survey period and consideration of the potential effect of longer term changes in loch occupancy on the SPA diver population, and how this would affect collision and barrier effects. Potential displacement effects should also be assessed on the basis that some pools used in the past but not occupied during the survey years could be re-occupied in the future.

v. Assessment of the potential effect on the population arising through impacts on immature (and pre-breeding divers). The detail of the information requested is set out in Annex 1.

Annex 1 contains full details and reasoning of these requirements. Once this information has been provided, we will be able to give further consideration to this proposal.

Natural Heritage Zone bird populations

3.5 The assessment of cumulative impacts is insufficient to assess impacts on Natural Heritage Zone (NHZ) populations of a number of species of high conservation importance. This is particularly true for breeding waders such as golden plover and curlew (species of high conservation importance) as well as merlin and Artic skua. This is particularly true for breeding waders such as golden plover and curlew (species of high conservation importance) as well as merlin and Artic skua. Further information will be required to allow assessment of the impacts of this development on NHZ populations. More detail on the information required is set out in Annex 1.

Wider countryside birds

3.6 Paragraph 10.6.2 of Chapter 10 (Ornithology) states that the species which should be considered in cumulative impact assessment are those for which a likely potentially significant effect has been predicted. However, small impacts on bird populations resulting from multiple developments, although not individually considered significant, may in combination result in a significant overall impact. Cumulative impact assessment should therefore consider these effects on all important bird species.

3.7 We therefore consider that the ES does not adequately assess potential cumulative impacts on a number of important breeding bird species, including red-throated diver, golden plover, curlew, merlin and Arctic skua. Our reasoning is set out in Annex 1. We advise that a fuller account of cumulative impacts on these species should be sought from the applicant.

3.8 The Environmental Statement lists relevant wind farms, however the cumulative impacts should be assessed in relation to all relevant developments and not only wind farms. The assessment should also consider the likely additional impact arising from the overhead power line connecting the Beaw Field development to the proposed Kergord sub-station.

Otters – European Protected Species

3.9 On the basis of the otter survey undertaken in August 2015 and submitted as Appendix 11.3 of the ES we agree that the development site is currently only occasionally used by otters and is not an important area for the species. Consequently there is no need for an otter licence to be considered before determination of this application.

3.10 Should the development be approved, further surveys should be undertaken no more than two months before work begins, as set out in the Outline Construction Environmental Management Plan (OCEM), to ensure that no otter holts have been established in the meantime.

3.11 Otter holts in Shetland are found almost exclusively near the coast, with the exception of natal holts which are usually located inland and well hidden. If a holt is discovered by the pre-construction surveys or during construction it is therefore likely to be a natal holt and should be presumed to be so. An exclusion zone of at least 100 metres radius, rather than 30 metres as specified in the OCEM, should be established around it unless and until it can be established that the otters are not breeding or that the cubs have left the holt.

Peatland

3.12 We welcome the proposal to use peat excavated during construction to restore degraded blanket bog habitat in the vicinity of the development, however we would stress that care needs to be taken if catotelm peat is to be used for this purpose. Once disturbed, catotelm peat is unstable, difficult to handle and liable to be remobilised by water flowing over or through it.

3.13 Details of use of excavated peat for habitat restoration, including measures to ensure the stability of any catotelm peat used, should therefore be set out in the final peat Management Plan and approved by the relevant authorities before construction begins.

Habitat Management Plan

3.14 We support the measures proposed in the Outline Habitat Management Plan to implement measures to improve the condition of peatland and the nesting habitat of merlin and red-throated diver. We reiterate though that the restoration of diver nesting pools should not be considered as mitigation or compensation for any potential impacts of the development on the SPA as these measures cannot be guaranteed to be effective.

Landscape and visual impacts

3.15 There are no nationally designated landscapes within the site. Two sections of the Shetland NSA lie within 30km of the site. We agree with the ES, that the Special Qualities (SQs) of the NSA and specifically of Fethaland are primarily related to its coastal setting and the relationship between land and sea. **Whilst the development would be visible from within the NSA, at a distance of approximately 13km and in a direction away from the coast, we do not consider this would impact significantly on the experience of the SQ.**

3.16 SNH Wild Land Areas are not designated, but are recognised as a nationally important asset within SPP. The nearest and only WLA on Shetland is Ronas Hill and North Roe, located 15km distance on Mainland Shetland. **We agree with the ES assessment of impact that whilst the development would be visible, given the context of the WLA within Shetland and the distance to the development, we do not consider this impact to be significant.**

3.17 We consider that there are significant impacts on landscape character of the immediate site *Yell Peatland* landscape character area (LCA) and the sensitive transition and character areas of the adjacent pockets of settled crofting along the coast.

3.18 We consider the development would introduce significant visual effects out to approximately 12kms which are predicted to affect high sensitivity receptors in some local communities.

3.19 Cumulatively, the introduction of turbines at South Yell will, at a more strategic level, could intrude upon an area of 'respite' between the consented developments at Viking and Garth, visually sequentially linking these two developments when travelling across the Mainland and Yell.

3.20 Given the scale and predicted severity of impact on high sensitivity coastal communities within 10km of the development, we recommend further refining the wind farm design and the siting and design of the borrow pits and grid connection to mitigate the severity of landscape, visual and cumulative effects.

Yours sincerely

Graham Neville
Operations Manager
Northern Isles and North Highland

Annex 1 – Assessment of the effect of the wind farm on bird populations

Impacts on the red-throated diver interest of Otterswick & Graveland SPA

The proposed wind farm lies to the south-east of Otterswick and Graveland SPA, between the site and the sea. The most north-westerly turbine would lie approximately 240 metres from the site boundary and 7-800 metres from the nearest red-throated diver nesting pools within the site (although neither of these pools was used during 2011, 2012 or 2015 when the EIA surveys were undertaken). It is clear from this that the wind farm could affect the breeding red-throated diver qualifying interest of the SPA and the proposed development will require a Habitats Regulations Assessment (HRA).

The proposed layout of the wind farm has been guided in part by the potential for effects on the breeding red-throated diver population. The iterative design process removed turbines to the west of the current layout to maintain a corridor to the coast for breeding divers, so avoiding barrier and potential collision effects in that area. Nevertheless, the EIA vantage point surveys show divers flying at blade height through the current turbine envelope and consequently there remains a small risk of mortality due to collisions. There is also accumulating evidence from other wind farms that displacement of breeding divers is a significant issue, indeed the ornithology chapter mentions that 'macro-avoidance' (i.e. displacement) is the biggest issue with wind farms.

Our advice is therefore that, contrary to the summary assessment in section 10.5.8 of the ES, the development is likely to have a significant effect on the diver qualifying interest of the SPA. Consequently, an appropriate assessment must be undertaken of the implications for the site in view of the site's conservation objectives.

On the basis of the information supplied to date, we cannot be certain that there will be no significant disturbance of the divers nor that the distribution of nesting divers within the site will not be affected. In order to make this assessment the following information will be required:

1. Clarification of the locations of the breeding diver pools and survey times for each.

Information on survey times is summarised in Table 2 of the Birds Technical Report (Appendix 10.1 of the ES) but there is no indication of which lochs were watched, or for how long.

2. An assessment of the potential lack of information from early in the season, when pairs may have established but failed early on.

It is not clear from Table 2 whether adequate watches were undertaken early in the season. Most of the flight data appears to be taken from dedicated observations of 'successful' pairs, which potentially also underestimates the flight activity early in the season, as this will have missed pairs that fail early; a common phenomenon in red-throated diver. This may be an artefact of the way the data are presented but, if real, this data gap might require further survey work unless the applicant can present a reasoned case to the contrary.

3 An assessment of the diurnal distribution of flight activity, particularly with respect to diver flights early and late in the day.

Divers show strong diurnal patterns in flight activity, being particularly active early and late in the day. It is therefore essential that surveys cover the whole diurnal time frame across the breeding season. It is not clear from Table 2 whether the distribution of data across the diurnal period is adequate to accurately characterise flights to and from breeding pools.

4. Incorporation of data on loch occupancy from outwith the restricted survey period and consideration of the potential effect of longer term changes in loch occupancy on the SPA diver population, and how this would affect collision and barrier effects. Potential

displacement effects should also be assessed on the basis that some lochs, not occupied during the survey years, could be occupied in future.

Over the three years of survey, diver breeding attempts were recorded at only a few of the pools where it has been recorded in the past. Divers show a degree of site fidelity but are known to move nest sites for a number of reasons, including loss of mate, unsuitability of the habitat and repeated breeding failure. Section 10.5.3 of the ES refers to a study of site fidelity in red-throated diver (although the author was in fact J D Okill, rather than James Pearce-Higgins), however this was based on a total of only 24 records, 6 of which were not recaptures at the original pool, with movements of up to 1km away from the original site. Whilst this is reasonable evidence of high short-term site fidelity, long term studies show that patterns of occupancy do change over time. It is likely therefore that over the projected 25 year operation of the wind farm a wider range of pools within the SPA will be used. The limited survey data for the wind farm does not and cannot represent the long-term pattern of loch occupation, however this needs to be taken into account. To help with this assessment, we have provided the developer with past data on red-throated diver occupancy.

5. Further assessment of the potential effect on the population arising through impacts on immature and pre-breeding divers.

The stability of the SPA diver population depends on recruitment of breeding birds from among the pre-breeding cohort as old birds die. The ES acknowledges that immature and non-breeding birds currently fly across the wind farm site. The development could therefore affect recruitment either by causing increased mortality of potential breeding birds or, more probably, as a result of displacement and barrier effects. Established breeders, being site faithful, may tolerate some degree of disturbance at a familiar nesting pool, so displacement might therefore be expected to have a greater effect on new recruits than on existing breeders.

Impacts on Shetland Natural Heritage Zone (NHZ) bird populations

The assessment of cumulative impacts is insufficient to assess impacts on NHZ populations of a number of species of high conservation importance, as set out below:

	Birds Directive, Annex 1	Wildlife and Countryside Act, Schedule 1	UK Red List of Birds of Conservation Concern
Red-throated diver	x	x	
Golden plover	x		
Curlew			x
Merlin	x	x	x
Arctic skua			x

Shetland supports a significant proportion of the UK breeding populations of red-throated diver (approx. 32%), golden plover (approx. 15%), curlew (approx. 15%), merlin (approx. 7%) and Arctic skua (approx. 53%)[1]. There is evidence that these species may be affected by wind farms, either as a result of collision risk or through displacement[2].

The developer has made some assessment of the cumulative impact on the Shetland NHZ population of red-throated diver, but we consider that further analysis is necessary, possibly

[1] Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504. pp72. Available from: www.swbsg.org

[2] **Pearce-Higgins, J.W., Stephen, L., Douse, A. & Langston, R.H.W.** 2012. Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. *Journal of Applied Ecology* **49**: 386-394. (http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2664.2012.02110.x/full)

including some population modelling, before we can be sure that effects on the Shetland wide population are not significant.

Cumulative impacts on other species appear to have been ruled out on the basis that the Beaw Field development on its own will not have a significant impact and therefore no further assessment is required. Whilst the principal effects from Beaw Field alone on the Shetland NHZ populations will be minor, there is potential for significant cumulative impacts in combination with other consented wind farms, particularly the consented Viking wind farm, and with other developments, including the overhead power line linking the Beaw Field development to the interconnector station at Kergord. These in-combination impacts need to be fully assessed to determine whether there is a significant cumulative impact.

With regard to golden plover, we disagree with the view expressed in the ES that impacts arising from operational wind farms are likely to be minimal. The results of studies undertaken at Gordonbush, which have been in the public domain for some time and have recently been published[3], show high levels of disturbance and displacement of golden plover at operational wind farms.

[3] Sansom, A., Pearce-Higgins, J. W., Douglas, D. J. T. (2016), Negative impact of wind energy development on a breeding shorebird assessed with a BACI study design. Ibis. doi: 10.1111/ibi.12364

Appendix 3.2

Isle of Yell RTD Lochan Nest Searches

This information is confidential and has therefore been removed from this version of the FEI Appendices.

Appendix 3.3

Vantage Point Dawn / Dusk Timings

This information is confidential and has therefore been removed from this version of the FEI Appendices.

Appendix 3.4

Otterswick SNH Historic RTD Breeding Data

This information is confidential and has therefore been removed from this version of the FEI Appendices.

Appendix 3.5

RTD Population Viability Analysis

This information is confidential and has therefore been removed from this version of the FEI Appendices.

Appendix 4.1a

Visit Scotland Consultation Response

23 March 2016

Joyce Melrose
Scottish Government
Energy Consents and Deployment Unit
5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

Dear Ms Melrose,

Beaw Wind Farm, Yell, Shetland

Thank you for giving VisitScotland the opportunity to comment on the above wind farm development.

Our response focuses on the crucial importance of tourism to Scotland's local and national economy, and of the natural landscape for visitors.

Background Information

VisitScotland, as Scotland's National Tourism Organisation, has a strategic role to develop Scottish tourism in order to get the maximum economic benefit for the country. It exists to support the development of the tourism industry in Scotland and to market Scotland as a quality destination.

While VisitScotland understands and appreciates the importance of renewable energy, tourism is crucial to Scotland's economic and cultural well-being. It sustains a great diversity of businesses throughout the country. According to a recent independent report by Deloitte, tourism generates £11 billion for the economy and employs over 200,000 – which is 9% of the Scottish workforce. Tourism provides jobs in the private sector and stimulates the regeneration of urban and rural areas.

One of the Scottish Government and VisitScotland's key ambitions is to grow tourism revenues and make Scotland one of the world's foremost tourist destinations. This ambition is now common currency in both public and private sectors in Scotland, and the expectations of businesses on the ground have been raised as to how they might contribute to and benefit from such growth.

Importance of scenery to tourism

Scenery and the natural environment have become the two most important factors for visitors in recent years when choosing a holiday location.

The importance of this element to tourism in Scotland cannot be underestimated. The character and visual amenity value of Scotland's landscapes is a key driver of our tourism product: a large majority of visitors to Scotland come because of the landscape, scenery and the wider environment, which supports important visitor activities such as walking, cycling wildlife watching and visiting historic sites.

The VisitScotland Visitor Experience Survey (2011/12) confirms the basis of this argument with its ranking of the key factors influencing visitors when choosing Scotland as a holiday location. In this study, over half of visitors rated scenery and the natural environment as the main reason for visiting

Scotland. Full details of the Visitor Experience Survey can be found on the organisation's corporate website, here: http://www.visitscotland.org/research_and_statistics/tourism_topics/wind_farms-1.aspx

Taking tourism considerations into account
We would suggest that full consideration is also given to the Scottish Government's 2008 research on the impact of wind farms on tourism. In its report, you can find recommendations for planning authorities which could help to minimise any negative effects of wind farms on the tourism industry. The report also highlights a request, as part of the planning process, to provide a tourism impact statement as part of the Environmental Impact Analysis. Planning authorities should also consider the following factors to ensure that any adverse local impacts on tourism are minimised:

- The number of tourists travelling past en route elsewhere
- The views from accommodation in the area
- The relative scale of tourism impact i.e. local and national
- The potential positives associated with the development
- The views of tourist organisations, i.e. local tourist businesses or VisitScotland

The full study can be found at www.scotland.gov.uk/Publications/2008/03/07113507/1

Conclusion
Given the aforementioned importance of Scottish tourism to the economy, and of Scotland's landscape in attracting visitors to Scotland, VisitScotland would strongly recommend any potential detrimental impact of the proposed development on tourism - whether visually, environmentally and economically - be identified and considered in full. This includes when taking decisions over turbine height and number.

VisitScotland strongly agrees with the advice of the Scottish Government –the importance of tourism impact statements should not be diminished, and that, for each site considered, an independent tourism impact assessment should be carried out. This assessment should be geographically sensitive and should consider the potential impact on any tourism offerings in the vicinity.

VisitScotland would also urge consideration of the specific concerns raised above relating to the impact any perceived proliferation of developments may have on the local tourism industry, and therefore the local economy.

We hope this response is helpful to you.

Yours sincerely

Douglas Keith
Business Affairs Executive
VisitScotland

Appendix 4.1b

Scottish Water Consultation Response

29 March 2016

Joyce Melrose
Local Energy and Consents
The Scottish Government

By email to: econsentsadmin@scotland.gsi.gov.uk

SCOTTISH WATER
The Bridge
Buchanan Gate Business Park
Cumbernauld Road
Stepps
G33 6FB

0141 414 7444
www.scottishwater.co.uk
EIA@scottishwater.co.uk

Dear Joyce

Beaw Field Windfarm, Yell, Shetland

Thank you for consulting with Scottish Water regarding the above proposed development.

Advice to the Scottish Government

As indicated in our response to the request for an EIA Scoping Opinion issued in May 2015, there are no Scottish Water drinking water abstraction sources or wider drinking water catchments in the area that may be affected by the proposed Beaw Field Windfarm. Scottish Water drinking water abstraction sources are designated as Drinking Water Protected Areas (DWPA) under Article 7 of the Water Framework Directive.

As detailed below, we recommend that Peel Energy contacts Scottish Water's Asset Impact Team to discuss the proposed development as there is Scottish Water infrastructure located within the site boundary that may result in a conflict with the infrastructure of the windfarm.

Advice for the Developer

Drinking Water Protected Areas

As noted above and in our previous correspondence, there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed development.

Scottish Water Assets

It is noted that, based on advice provided in our response to the request for an EIA Scoping Opinion in May 2015, Peel Energy has identified that there is Scottish Water infrastructure located within the Beaw Field Windfarm site boundary. Section 15.4 of the Hydrology and Hydrogeology chapter of the Beaw Field Windfarm Environmental Statement (ES) states:

"Scottish Water suggested that the ES should provide detailed information on Scottish Water assets. Scottish Water asset plans were obtained and a water main was identified within the Site. The Proposed Development (access tracks) were located outwith Scottish Water's specified avoidance buffer from their assets to prevent damage."

Whilst we welcome that efforts have been made to avoid Scottish Water infrastructure in designing the layout of the windfarm, our records indicate that there is a 180mm distribution main within the site which appears to be impacted by access road A001 and turbine T14. We therefore request that Peel Energy contacts the Scottish Water Asset Impact Team (AIT) at **service.relocation@scottishwater.co.uk** as soon as possible to discuss this further.

Annex 1 includes a list of precautions to be taken when working within the vicinity of Scottish Water assets. This list of precautions is not exhaustive but should be taken into account as the development progresses through the planning and development process.

It should be noted that the development will be required to comply with Sewers for Scotland and Water for Scotland 3rd Editions 2015, including provision of appropriate clearance distances from Scottish Water assets.

If you have any questions relating to the above, or in relation to the information presented in Annex 1, please do not hesitate to contact me.

Yours sincerely

Joanna Cottin
Strategic Planner – Environmental Impact Assessment
EIA@scottishwater.co.uk

Enc.

cc. Bernadette Barry, Development Manager, Peel Energy (bbarry@peel.co.uk)

Annex 1: Precautions to protect Scottish Water assets during windfarm construction and operational activities

General requirements

1. The proposed timing of the works, including planned start and completion dates, should be submitted to Scottish Water in advance of any activities taking place on-site. This information should be submitted to **EIA@scottishwater.co.uk**.
2. If a connection to the water or waste water network is required, a separate application must be made to the Scottish Water Customer Connections Team for permission to connect. It is important to note that the granting of planning consent does not guarantee a connection to Scottish Water assets. The Customer Connections Team can be contacted by telephone on **0800 389 0379** or via email at **customerconnections@scottishwater.co.uk**.
3. In the event of an incident occurring that could affect Scottish Water we should be notified without delay using the Customer Helpline number **0800 0778 778** and the local contact if known.

Protecting Scottish Water assets

4. If an activity associated with a development proposal is located within close proximity to Scottish Water assets, including water and waste water pipe infrastructure, treatment works and reservoirs etc., it is essential that these assets are protected from damage. To this end, the developer will be required to comply with Scottish Water's current process, guidance, standards and policies in relation to such matters.
5. Copies of Scottish Water's relevant record drawings can be obtained from the undernoted Asset Plan Providers. This is distinct from the right to seek access to and inspect apparatus plans at Scottish Waters area offices, for which no charge is applied.

   Site Investigation Services (UK) Ltd
   Tel: 0333 123 1223
   Email: sw@sisplan.co.uk
   www.sisplan.co.uk

   National One-Call
   Tel: 0844 800 9957
   Email: swplans@national-one-call.co.uk
   www.national-one-call.co.uk/swplans

6. It should be noted that the site plans obtained via the Asset Plan providers are indicative and their accuracy cannot be relied upon. It is therefore recommended that the developer contacts the **Scottish Water Asset Impact Team** at **service.relocation@scottishwater.co.uk** for further advice if assets are shown to be located in the vicinity of the proposed development, and where the exact location and the nature of the infrastructure shown could be a key consideration for the proposed development. An appropriate site investigation may be required to confirm the actual position of assets in the ground. Scottish Water will not be liable for any loss, damage or costs caused by relying upon plans or from carrying out any such site investigation.
7. Prior to any activity commencing, all known Scottish Water assets should be identified, located and marked-out.
8. Scottish Water expects method statements, safe systems of work and risk assessments to be prepared and submitted in advance to Scottish Water for formal review and acceptance. These documents shall consider and outline in detail how existing Scottish Water assets are to be protected and/or managed for the duration of any construction works and during operation of the development if relevant. These documents must be submitted to Scottish Water's Asset Impact team for formal prior written acceptance.
9. The developer shall obtain written acceptance from Scottish Water's Asset Impact Team where any site activities are intended to take place in the vicinity of Scottish Water's assets. The Asset Impact Team can advise on any potential risk mitigation measures that may be required.
10. Scottish Water and its representatives shall be allowed access to Scottish Water assets at all times for inspection, maintenance and repair. This will also ensure that the Scottish Water assets are protected and that any Scottish Water requirements are being observed.
11. Any obstruction or hindrance of access to Scottish Water assets should be avoided. The prompt and efficient use and manipulation of valves, hydrants, meters or other apparatus is required at all times. There should also be no interference with the free discharge from water main scours or sewer overflows.

12. In the event of an incident occurring that could affect Scottish Water, including any damage to assets, Scottish Water should be notified without delay, using the Customer Helpline number **0800 0778 778**, and the local contact if known. Scottish Water apparatus should not be interfered with or operated by anyone other than Scottish Water personnel.

13. The 'offset distance' is the distance between any Scottish Water asset and adjacent properties and structures. Scottish Water reserves the right to ask for an offset distance in accordance with its own current policy and standards and to suit specific circumstances. The details of this requirement should be confirmed with Scottish Water as an early part of the design process.

14. Stationary plant, equipment, scaffolding, construction or excavated material, etc. should not be placed over, or close to, any Scottish Water assets without the prior written consent of Scottish Water which may be withheld depending on circumstances on-site.

15. Special care should be taken to avoid the burying of Scottish Water assets or the obstruction of sewers or manholes with fill or other material. Arrangements for altering the level of any chambers should be agreed in advance with Scottish Water and these should be constructed in accordance with Scottish Water requirements. The cost of any work to Scottish Water assets will be met by the project developer.

16. Excavation works (e.g. of wind turbine foundations) should not be carried out in the proximity of a water or waste water main without due notice having been given to Scottish Water and prior written acceptance obtained. The developer will comply fully with any Scottish Water specific site requirements.

17. Any tree planting associated with the development (e.g. compensatory planting or screening etc.) should be undertaken in line with Water for Scotland 3rd Edition (April 2015) to ensure that Scottish Water assets are not put at risk by future growth of tree roots.

18. Vibration in close proximity to Scottish Water pipelines or ancillary apparatus should be managed in accordance with British Standard 5228-1:2009 (Code of practice for noise and vibration control on construction and open sites). The predicted levels of vibration should be agreed in advance with Scottish Water as part of the risk assessment and method statement and agreed vibration monitoring arrangements will be required.

19. The developer will consider the possibility of increased loading on Scottish Water apparatus and measures will be taken to eliminate or mitigate increased loading on assets. Care should be taken to identify any assets which may be crossed by vehicles on the access route to the site and crossing points will be engineered to the requirements of Scottish Water. Any pipe crossing proposals are subject to prior written acceptance by Scottish Water.

20. Scottish Water will not accept liability for any costs incurred in fulfilling any of the above requirements during the development planning, construction or operational phases, either by the developer, the developer's associates, contractors or any other person or organisation involved in the project.

21. If the developer damages any Scottish Water asset they will be held liable for any costs resulting from this.

22. Scottish Water may require costs associated with the development to be reimbursed by the developer or the developer's agents.

Appendix 4.1c

Defence Infrastructure Organisation Consultation Response

Defence Infrastructure Organisation

Debi Parker
Safeguarding Assistant
Ministry of Defence
Safeguarding – Wind Energy
Kingston Road
Sutton Coldfield
West Midlands B75 7RL
United Kingdom

Telephone [MOD]: [redacted]
Facsimile [MOD]:
E-mail:

Your Reference: Section 36

Our Reference: [redacted]

Joyce Melrose
The Scottish Government
4th Floor, 5 Atlantic Quay
150 Broomielaw
Glasgow G2 8LU

28th April 2016

Dear Ms Melrose

Please quote in any correspondence: 15761

Proposal: Erection of 17 Wind Turbines

Site Name: Beaw Field

Site Address: Isle of Yell, Shetland Islands

Planning Application Number: Section 36

Thank you for consulting the Ministry of Defence (MOD) on the above Planning Application in your communication dated 15th March 2016.

I am writing to tell you that the MOD has no objection to the proposal.

The application is for 17 turbines at 145.00 metres to blade tip. This has been assessed using the grid references below as submitted in the planning application or in the developers' or your pro-forma.

[redacted]

[redacted]

In the interests of air safety, the MOD requests that all perimeter turbines are fitted with MoD accredited 25 candela omni-directional red lighting or infrared aviation lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point.

The principal safeguarding concern of the MOD with respect to the development of wind turbines relates to their potential to create a physical obstruction to air traffic movements and cause interference to Air Traffic Control and Air Defence radar installations.

Defence Infrastructure Organisation Safeguarding wishes to be consulted and notified of the progression of planning applications and submissions relating to this proposal to verify that it will not adversely affect defence interests.

If planning permission is granted we would like to be advised of the following;

- the date construction starts and ends;
- the maximum height of construction equipment;
- the latitude and longitude of every turbine.

This information is vital as it will be plotted on flying charts to make sure that military aircraft avoid this area.

If the application is altered in any way we must be consulted again as even the slightest change could unacceptably affect us.

I hope this adequately explains our position on the matter. If you require further information or would like to discuss this matter further please do not hesitate to contact me.

Further information about the effects of wind turbines on MOD interests can be obtained from the following websites:

MOD: https://www.gov.uk/government/publications/wind-farms-ministry-of-defence-safeguarding

Yours sincerely

[redacted]

Debi Parker
Safeguarding Assistant – Wind Energy
Defence Infrastructure Organisation

SAFEGUARDING SOLUTIONS TO DEFENCE NEEDS

Appendix 4.1d

Shetland Amenity Trust Response

Iain McDiarmid
Executive Manager - Planning Service
Shetland Islands Council
8 North Ness Business Park
Lerwick

ZE1 0LZ

Dear Mr McDiarmid

Electricity Act 1989: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000

Section 36 Application for the Proposed Beaw Field Wind Farm, Island of Yell,Shetland

Shetland Amenity Trust is a Charitable Trust set up in 1983. One of the Trust's core objectives is the provision, development and improvement of facilities for the enjoyment by the public of the Shetland countryside and its flora and fauna, the conservation and enhancement for the benefit of the public of its natural beauty and amenity and the securing of public access to the Shetland countryside for the purposes of research, study and recreation.

We would like to offer the following comments on this Section 36 application.

We accept that the proposed project is unlikely to have significant adverse impacts on the ornithological interests of the area and are encouraged to see that the developer is planning to attempt to restore some of the habitat within the site to active blanket bog, and create potential breeding lochans for Red-throated Diver. We do, however, have some concerns regarding aspects of the ES and EIA. These relate largely to the quantity and quality of blanket bog on the site, the carbon audit and the scope of the Outline Habitat Management Plan. Initially we outline our general concerns and these are followed by more detailed comments referring to specific points in the documents presented with this application.

General Comments

1. The quality of the blanket bog within the site is underplayed. Both aerial photographs and the data presented in the Beaw Field Peat Depth Survey suggest that at least 10% of the site is active blanket bog. Active blanket bog is a European Priority Habitat. Alba Ecology seem unclear as to whether or not any of the blanket bog is active – see 11.5.18, and below. In our view there is no doubt that a proportion of the blanket bog within the site is 'active' in terms of the Annex 1 European habitat descriptions.

In terms of the carbon audit for this project the area of active blanket bog currently present on site seems to be underplayed (as detailed above) yet the area which it is proposed will recover to active bog following the implementation of the Habitat Management Plan, given as 500 hectares, seems to be overstated. Blanket bog restoration in Shetland is challenging and it seems unlikely that such an area will recover based on the prescriptions given with the Outline Habitat Management Plan

(OHMP) detailed in the application. Both of these factors serve to reduce the carbon payback time of this project.

2. There is insufficient detail on what will happen to the quarter a million cubic metres of peat that will be generated as a result of this project. It is suggested that much of this will be used to 'reinstate' borrow pits, some will be used to infill areas of degraded/eroded blanket bog, and some will be stored and used in re-instatement. Yet there is no evidence presented that any of these methods will be successful. This seems more of an exercise in finding 'apparently appropriate' ways of dealing with a vast overburden than any serious attempt at utilising the peat-waste in a meaningful way and properly addressing the genuinely difficult issues of storage of peat and its subsequent re-use.

3. The Outline Habitat Management Plan (OHMP) should, in our opinion, have contained more detail than was presented in this 'summary'.

There are repeated references to successful restoration on adjacent ground in west Yell but nowhere does it describe in detail:

- where exactly this area is
- what the changes in management were
- how the physical characteristics of this site compare with the Beaw Field site
- a description of the vegetation in this area prior to 'restoration' there, and how this compares with the Beaw Field site
- what vegetation changes have actually taken place at west Yell and how this differs from what was there before

Without more details of this recovery it seems little more than conjecture that the implementation of the OHMP as currently prescribed will change the vegetation in the area of the proposed wind farm in the same positive way.

We are also surprised that the OHMP appears to rely almost entirely on stock reduction. It makes no mention of blocking of erosion channels and drains, re-profiling of hags, treatment of bare areas etc. These will be required to raise the water table within the eroded areas as a precursor to successful colonisation by bog plants and full peatland restoration. Indeed stock exclusion may be necessary in some areas to allow restoration to be successful. Shetland Amenity Trust has been involved with two peatland restoration projects in Shetland and would be happy to show representatives of the developers these, and to discuss possible restoration techniques that could be used in Shetland.

4. There are a series of deficiencies within the Carbon audit equation and indeed, as far as we are aware, the version used has been deemed as NOT suitable for use in a planning application such as this. As is so often the case the values used in various parameters are loaded to minimise the carbon payback time and thus favour the developer. We do not believe a realistic figure for carbon payback is given and are certain that a figure representing a proper worst case scenario is not presented.

5. The size of the windfarm exceeds the size recommended for this area in the SIC supplementary guidance on onshore wind farms.

Detailed comments (the relevant sections of the submitted documents are given)

Chapter 10 Ornithology

10.5.14 In our view the worst case scenario should be used to calculate collision risk for Red-throated Divers i.e. the maximum collision risk in any one year of survey work, not the mean across two years.

10.5.21 The restoration of potential breeding lochans is of questionable relevance in terms of assessing the impact of this development on Red-throated Divers given that there is no guarantee that the restored lochans will be used by divers.

10.5.31 The Shetland-wide population of Golden Plovers is given here as 1,450 pairs yet in section 10.4.15 it is given as 5,665 pairs. There are similar inconsistencies for Dunlin (2,054 pairs in 10.4.17 but 1,700 pairs in 10.5.42) and Curlew (4,227 pairs in 10.4.24 but 2,300 pairs in 10.5.66). We assume that the set of figures in section 10.4 are based on the paper by Wilson *et al* 2015 (*Natural Heritage Zone Bird Population Estimates*), whereas those in section 10.5 are extracted from Pennington *et al* 2004 (*The Birds of Shetland*). Whilst we have no reason to doubt the figures presented for collision risk, or the impacts of land-take or habitat loss on these species, the inconsistency in presenting something as important as Shetland population size does not inspire confidence.

10.7.13 We believe that peatland restoration should be encouraged by more than just a reduction in stock numbers. Two small peatland restoration projects in Shetland have highlighted the benefits of blocking erosion gulleys/drains and lifting the water table as a consequence. These methods may well be appropriate in the vicinity of the Beaw Field windfarm and as such their consideration and implementation should be a part of any proposed Habitat Management Plan. Furthermore, the constant reference to 'adjacent land at West Yell' and the successful habitat improvements undertaken there is unhelpful without a more detailed description of that habitat, the management changes effected there and how these have led to the subsequent improvement in habitat.

Chapter 11 Ecology

11.4.5 In this section Alba Ecology suggest that 8% of the study area is unmodified blanket bog and 63.5% of the study area is modified bog. They are non-committal in terms of whether this unmodified bog is active or not (see below). It would have been more useful in terms of the conservation status of the bog and the ecosystem services that it provides (notably carbon storage and carbon sequestration), and indeed in determining the carbon footprint of this project, if the cover of active blanket bog had been determined. Most blanket bog in Shetland has been modified to some extent through historical peat cutting or grazing and there is no doubt that a significant area of blanket bog within the study site shows signs of erosion and as such is not active. Despite not visiting the site, it is our contention, however, that Alba Ecology has under-estimated the area of active blanket bog. Aerial photographs suggest that there are some areas of relatively intact active blanket bog and smaller pockets of active bog within more heavily eroded areas. The data presented in the Peat Depth Survey report also suggest that this may be the case. In that report, 52 of 143 (36%) of points at which blanket bog was recorded showed no signs of erosion while Sphagnum cover (a key ingredient for active blanket bog) was abundant in 13 of the 143 points (9%) sampled and frequent in another 13% of the points sampled.

There is also a discrepancy in the NVC descriptions given by Blairbeg Consultants who undertook the peat depth survey and suggest that M17 is as frequent as M19 in the study area, and Alba Ecology who did not recognise any M17 on the site. M17 is typically wetter than M19. We should add, however, that in our experience it is not always easy to fit blanket bog in Shetland into NVC categories so it is perhaps understandable how different recorders have come to different conclusions.

11.5.18 Alba ecology seem to be confused about the definition of active blanket bog and indeed whether any of the bog on this site is active. They state that 'some of the unmodified blanket bog habitat in the Study Area could be described as 'active' using Annex 1 definitions' and go on to say in 11.5.19 'although some of the unmodified blanket bog is possibly approaching both UK BAP and Annex 1 habitat definitions'. This is unfortunate given the importance of active blanket bog in terms of the Directive and in terms of carbon sequestration. Given the amount of Sphagnum moss and *Eriophorum* (cottongrass) present in parts of the site we feel there is little doubt that some areas of the study site are indeed active.

11.5.19 Here it is argued that the sensitivity of blanket bog is considered to be low/medium as bogs can recover, given the chance. This is somewhat nonsensical as it depends very much on what they are needing to recover from. For example, whilst bogs may recover well from light trampling if grazing is subsequently excluded, they are highly unlikely to recover from gross disturbance of the bog surface following construction. Our experience leads us to suggest that blanket bog restoration in Shetland isn't quite as easy as may be suggested here.

11.5.47 Both here and in 11.5.19 there is a suggestion that as long as the area of active bog that is lost is small then that is not significant. In fact it could, and should, be argued that no further loss of active blanket bog is acceptable. It seems ironic that at a time when Government is finally waking up to the importance of active blanket bog for the ecosystem services it provides, this attitude still prevails.

Chapter 12 Soils and Peat

Peat management and reinstatement.

It is our distinct impression upon reading this section that the major driver here is to find ways of disposing of excavated peat rather than giving a proper detailed consideration as to if, and how, excavated peat can be used to achieve sensible restoration.

12.9.8 However carefully it is extracted and stored, peat will start to dry out and oxidise very quickly once it is removed. No timescale is given to indicate how long this peat will be left prior to re-instatement thus it is difficult to gauge how successful this proposal will be.

12.9.9 We very much doubt that the acrotelm of the peat extends to a depth 0.5-1.0m; 20-30 cm would be more realistic.

12.9.10 In our view the benefit of disposing of catotelmic peat into borrow pots is questionable. It is not entirely clear how this peat will be treated once it is relocated into these pits.

12.9.12 We are not aware that infilling erosion gullies or relocating peat to areas from which peat has eroded are recognised restoration techniques. The main aim of peatland restoration is to block gullies and drains so as to raise the water table and encourage Sphagnum mosses to colonise/grow. Using excavated peat in the manner proposed here is highly unlikely to achieve that goal. We are also concerned that transporting large volumes of peat over blanket bog may lead to deterioration of the habitat.

12.9.14/12.9.15 It is questionable whether peat stored as detailed in this section will be suitable for re-instatement years later as proposed here.

12.9.19 Saturated mire habitat is a somewhat euphemistic concept. Arguably, liquified, quaking peat might be a better description of the likely outcome.

12.9.26 If catotelmic peat is to be used to block gullies or ditches (infilling should be a non-starter) then it will first need to be inserted into a material e.g. hessian or sisal, for use as a soft dam. Just tipping it is unlikely to achieve anything other than to enable it to contribute to the silt/peat burden that is transported downslope by water.

Chapter 14 Carbon Balance

14.3.1 The carbon balance has been calculated using version 2.9.1 of the Scottish Government Windfarm Carbon Assessment Tool, yet as far as we are aware this version is an unprotected version which the instructions say should NOT be used in planning application.

14.3.3 Suggests that all excavated peat will be reused on site to restore extensive areas of degraded peat. It is highly likely that most of this peat will have oxidised prior to being 'returned' through restoration, the success of which is highly debatable anyway.

Table contents

The average extent of drainage is given an expected value of just 10 m and a max value of 20 m. There is considerable debate about these figures and in terms of a worst case scenario a figure of 50m should have been used. Carbon payback is highly sensitive to drainage.

Time required for regeneration of bog plants after restoration to a point where they will be sequestering carbon . Firstly this asserts that restoration will be successful which is perhaps unlikely over much of the site, and a period of 5 or even 10 years is arguably much too short.

Counterfactual emissions. The 'provisional' numbers for 2014 are coal 0.93, grid mix 0.394, fossil fuel mix 0.642 not 0.906, 0.462 and 0.642 as listed here. Smith et al (2014) recommend a grid mix average over the lifetime of the windfarm, currently this would estimate an average of ca. 0.2 for grid mix in 2018. The lower the figure the longer the carbon payback time.

Improvement of degraded bog. It is highly unlikely in our view, that even 300 ha of degraded bog will be improved to a point where the water table lies just 0.1m below the surface based on the measures proposed in the Outline Habitat Management Plan. It is also highly unlikely that this process will take place over just 5-10 years. Where is the detailed evidence for these assertions?

Restoration of peat removed from borrow pits. Again we would ask for the detailed evidence that this restoration is possible, let alone within a 5 year period. Is a personal comment based on a completely different scenario on adjacent land really sufficient?

14.3.4 It is highly unlikely that the hydrology will be restored across the whole site, and we suggest that the need for restoration will be somewhat more than limited, given the scale and extent of the infrastructure and service roads etc.

14.5.3 Suggests that just 10% of the carbon would be removed from the peat as a consequence of oxidation and peat removal. We suspect that even the greater figure of 20% may be too low given the proposed storage and re-instatement methods.

As a final comment we feel it would be entirely appropriate and should indeed be necessary, to present a separate figure for the carbon payback of this project BASED PURELY on the carbon debits through construction and habitat loss etc. set against the carbon benefits in terms of the energy generated during the operational phase.

Outline Habitat Management Plan

We welcome objectives 1a and 1b, i.e. the proposals to recreate six lochans as potential breeding sites for Red-throated Divers and to exclude grazing from areas of heather to promote heather growth for Merlin.

Objective 2a. It is likely that historical peat cutting has been a (maybe THE) major factor contributing to the deterioration of peatland at this site, although grazing will have been a contributory factor and will certainly interfere with recovery – largely through trampling.

Consideration will need to be given to more sensitive prescriptions than merely reducing existing grazing levels by 50%. Some areas (particularly damper spots) may require stock exclusion to aid recovery.

We feel there is an over reliance on stock reduction in the OHMP. In our view the developer needs to commit more resources to peatland restoration. It is likely that erosion gulleys and ditches will need to be blocked to lift the water table to allow colonisation by Sphagnum and *Eriophorum* (cottongrass). Re-profiling of hags is also likely to facilitate recovery. Shetland Amenity Trust is involved with two small-scale peatland restoration schemes in Shetland and would be happy to show the developer, or their agents, around these and to discuss restoration methods in a Shetland context.

Objective 2b. In our view woodland planting is a distraction in terms of this project. In Shetland Wheatear, Skylark and Meadow Pipit are the three main prey species for Merlin. It is unlikely that woodland planting will have any impact on the population of these species. If resources are limited they would be better targeted at peatland restoration.

Reference: Smith, Jo, Nayak, Dali Rani, Smith, Pete. (2014). Wind farms on undegraded peatlands are unlikely to reduce future carbon emissions. *Energy Policy* 66: 585-591.

Paul Harvey, Shetland Amenity Trust, 18th April 2016.

heritage
Shetland
culture

AR/3d/359 VT/sf

Ms Bernadette Barry
Peel Wind Farms (Yell) Limited
Peel Dome
The Trafford Centre
Manchester
M17 8PL

24th March, 2016

Dear Ms Barry,

Beaw Field Wind Farm, Yell Environmental Statement

Thank you for sending through the Environmental Statement (ES) and enclosures.

The introduction to the Cultural Heritage section of the ES refers to a watching brief for all ground disturbance to be carried out by a qualified archaeologist (we would expect to approve that person prior to works commencing) and geophysics and topographical survey to be carried out on the two features which are known to be cut by this development. We did have some email discussion with your contractors in September concerning Lidar, however, this has not been progressed. I am not aware of the reasons for that but I would anticipate that it would be in your own interests to carry this out since a total reliance on a watching brief is a high risk strategy. That archaeology does lie beneath the peat has been demonstrated at the TOTAL Gas Plant site, where an excavation which took several months was required.

All archaeological work will require a WSI, to be agreed between us (on behalf of SIC Planning Department) and your archaeological contractors, before the commencement of any ground breaking work. Any geotechnical work, test pitting or intrusive work of any sort, which needs to be carried out prior to the actual construction development will also require a WSI to be prepared and agreed before commencement.

We look forward to working with your contractors as the development progresses.

Yours sincerely,

Dr V. Turner
Shetland Archaeologist

VT-Bernadette Barry letter

Appendix 4.1e

RSPB Consultation Report

giving nature a home

RSPB Scotland

25 April 2016

Joyce Melrose
Admin Officer
Local Energy and Consents
The Scottish Government

Dear Ms Melrose

Application under Section 36 of the Electricity Act 1989 to construct and operate a wind farm at Beaw Field, Yell (ref EC00003121)

Thank you for consulting RSPB Scotland on this application and for allowing us until 29 April to provide comments.

RSPB Scotland supports the development of renewable energy, including wind energy generally, as a vital part of dealing with the challenge of climate change – the greatest long-term threat to birds, other wildlife and people. However, developments must be located and designed to avoid harming our most important places for wildlife.

There are a number of elements to this proposal that we welcome. These include the proposed reduction in grazing levels, improving the potential for a small number of lochs to hold breeding red-throated divers, potentially improving some nesting habitat for merlins and improving some of the blanket bog habitat.

However we consider that the proposals for the mitigation/compensation of the potentially adverse effects on red-throated divers, merlins and blanket bog are not sufficient to mitigate all significant risks to these internationally important species and habitats.

RSPB Scotland **objects** to this application as currently proposed for the following reasons:

- **In its current form, this proposed development would have an unacceptable adverse effect on the declining Shetland population of the red-throated diver which is listed in Annex 1 of the European Birds Directive.**

- **In its current form, the development is likely to result in the unacceptable loss of breeding merlins (listed in Annex 1 of the Birds Directive) from the area of the proposed development.**

- **In its current form, this proposed development would have an unacceptable adverse effect on blanket bog, a priority habitat in Annex 1 of the Habitats Directive and in the UK Biodiversity Action Plan.**

Sumburgh Head Lighthouse
Virkie
Shetland
ZE3 9JN

BirdLife INTERNATIONAL

- **The development as proposed is contrary to Policy NH2 Protected Species and Policy NH3 Furthering the Conservation of Biodiversity in the Shetland Local Development Plan 2014.**

Importance of the site for birds
The application area and adjacent parts of Yell hold small numbers of breeding red-throated divers and in some years a pair of breeding merlins.

Both the red-throated diver and the merlin are in Annex 1 of EU Directive 79/409/EEC on the Conservation of Wild Birds, which requires the UK Government to take special conservation measures to protect their habitats. Both species are also on Schedule 1 of the Wildlife and Countryside Act 1981.

For species on Annex 1 and the regularly occurring migratory species, Article 4 of the 'Birds' Directive requires "special conservation measures" to be taken "to ensure their survival and reproduction in their area of distribution." Such measures include, *inter alia,* due regard to their conservation in the taking of development management decisions. For all species, especially those of conservation concern, such decisions also contribute to the "requisite measures" taken by Member States to secure the objectives of Articles 2 and 3.

Impacts of the proposed development on birds
As discussed in the annex to this letter the potential adverse impacts on red-throated diver and merlin remain unacceptably high. Displacement, operational disturbance and potentially risk of collision with turbine blades are likely to have significant adverse effects on the Shetland populations of these species. We make a number of suggestions for further survey work and mitigation, including the removal of turbines from particularly sensitive locations, in an attempt to reduce the potential damage to these species from the proposal.

Impacts on blanket bog habitat
Much of the application area is covered by blanket bog, some of which is active (still peat-forming), which is a priority habitat on Annex 1 of the EU Habitats Directive and therefore of international importance. Blanket bog is also a priority habitat in the UK BAP. Aspects of the proposed development could damage blanket bog, as discussed in the annex to this letter. RSPB Scotland is concerned about the excavation of large quantities of peat and some aspects of the plans for re-use or disposal. Some of the proposed methods of re-use, such as spreading along track sides and to restore blanket bog habitats, are unacceptable as they could further damage blanket bog habitat.

Conclusion
RSPB Scotland considers that the application in its current form is contrary to national and local planning policy as explained in Annex 1 attached to this letter. We consider that the proposal in its current form would harm important bird populations and blanket bog habitat. We also consider that some of the methods of disposal/reuse of excavated peat could further damage blanket bog habitat. However, if the Scottish Ministers are minded to grant consent for the development notwithstanding RSPB Scotland's objection, we would welcome the opportunity to request appropriate conditions to minimise impacts on the important species and habitats detailed in this response.

Further details of our comments and recommendations can be found in Annex 1.

If you wish to discuss any matters raised in this response in more detail please contact me.

Yours sincerely

[redacted]

P.M. Ellis
Northern Isles Manager

Annex 1. Detailed comments on application

<u>Planning Policy</u>

Scottish Planning Policy

Scottish Planning Policy (SPP) makes clear in paragraph 169 that considerations for energy development proposals include cumulative impacts; effects on the natural heritage, including birds; and impacts on carbon rich soils, using the carbon calculator. Wind farms should be sited and designed so that impacts are minimised.

SPP requires the planning system to conserve and enhance protected sites and species; seek to protect soils from damage such as erosion or compaction; and seek benefits for biodiversity from new development where possible (including restoration of degraded habitats and avoidance of further fragmentation or isolation of habitats).

Decisions should take account of potential effects on the natural environment, including cumulative effects. Developers should seek to minimise adverse impacts on the natural environment through careful planning and design, considering the services provided by the natural environment and maximising the potential for enhancement. Planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment (paragraphs 202-203).

Paragraph 204 requires planning authorities to apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur. If there is any likelihood that significant irreversible damage could occur, modifications to the proposal to eliminate the risk of such damage should be considered. If there is uncertainty, the potential for research, surveys or assessments to remove or reduce uncertainty should be considered.

Development should aim to minimise the release of carbon dioxide as a result of disturbance to peatland (paragraph 205).

The proposed development would adversely affect species protected under the Birds and Habitats Directives and the Wildlife and Countryside Act (1981) and identified as priorities in the UK Biodiversity Action Plan.

Shetland Local Development Plan 2014

The development proposal is contrary to Policy NH2 *Protected Species* in the Shetland Local Development Plan (LDP) 2014, which states:

Planning permission will not be granted for development that would be likely to have an adverse effect on a species protected under Schedules 1, 1A or A1 (birds) of the Wildlife and Countryside Act 1981 (as amended), unless the Council is satisfied that:

- *The development is required for preserving public health or public safety; and*
- *There is no other satisfactory solution.*

We consider that the application as submitted also fails to comply with the Shetland LDP Policy NH3 *Furthering the Conservation of Biodiversity*, which states:
Development will be considered against the Council's obligation to further the conservation of biodiversity and the ecosystem services it delivers. The extent of these measures should be relevant and proportionate to the scale of the development.
Proposals for development that would have a significant adverse effect on habitats or species identified in the Shetland Local Biodiversity Action Plan, Scottish Biodiversity List, UK Biodiversity Action Plan, Annexes I and II of the Habitats Directive, Annex I of the Birds Directive (if not included in Schedule 1 of the Wildlife and Countryside Act) or on the ecosystem services of biodiversity, including any cumulative impact, will only be permitted where it has been demonstrated by the developer that;

- *The development will have benefits of overriding public interest including those of a social or economic nature that outweigh the local, national or international contribution of the affected area in terms of habitat or populations of species; and*
- *Any harm or disturbance to the ecosystem services, continuity and integrity of the habitats or species is avoided, or reduced to acceptable levels by mitigation.*

RSPB Scotland comments on the application and environmental statement

There are a number of elements to this proposal that we welcome. These include the proposed reduction in grazing levels, improving the potential for a small number of lochs to hold breeding red-throated divers, potentially improving some nesting habitat for merlins and improving some of the blanket bog habitat.

However we consider that the proposals for the avoidance, mitigation and compensation of potentially adverse effects on red-throated divers and merlins are not sufficient to mitigate all significant risks to these species and are not precautionary. We are also concerned that some of the proposals for reuse of catotelm peat could be damaging to blanket bog habitats. The current proposals are therefore contrary to Scottish Planning Policy and the Shetland Local Development Plan.

Red-throated diver
Status of red-throated diver

The red-throated diver is in Annex 1 of EU Directive 79/409/EEC on the Conservation of Wild Birds ('the Birds Directive') which requires the Government to take special conservation measures to protect its habitats. It is also in Schedule 1 of the Wildlife and Countryside Act 1981. The Shetland population is estimated to be 407 breeding pairs (33% of the British breeding population) and 536 non-breeding adults. There was a 3.8% decline between the censuses in 1994 and 2006 and an earlier decline of 36% between 1983 and 1994 censuses. Consequently, with recorded declines in both national surveys since 1983, we do not agree with the contention in paragraphs 10.4.11 and 10.5.9 of the environmental statement that this species is likely to be in *Favourable Conservation Status*.

We welcome the dropping of the western part of the site from consideration for turbines (as discussed in paragraph 10.5.4) as this reduces the potential for adverse impacts on divers on the Otterswick and Graveland Special Protection Area (SPA).

Land take and disturbance impacts

The proposed siting of turbine 13 only 160m away from one of the breeding sites (Litla Water) is in our view not precautionary and could result in disturbance to breeding divers. No turbines should be situated within 500m of this breeding site.

We do not agree that conclusions drawn from studies at Burger Hill in Orkney can be applied to this site to justify siting turbines close to red-throated diver breeding lochs. At Burger Hill, there is a single line of turbines. It may be that divers will respond differently to turbines in a more complex array (as is proposed in the current application), and consequently, conclusions on diver responses at Burger Hill may not be applicable to this area.

On page 4 of Appendix 10.2, it is stated that three pairs of red-throated diver nest successfully within 200m of turbines at Burger Hill in Orkney. In fact, there were up to three pairs before the construction of the turbines, but only one to two pairs have nested since then and it is possible that this reduction has been due to the presence of the turbines. The reliance on information from Burger Hill to justify the siting of turbines close to red-throated diver breeding lochs may mean displacement effects are underestimated, and is in our opinion unjustified and not precautionary. In accordance with SPP (paragraph 204) the proposal should be modified (as recommended below) to eliminate the risk to this nationally and internationally significant species.

Collision impacts

We consider that there is insufficient data on nest watches from those nesting lochs in the vicinity of the Hill of Canisdale and Hill of Arisdale that are closest to turbines in the north-western part of the proposed array. In 2011, three unsuccessful nesting attempts were made in this area and in 2012, one unsuccessful nesting attempt occurred. Despite this, no nest watches were carried out at these sites. The increase in diver flight activity in the north-western part of the array in 2011 may have been due to diver activity at these sites. In our opinion, the lack of any data from specific watches at these nest sites, could significantly affect the accuracy and reliability of the collision risk data presented in the environmental statement. Consequently, we consider that the flightline data are incomplete and may underestimate the potential for diver collisions in this part of the array. The requirements of SPP (paragraph 204) should therefore be followed – “If there is uncertainty, the potential for research, surveys or assessments to remove or reduce uncertainty should be considered.” We consider that further flightline data should be gathered from the nesting lochs in the vicinity of the Hill of Canisdale and Hill of Arisdale.

Summary

In its current form, this proposed development would have an unacceptable adverse effect on the declining Shetland population of this Annex I species. Consequently, we recommend that:

- **Further flightline data should be gathered from the nesting lochs in the vicinity of the Hill of Canisdale and Hill of Arisdale, following which a revised collision risk analysis should be carried out.**
- **Turbine 13 should be relocated to be more than 500m from Litla Water and associated tracks should be re-routed to be more than 250m from this loch.**

Merlin

Status of Merlin

The merlin is in Annex 1 of the Birds Directive, which requires the Government to take special conservation measures to protect its habitats. It is also on Schedule 1 of the Wildlife and Countryside Act 1981 and the Red List of Birds of Conservation Concern. The Shetland population of about 24 pairs in 2015 is approximately 2% of the UK/GB population. Population trends within Shetland are currently unclear.

Land take and displacement impacts

The known nest sites in the Gossabrough home range are known to have been checked in 19 breeding seasons since 1984 (Zetland Raptor Study Group data). Three nests have been found in that time, all close to the 2015 nest location. The siting of turbine 5, only 110m and turbine 3 only 225m from this nesting area is acknowledged in Appendix 10.2 (page 5) of the environmental statement as being *detrimental and cause the birds not to breed within this area*. Appendix 10.2 then goes on to speculate on there being *an alternative nest site >2km away*. It is clear that no alternative nest sites have been found in this home range since 1984. Consequently, in our view it is likely that the siting of turbines 5 and 3 so close to this nesting area is likely to lead to unacceptable displacement effects and the loss of nesting merlins from this home range.

Construction/operational disturbance

Appendix 10.2 (page 5) acknowledges that the sightings of turbines 5 and 3 close to the merlin nesting area, and a section of access track only 90m away, means that *both construction and operational disturbance would likely adversely affect nesting merlins (if present).*

Collision impacts

Appendix 10.2 (page 6) states that *there were no VP data for 2015, the year when merlins nested*. Appendix 10.2 acknowledges that merlins are *potentially vulnerable to collisions with turbines when displaying, mobbing avian intruders and hunting*. The first two activities are particularly prevalent in the vicinity of nest sites. The close proximity of turbines 3 and 5 would make any merlins nesting in the only known nesting area since 1984 vulnerable to collision.

We do not consider the proposed compensation of producing potential merlin nesting habitat in other parts of this home range to be adequate. RSPB Scotland has excluded stock from several former merlin nest sites on our Lumbister Nature reserve in Yell. Despite the enhanced growth of heather in these exclosures, no merlins have nested in them, although they have nested frequently in the shorter heather nearby. Consequently there is no certainty that merlins would move into the sites where habitat improvement is proposed.

<u>Summary</u>

In its current form, the proposed development is likely to result in the loss of breeding merlins form the Gossabrough home range and is consequently unacceptable. We therefore recommend that:

- **Turbines 3 and 5 should be relocated to be more than 500m from the 2015 nesting area and associated tracks re-routed to be more than 250m away from that nesting area. This would reduce the adverse effects of construction and operational disturbance and the risk of collision with turbine blades.**

Disposal/reuse of peat

Much of the application area is blanket bog, a proportion of which is potentially active, i.e. with a significant area of peat-forming vegetation present. This is a Priority Habitat on Annex 1 of the EU Habitats Directive. Blanket bog is also a Priority Habitat in the UK BAP.

The application proposes the reuse of catotelm peat to restore degraded areas of blanket bog. The use of acrotelm turfs in peatland restoration is in some circumstances to be welcomed, and could be used for ditch blocking. However in our view, no catotelm peat should be used for these purposes as it cannot be guaranteed that during heavy rainfall, this peat will remain in place and not be washed away. In any restoration work that involves the use of vehicles over blanket bog, there is a considerable risk of further damage to the habitat. We are therefore concerned about the statement in paragraph 3.19.7 of the ES that *surplus peat would be used to restore any degraded areas in the vicinity*.

We acknowledge the statement in paragraph 5.47 in the Outline CEMP Annex 1: Outline Peat Reinstatement and Management Plan that only peat turf and fibrous peat is likely to be suitable for battering road verges. This paragraph and paragraph 5.4.11 and state that no catotelm peat would be spread on road/track verges, but only acrotelm turfs would be used for this purpose.

20,760m3 (9.6%) of catotelm peat is proposed to be used for ditch/gulley blocking and targeted infilling. In our view, no catotelm peat should be used for ditch gulley blocking or similar uses, as it cannot be guaranteed that during heavy rainfall, this peat will remain in place and not be washed away.

In its current form, this proposed development would have an unacceptable adverse effect on the blanket bog habitats. Consequently, we recommend that:

- **No catotelm peat should be reused to restore degraded areas of blanket bog or spread on road/track verges and the relevant sections of the CEMP should be amended accordingly to reflect this.**

Appendix 4.1f

CH2M Consultation Response

PEAT LANDSLIDE AND HAZARD RISK ASSESSMENT

Beaw Field Wind Farm

Prepared for

Energy Consents Unit, Scottish Government

April 2016

ch2m

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Contents

Document History

This report has been prepared in accordance with the instructions of the client, Energy Consents Unit Scottish Government, for the client's sole and specific use.

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This document has been issued and amended as follows:

Version	Date	Description	Created By	Verified by	Approved by
1.0	26/04/2016	For Issue	A Bellis	S Leitch	G Barton

Introduction

1.1 Background to Report

The Scottish Government Energy Consents Unit is responsible for processing Section 36 applications to develop electricity generation projects, in accordance with Electricity Act 1989. In addition, under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, Scottish Ministers are required to consider the environmental impacts of the proposal. Development applications are therefore required to be supported by environmental statements, which include site-specific information and survey details in respect of the risk of peat landslide events for elements of the proposal and its infrastructure (i.e. construction of roads, access tracks, wind turbine foundations etc.).

The Energy Consents Unit commissioned CH2M (formerly Halcrow Group Ltd) to technically assess the Peat Stability Report(s) submitted by developers. The assessment report will consider whether or not adequate and appropriate field survey, peat sampling and analytical methods have been employed to provide a sound basis for assessing peat stability and the risk of peat landslides within the development envelope. The assessment report will provide a summary of findings and recommendations and the Energy Consents Unit will issue a copy to the developer in accordance with the requirements of the Best Practice Guide (Scottish Executive, 2006).

1.2 Scope to this Report

The proposed Beaw Field Wind Farm development site is located on the Island of Yell within the Shetland Islands Council area. The site is described by the developer as being 4km northeast of Ulsta, 1km northwest of Burravoe and 1km south of Gossabrough and in the ownership of the Burravoe Estate. The land is predominantly agricultural, used for summer grazing and winter moorland. The site is partially within the 'Obstacle Limitation Surface' for Scatsta Airport and contains sensitive bird-breeding areas, which together place extensive technical and environmental constraints on the proportion of the site in which infrastructure can be situated. These constraints, along with the infrastructure, are helpfully shown in Figure 5.8 of the Environmental Statement for the site.

The developer is Peel Wind Farms (Yell) Ltd (PWFY Ltd), part of Peel Energy Ltd. Beaw Field Wind Farm will comprise:

- 17 turbines, which for the purposes of the EIA and ES are assumed to be 3.4MW and 145m to tip. This would result in a total installed capacity of c.59MW. According to Para 3.5.1 and Figure 3.5 of the Environmental Statement (ES) each turbine would be accompanied by hardstands and laydown areas to accommodate cranes and other aspects of turbine assembly totalling c.1,600m^3.
- 11.1km of access tracks of average width 4.5m plus verges and drainage. It is unclear what proportion of this will be new track and what will be an upgrade to existing tracks. However, the Construction Environment Management Plan (CEMP) states that floating road will be used where peat is deeper than 500mm and the ES places an upper limit of 954m on the length of floating road due to slope constraints.
- A total of six watercourse crossings; five major and one minor.
- An electrical substation and control building.
- Underground cabling.
- A 90m tall anemometry mast.

- Up to four borrow pits for aggregates.
- A telecommunications tower.
- A temporary site construction compound.
- A site office.

Additionally, the overall scheme will include an ecological enhancement and mitigation scheme and will improve signage for heritage features at the site. Temporary removal of road signage will also be required to accommodate delivery of turbine components.

The Environmental Statement (ES) for Beaw Field Wind Farm has been produced by Wardell Armstrong on behalf of the developer, with some of the input in relation to Soils and Peat being provided by Blairbeg consulting. This report provides a detailed review of the 'Peat Slide Risk Assessment' (PSRA) which is included as Appendix 12.2 to the ES. The following chapters and appendices of the Environmental Statement have also been considered:

- Foreword;
- Chapter 1 (Introduction);
- Chapter 2 (Site Selection and Design);
- Chapter 3 (Project Description);
- Chapter 5 (Design Evolution and Alternatives);
- Chapter 9 (Cultural Heritage);
- Chapter 11 (Ecology);
- Chapter 12 (Soils and Peats);
- Chapter 13 (Geology);
- Chapter 15 (Hydrology and Hydrogeology);
- Appendix 3.5 (Photographs);
- Appendix 3.6 (Outline CEMP);
- Appendix 3.6, Annex 1 (Outline Peat Reinstatement and Management Plan);
- Appendix 12.1 (Peat Depth Survey).

Peat Stability Assessment - Review

2.1 Synopsis of Review

The Peat Slide Risk Assessment (PSRA) prepared by Wardell Armstrong provides an assessment of peat stability issues at the proposed wind farm development site. The methods of investigation and format of the reporting have been undertaken with reference to the approaches outlined by the 'Peat Landslide Hazard and Risk Assessments – Best Practice Guide for Proposed Electricity Generation Developments' (Scottish Executive, 2006). However we feel there are several additional actions, which will most likely lead to a revision of the PSRA, that need to be undertaken to make the report sufficiently robust.

To summarise the findings of the review:

- Existing site information established through desk study is limited. Whilst some information relevant to the PSRA is presented in other parts of the ES and its appendices, a summary of the information relevant to the PSRA would be beneficial.
- The report makes reference to the Best Practice Guide and applies some of the Guide's content to the assessment of peat instability at the site.
- An overview of the mechanisms and characteristics of peat instability are presented, indicating some understanding of the subject matter.
- No reference has been made to the small but important body of literature specifically relating to peat instability in Shetland, and we feel consideration of this could substantially improve the assessment.
- Site survey has been undertaken, which included peat probing, but primarily has an ecological as opposed to slope stability focus. We recommend that any further survey work and revision to the PSRA involves a suitably experienced geotechnical engineer, engineering geologist or engineering geomorphologist.
- Peat probing has been undertaken as a first pass on a 250m grid, then subsequently on a 100m and 50m grid in those areas where infrastructure is to be located. Significant lengths of the proposed access track alignment and many of the infrastructure elements have no or a limited number of spatially coincident peat depth measurements. No field sampling has been undertaken at the site therefore the information available on the nature of the peat at the site and the substrate is very limited.
- Much of the site is covered by peat, with the maximum depth of peat being 4.35m. Whilst we have reservations about the coverage of the peat depth survey, the access track alignments and infrastructure locations have been chosen with a view to minimising encroachment into areas of deeper peat based on the data collected so far.
- No quantitative stability analysis has been undertaken.
- A semi-quantitative hazard and risk assessment has been undertaken. This follows a logical progression and is well supported by figures. However, the individual stages require more consideration of the factors which contribute to peat instability to make this part of the assessment sufficiently robust.
- A reasonable range of generic mitigation measures are presented and specific mitigation measures have been put forward for infrastructure elements according to the outcomes of the semi-

quantitative hazard and risk assessment. However, whilst on face value these measures seem appropriate, it is difficult to draw firm conclusions about their suitability until the issues highlighted with the hazard and risk assessment are addressed.

2.2 Desk Study

2.2.1 Existing Site Information

The PSRA does not contain a specific section covering a review of existing site information, or a desk study section. We acknowledge that there are sections of the main ES covering Soils and Peat (Chapter 12) and Geology (Chapter 13) which contain some information derived from third party data sources such as the James Hutton Institute and the British Geological Survey (BGS) which is relevant to the PSRA. We also note that both these chapters list published guidance and good practice documents relevant to developments in peatland. However, the report would be substantially improved if a clear list of the relevant third party data sources (including, but not limited to, guidance, reports, maps, photographs, digital data) used to inform the PSRA were included.

The PSRA does include subsections entitled 'Peat Failure Characteristics and Mechanisms' and 'Geomorphological Characteristics of Potential Instability'. We welcome that these subsections have been included and whilst much of the information presented is contained within the Peat Landslide Best Practice Guide (Scottish Executive, 2006), it demonstrates that this guidance has been consulted and that reference, albeit limited, has been made to the peat landslide literature such as MacCulloch (2006) and Warburton *et al* (2004). However, the PSRA is lacking an appraisal of the body of literature which specifically relates to peat instability in Shetland. Such an appraisal would substantially improve the report and provide information which has the potential to materially affect the outcome of the assessment, including data about the locations and circumstances in which peat instability has occurred in Shetland and the likely indicators, mechanisms and triggers involved in those failures.

We recommend that the developer consult the body of peatslide literature which specifically relates to Shetland with a view to learning from this and applying it to hazard and risk assessment. The following articles, the full references for which can be found in the 'References' section of this report, are likely to prove useful in this regard:

- Dykes and Warburton (2008)
- Veyret and Coque-Delhuille (1993)
- Halcrow (2004)
- Moore *et al* (2006)

We also draw the developer's attention to an instance of peat instability on Shetland Mainland which may also provide useful information for the assessment and which was reported in the Shetland Times article on 30 October 2015.

We also recommend that the developer review aerial photography, both contemporary (which we note the developer has access to as it has been used for Figure 3.2 in the main ES) and historical aerial photography (if available).

A slope map is presented as Figure A12.2.1 of the PSRA which appears to be derived from a 5m resolution digital elevation model. Annex 1 of the CEMP appears to confirm this, but the PSRA would be improved if the resolution and origin of this slope data was confirmed along with any other data sources.

2.2.2 Site Reconnaissance Survey

The PSRA does not state when site reconnaissance was undertaken for the assessment. However, Chapter 12 (Soils and Peat) states that a preliminary peat depth survey was undertaken from 22nd to 25th January 2015 on a 250m grid and an additional peat depth survey was undertaken from 5th to 9th August 2016 on a 50m to 100m grid around the infrastructure envelope. We recommend that the PSRA clearly states when the surveys in which it relies upon were undertaken and the conditions (weather and underfoot) in which the survey was taken.

Chapter 12 (Soils and Peat) states that the peat probing was ‘full depth to underlying strata’. We welcome that probing was to full depth, but recommend that the report states the equipment used and how it was verified that probing was limited to peat and did not penetrate any underlaying soft deposits which would lead to an overstatement of peat depth. The Outline Peat Reinstatement and Management Plan (OPRMP) which draws on the same peat depth data states that ‘An assumption [has been made] that probe depth is representative of actual depth’ which indicates that probe depths have not been corroborated.

In total, 1,762 probing points have been undertaken at the site and we acknowledge that the report states that the approach to the survey has been ‘approved by SEPA’. The peat probing indicates that peat depth at the site ranges from 0m (mineral soil or peat absent) to a maximum depth of 4.35m. The results of the peat depth survey are presented in Figure 12.2 of the main ES as an interpolated peat depth surface with point values. This is a useful map but the report could be improved through the inclusion of a brief discussion of the interpolation method used and the benefits and limitations of using that method relative to others available. Inclusion of the map as a figure in the PSRA itself would also be helpful. Whilst we have reservations about the significant (250m) separation between some survey points and the extent peat depth can be estimated with confidence over such distances, it is evident that the creators of this map have taken steps not to ‘over-interpolate’ the data across distances greater than this or extrapolate beyond the extent of the real data points. However, we do note that interpolation of peat depth has occurred across significant areas of open water (Horse Water, Litta Water and Evra Water) and recommend such areas are excluded from the interpolation.

Appendix 12.1 (Peat Depth Survey) states that additional information including ‘habitat type and composition, condition (erosion and presence of bare soils) and land management (drainage burning and grazing pressure)’ were assessed on a 250m grid during the January 2015 survey. It goes on to state that these characteristics were assessed a maximum of 20m from each peat depth point. This implies that there are gaps of at least 210m between each survey point that effectively remain unassessed.

Overall, we consider that this site reconnaissance falls someway short of our expectations of what should be undertaken at a site such as this with extensive peat deposits in a region with a recent history of (comparatively) frequent peat instability. In this regard, we draw the developer’s attention to the Scottish Government *et al* (2014) guidance document ‘Developments on Peatland: Site Surveys’ and our comments in Section 2.3.1 (Geomorphological Mapping) and 2.3.3 (Field Sampling and In-Situ Testing) below for advice on what we would consider appropriate at a site such as this.

Specifically in regard to the peat probing, we would expect a more intensive programme of probing along the design freeze access track alignment and at design freeze infrastructure locations. The shortcoming of the current probing configuration is that there are lengthy sections of access track and infrastructure locations with limited or no spatially co-incident peat depth measurements, with the nearest measurements being 10s of metres away.

We recognise the aviation and ecology related constraints at the site require the infrastructure, with the exception of the main access track from the west, to be placed in the northeastern part of the site. From Chapter 5 (Design Evolution and Alternatives) we also recognise that the data which has been collected through the site reconnaissance has been used to select access track and infrastructure locations which, as far as can be understood from the data collected so far, minimise the impacts on deeper peat. As such we would look sympathetically on site reconnaissance (including further peat depth probing), geomorphological mapping and field sampling which a) focused on the main access track from the west and that part of the site outwith the areas precluded from development by aviation and ecological constraints (including the design freeze infrastructure) and b) adhered to the Scottish Government *et al* (2014) guidance and our recommendations in this report.

2.3 Ground Investigation

2.3.1 Geomorphological Mapping

During the January 2015 survey, data was gathered on a 250m grid basis on habitat type and composition, erosion (including hags and gullies) and presence of bare soils, land management (drainage, burning and grazing pressure). Habitat data were recorded within 2m of the sampling point and other data within a 20m quadrat surrounding the sampling point.

Whilst these data are presented as points in a series of maps in Appendix 12.1 to the ES and are indeed valuable features to include in a geomorphological map, the sampling strategy leaves large extents (≥210m between sampling points) unsurveyed and no geomorphological map is presented. There are also other very relevant features which could be recorded on a geomorphological map of a site such as this and which, once identified and located, will significantly improve the assessment of hazard and risk. Again we refer the developer to the body of literature on peat instability in Shetland (particularly Dykes and Warburton, 2008; Veyret and Coque-Delhuille, 1993; and Halcrow, 2004) which highlight the features important to instability in Shetland and give example geomorphological maps, as well as the wider body of literature on peat instability and peatland geomorphology (particularly, but not exclusively, Evans and Warburton, 2007; Dykes, 2008) which provide more general information on peatland and peat instability mapping and features.

We recommend that, given the lack of forestry at the site, a geomorphological map is produced using the aerial photography available for the main ES and ground-truthed through a site walkover. Whilst not an exhaustive list, we recommend that the map include the following features; haggs, gullies, pools, hummocks, natural and manmade drainage features, peat cutting features, instability indicators (tension and desiccation cracks, compression features, scars), flushes, breaks of slope, rocky outcrops, slope angles and the locations of peat pipes. Indeed, many of these features are listed in Para 1.2.18 of the PSRA itself. The mapping of these features should allow characterisation of the site into various geomorphological zones for consideration in any hazard and risk assessment and allow the proximity of infrastructure to indicators of instability (such as tension cracks, flushes and convex breaks of slope) to be assessed.

In terms of the spatial extent of such a map, again we understand the aviation and ecological constraints at the site and recommend mapping is undertaken, ideally, across the whole area within the red line boundary and a reasonable distance beyond. At the very least mapping should be undertaken across those areas not constrained by the aviation and ecological constraints in which the infrastructure is situated, as well as a corridor around the access track from the western site boundary of sufficient width to provide upslope and downslope context to the location of the access track.

2.3.2 Intrusive Investigation Techniques

No intrusive investigation has been undertaken other than the probing described in Section 2.2.2 (Site Reconnaissance) of this report.

2.3.3 Field Sampling and In-situ Testing

No field samples have been undertaken as part of the assessment. We recommend that some minimally intrusive investigation is undertaken to allow characterisation of the peat across the site and to confirm that the soft sediments being probed are indeed peat, for instance using Gouge Augers or Russian Corers. This would provide information on the nature of the peat profile and substrate, in turn providing useful information for the hazard and risk assessment around the degree to which the substrate and peat profile are likely to exacerbate or mitigate the likelihood of failure and how the peat is to likely handle upon excavation.

We recommend that, ideally, cores are taken at around 10% of the locations where probes have been undertaken. We recommend that cores are described using the Von Post (Hobbs, 1986) scheme to at least describe the humification and water content of the organic sediments and the Troels-Smith (1955) scheme to permit description of any mineral strata as well as the organic strata. Any descriptions from cores would be usefully supplemented by similar descriptions from exposures which, from site photographs included in the ES and its appendices, appear to be relatively widespread.

2.3.4 Laboratory Testing

No laboratory testing has been undertaken. This is acceptable at this stage of the investigation however we refer the developer to the Best Practice Guide (Scottish Executive, 2006) which includes information on the laboratory tests which are likely to be of value for characterising the peat and substrate in the more detailed stages of ground investigation, as well as guidance on developing an appropriate sampling strategy.

2.3.5 Site Instrumentation and Monitoring Regimes

No monitoring of site conditions (ground water or ground movement) has been undertaken to date. Section 5 (Mitigation and Risk Register) of the PSRA mentions the need for monitoring numerous times. In particular, Table 6 of the PSRA mentions having a 'monitoring system in place to assess movement of surrounding peatland area' at infrastructure locations where the 'hazard ranking' (see Section 2.5) is significant or greater. However, no further detail on the nature of monitoring is given. Whilst this is acceptable at this stage in the process, we draw the developer's attention to the Best Practice Guide (Scottish Executive, 2006) and recommend that any rainfall, groundwater and ground movement monitoring is undertaken minimum of twelve months in advance of construction to understand the seasonal variability in hydrological conditions and the behaviour of slopes in response to these conditions.

2.4 Stability Assessment

Quantitative stability analysis have not been undertaken. This is acceptable at this stage of the investigation. However, we believe that a quantitative stability analysis would be a useful addition to the report and recommend that, should it be undertaken, reference is made to the body of literature on peat instability in Shetland (Halcrow, 2004; Dykes and Warburton, 2008). In particular the likelihood that an important trigger mechanism of peat failure is the creation of artesian water pressures at the interface between peat and the substrate during periods of exceptionally heavy rain, which lead to a 'jacking-up' of the peat blanket, should be accounted for in the analysis. We also recommend that any quantitative analyses are subject to a sensitivity analysis on the geotechnical parameters used and consider the impact of additional surcharges from excavated peat and construction vehicles or other plant.

The PSRA does, however, include a qualitative (semi-quantitative) peat slide hazard and risk analysis which is discussed further in Section 2.5.

2.5 Hazard, Exposure and Risk Assessment

A qualitative (or semi-quantitative) assessment of hazard, exposure and risk (hazard ranking) is presented. The methodology assesses risk by first assessing hazard and the exposure of various receptors to that hazard, then multiplying the resulting hazard and risk scores together to derive an overall 'hazard ranking' score.

The methodology for assessing hazard, quoting Warburton *et al* (2004), makes reference to characteristics which are indicative of instability including; peat overlying an impervious or very low permeability clay or mineral base; a convex slope or a slope with a break of slope at its head; proximity to local drainage (seepage, groundwater flow, flushes, pipes or streams) and; connectivity between surface drainage and peat/impervious surface. As mentioned in Section 2.3.1 there are also numerous geomorphological characteristics indicative of peat instability quoted in Para 1.2.18 of the PSRA, more directly indicative of active, incipient or past peat instability such as tension cracking and tearing, compression ridges/thrusts and historical failure scars and debris.

However, the assessment essentially discounts or does not incorporate the vast majority of these important geomorphological and hydrological factors (which could be indentified through geomorphological mapping) and focuses solely on slope and peat depth. Below we describe the reasons given for discounting each factor and our view on the extent to which we believe it is appropriate to do so.

- Impervious or low permeability substrate – The PSRA states that it assumes such substrate underlies the whole site. On face value, this is a reasonable assumption to make in the absence of data about the substrate. However, in other instances where we have accepted such an assumption, a score for substrate which effectively increases the risk score and makes it more likely that a given location falls into a higher risk category, and therefore accounts for the uncertainty, has been allocated across the site. No such additional score for substrate has been allocated in this assessment and we would, in any event, prefer to see data on the nature of the substrate established through minimally intrusive field sampling (see Sections 2.2.2 and 2.3.3). This data could then be used to better assess the hazard and, potentially, differentiate between the hazard level at parts of the site which would otherwise have appeared equal.
- Slope convexity/presence of a break of slope – The PSRA states that it assumes all slopes are convex. Similar to the point above, the issue here is that despite this statement, no scores have been uplifted to reflect the likely increased hazard associated with such slopes. This is of particular relevance as the peat instability literature (Veyret and Coque-Delhuille, 1993; Halcrow, 2004) indicates convex breaks of slopes playing a role in peat instability at sites nearby with comparable topography, and the wider body of peat instability literature (Warburton *et al*, 2004; Evans and Warburton, 2007; Dykes and Warburton, 2007) also highlights the importance of such features.
- Proximity to local drainage features – The PSRA states that the presence of local drainage is considered through the exposure assessment. This unfortunately indicates limited appreciation about the role of drainage features as both a contributor to, and receptor of, the peat instability hazard. The presence of a drainage feature such as a spring, stream, pipe, flush or gully can increase the hazard through the rapid supply of water during heavy rainfall and, in the case of streams, have the potential to erode, and therefore remove passive support, at the toe of a slope. Watercourses and waterbodies can also in their own right be receptors of the peatslide hazard as the peat debris can lower water quality, and the additional material can turn watercourses into channelised debris flows which in turn can cause adverse morphological change and damage to other receptors further afield.
- Connectivity between surface drainage and the peat/impervious surface – The PSRA states that this connectivity can be inferred from peat instability indicators which are 'considered additionally to peat depth and slope parameters'. Again, this is a reasonable statement in its own right. However, whilst reference is made to these additional indicators in Table 5, they do not appear to affect the hazard scores presented and therefore do not appear to have been taken into account.

- Direct indicators of active, incipient and past peat instability – Similar to the bullet point above, whilst Table 5 provides an opportunity to highlight these key features, none are mentioned and there is no mechanism for incorporating them into the hazard scores. Whilst none may be present in the vicinity of the infrastructure, a good geomorphological map with comprehensive coverage across that part of the site outwith aviation, ecological and cultural heritage constraints would help confirm this.

Slope and depth are both assessed on five point scales, based on MacCulloch (2006). These seem reasonable other than that the 4-9° slope range is described as having an 'unlikely' probability of contributing to failure. MacCulloch (2006) actually describes the 4-9° slope range as having a 'probable' probability of contributing to failure. Furthermore, the majority of this category falls within the 5-20° slope range in which Evans and Warburton (2007) demonstrate that the majority of peatslides occur, and mostly within the 2-8° range in which they demonstrate the majority of bog bursts occur. Whist the Best Practice Guide (Scottish Executive, 2006) presents slightly different ranges based on the same data from Mills (2002) the principle of this observation still holds.

The impact of this allocation of scores is twofold. Firstly, the hazard associated with slopes in the 4-9° range is potentially underestimated in the semi-quantitative assessment. Secondly, 9° is seemingly used later in the assessment (4.1.1 of the PSRA) as a threshold design criterion for determining a maximum slope on which development should be undertaken. Whilst we do not necessarily question the use of a 9° threshold *per se*, we find the justification for it to be flawed.

We strongly recommend that our comments on the methodology used for determining the level of hazard across the site are considered by the developer and taken into account in producing and applying a revised hazard assessment methodology. The methodology should include a way to account for variation in those factors described in the bullet points above which have effectively been discounted, and provide reassurance that the hazard associated with peat instability on relatively low angle slopes has been appropriately assessed. Veyret and Coque-Delhuille (1993) and Dykes and Warburton (2008) may provide useful information specific to Shetland in respect of this latter point.

The assessment of exposure, by contrast, is reasonably comprehensive and well-considered. Like the hazard assessment, it draws on the methodology of MacCulloch (2006). The methodology applies a series of buffer zones to potential receptors of the peat landslide hazard, with exposure scores increasing the nearer the buffer zone is to the receptor. This is an acceptable approach, however, we offer the following comments which, if applied to the exposure assessment, would improve it:

- From a review of Figure A12.2.3 the exposure assessment appears to consider watercourses, water bodies, environmentally designated sites, occupied buildings and roads. It does not appear to consider the 73 known cultural heritage sites within the site boundary or the GWDTEs identified in Chapters 9 (Cultural Heritage) and 11 (Ecology). We recommend that these are taken into account in future revisions to the PSRA and all the receptor types considered should be clearly listed.
- The exposure assessment appears to only consider distance of the receptor from the hazard source. Whilst acceptable in the context of this PSRA, an improvement would be to also consider the severity of the consequences should that receptor be impacted by a peat landslide.
- The distance ranges used for the buffer zones could potentially be refined through reference to the Shetland peat instability literature, which provides information on run-out distances for past peat landslides.

Whilst they are nonetheless affected the points discussed above and likely to require revision, the figures provided in support of the hazard and risk assessment are helpful and show a logical progression through the process to arrive at the final hazard rankings. Updated versions of such maps should be included in any revision to the PSRA.

The infrastructure *per se* is not considered a receptor of the peat instability hazard in the assessment. We appreciate that it can be somewhat misleading to formally include the infrastructure as a receptor in semi-quantitative risk calculations, as doing so increases the apparent risk where infrastructure is located relative to other parts of the site where there is no infrastructure but all other hazard and exposure factors are equal. This could lead the reader to incorrectly infer that the infrastructure has been placed in an area of unnecessarily high risk, and as such we find it acceptable that the infrastructure has not formally been included as a receptor. However, we note that certain infrastructure elements (T1, BP2, BP3 and T5) encroach on areas assessed as having higher ('probable') hazard and therefore recommend that the nature of the risk, appropriateness of placing these infrastructure elements in these locations, and measures that may be required to mitigate risks to the infrastructure itself and construction/operations personnel are discussed qualitatively.

2.6 Mitigation

The discussion of mitigation (Section 5 of the PSRA) covers general mitigation measures and recommendations for specific mitigation measures for infrastructure elements assessed in the Peat Slide Risk Assessment (Section 4 of the PSRA) where the hazard ranking was categorized as 'substantial'.

The general mitigation measures discussed cover further ground investigation at infrastructure (including detailed peat probing, trial pits, mapping of underlying profiles and ground penetrating radar surveys) and personnel to manage and report on that investigation and use its findings to inform design. Without prejudice to our earlier comments that detailed probing along access track alignments and at infrastructure should already have been undertaken (see Section 2.2.2 and 2.3.3), these actions are sensible. We recommend that the appropriate personnel should be a qualified geotechnical engineer or engineering geologist.

The general mitigation measure discussion is sensible insomuch as it prioritises avoidance over engineering measures to minimise the occurrence of a peat landslide or its impacts should one occur. The engineering measures discussed include drainage, construction management (including monitoring of weather conditions and the setting of the weather conditions under which work must stop), catch ditches and catch fences. We note that Chapter 15 of the ES (Hydrology and Hydrogeology) and the OPRMP include commitments to maintain existing hydrological pathways across tracks alignments and preventing the creation of preferential flow paths. There is, however, scope for providing much more detail on the generic mitigation measures that can be applied to reduce the peat instability at wind farm sites.

We acknowledge that further detail about mitigation measures is included elsewhere in the ES and its appendices. For instance we note that the CEMP (Appendix 3.6 to the PSRA) and the OPRMP suggest sensible approaches to preventing peat collapse during excavations for turbine foundations and the handling and storage of excavated peat. We welcome this detail but recommend that it is either included in the PSRA or better cross-referenced from the PSRA.

We note that Chapter 12 of the ES (Soils and Peat) and the OPRMP discuss restoration of eroded peatland on the site through, among other techniques, blocking gullies. We are supportive of these plans but highlight that care should be taken not to create any adverse effects on peat stability, for instance creating adverse hydrological conditions near to vulnerable areas such as convex breaks of slope or wind farm infrastructure.

Table 6 presents a Draft Geotechnical Risk Register for the development infrastructure components. This uses the hazard ranking scores determined through the peat slide risk assessment to specify the control measures required at each infrastructure element or track section. This is helpful and, without contradicting our comments in Section 2.5 about improvements that could be made the peat slide risk assessment, this shows that control measures relate to the severity of the risk determined. Those infrastructure elements (track sections A001-F, A001-H and A002-C) assessed as having 'substantial' hazard ranking scores, are also discussed and mitigation measures given to reduce their residual hazard ranking scores to ‘significant’.

CH2M Field Review

3.1 General

Whilst we consider a field review of this site to be necessary, none has yet been undertaken as we believe the field review will be best undertaken and most informative once the issues highlighted in the assessment have been resolved.

3.2 Field Review Observations

When a field review is undertaken at a later date, observations will be made available either as an addendum to this report or as a re-issue.

Conclusions and Recommendations

4.1 Conclusions

In our opinion, this report does not yet present a sufficiently robust assessment of the peat instability hazard and risk at the site. The comparatively recent and frequent occurrence of peat instability in Shetland and the prevalence of blanket peat deposits and variable relief at the site make it all the more important that the report for this site is robust. The literature and recent reports of peatsliding in the press together show that recorded peat instability events have taken place in the 1930s, 1950s, 1980s, 1990s, 2000s and 2010s and therefore indicate that the likelihood of peat instability occurring in Shetland occurring within the 25-year lifetime of the wind farm is very high. Whilst this obviously does not mean that an event will occur during that period at the site in question, it strongly suggests that sites in Shetland with substantial peat cover should be considered high risk and investigated thoroughly.

The report has several good aspects, including reference to the Best Practice Guide (Scottish Executive, 2006), the quality and coverage of the maps produced, a logical progression to the hazard and risk assessment supported by the aforementioned maps and sensible approaches to exposure assessment and mitigation. However, there are areas where we feel significant improvements can be made.

We acknowledge and take into account in our assessment that development across much of the site is precluded by aviation, ecological and cultural heritage constraints and that some efforts have been made to characterise the whole site in spite of these constraints. However, we feel that more could be done to improve the report in spite of these constraints. In particular, we feel that improvements are particularly required to:

- Demonstrate (and apply to the assessment) a better understanding of the conditions in which peat instability occurs in Shetland.
- Demonstrate that features associated with higher peat instability hazard are understood and have been identified across the site. We believe this is best undertaken through the production of a comprehensive geomorphological map.
- Provide a more resolute appraisal of peat depth and nature through additional peat probing along access track alignments and at infrastructure, supported by minimally intrusive field sampling.
- Demonstrate, through their inclusion as integral factors in the assessment of peat stability hazard, the impact of factors other than slope on peat instability.

As such we present several recommendations below; some which we feel are necessary to make the report sufficiently robust and others which are less critical but would nevertheless improve the report further.

4.2 Recommendations

We recommend a number of actions which we believe are necessary to make the report sufficiently robust:

- The report should clearly state the relevant third party data sources used to inform the assessment. This should include, but not necessarily be limited to, guidance, reports, maps, imagery/photographs and digital data.

- The body of literature on peat instability relating specifically to Shetland should be consulted, and the learning gained from this demonstrated and applied to the assessment of peat instability hazard and risk at the site.
- A geomorphological map should be produced for site. We provide guidance on the features which might be included in such a map and on appropriate spatial coverage in Section 2.3.1.
- The report should clarify the equipment used for peat probing and how it was verified that the soft deposits being probed were peat.
- The resolution of peat probing, and its spatial coincidence with access track alignments and infrastructure locations should be improved. In this regard we refer the developer to the Scottish Government *et al* (2014) guidance document 'Developments on Peatland: Site Surveys'.
- Minimally intrusive investigation should be undertaken to prove the nature and depth of peat and substrate. Ideally, this should be at 10% of the locations where probes have been undertaken, subject to site conditions and constraints. This can be supplemented through description of exposures. We recommend that description of any such field sampling is undertaken using the Von Post (Hobbs, 1986) scheme to at least describe the humification and water content of the organic sediments and the Troels-Smith (1955) scheme to permit description of any mineral strata as well as the organic strata.
- Our comments in Section 2.5 on the methodology used for determining hazard across the site should be taken into account in producing a revised hazard assessment methodology, which should subsequently be applied to the site. If any factors identified as indicators or controls of peat instability are to be excluded, then robust justification should be included. As part of this action, the appropriateness of the 9° design criterion should be reappraised and, if still deemed appropriate, more robustly justified.
- The report should include discussion of the nature of the risk, appropriateness of locating infrastructure and any measures which need to be undertaken to mitigate risk at those infrastructure elements not identified as having a 'substantial' hazard ranking score, but which are assessed as having a higher (e.g. 'likely' or 'probable') level of hazard (as shown in Figure A12.2.2 and subsequent revisions). Examples include T1, BP2, BP3 and T5.
- The report should state that any detailed ground investigation is supervised by a suitably qualified geotechnical engineer or engineering geologist. We also recommend that a suitably qualified engineering geomorphologist, engineering geomorphologist or geotechnical engineer is involved in any revisions to the PSRA and additional survey work undertaken in support of it.
- A commitment should be included in the PSRA or OPRMP to ensure that any gully blocking does not affect hydrological conditions in such a way as to increase the peat stability risk in vulnerable areas, such as near convex breaks of slope or near infrastructure.

The following recommendations are less critical to the robustness of the report but would strengthen it further:

- The resolution and origin of slope data used for the assessment should be confirmed in the PSRA.
- The report should clearly state the dates of any surveys and the conditions in which they were undertaken.
- The report should include a brief discussion of the interpolation method used to interpolate the peat depth map and the benefits and limitations of that method relative to others available.
- The peat depth map should be included as a figure in the PSRA itself.

- The report should include a commitment to monitor any rainfall, groundwater and ground movement twelve months in advance of construction commencing as well as during the construction of the wind farm.
- Should a quantitative stability analysis be undertaken for future revisions of the PSRA, reference should be made to the body of literature on peat instability in Shetland. In particular the likelihood that artesian water pressures at the interface between the peat and substrate are a trigger for peat sliding should be taken into account. We also recommend any quantitative analysis is subjected to a sensitivity analysis on the geotechnical parameters used and the impact of additional surcharges from excavated peat, construction vehicles or other plant.
- The exposure assessment should address our comments and suggestions for improvement in Section 2.5.

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Figures

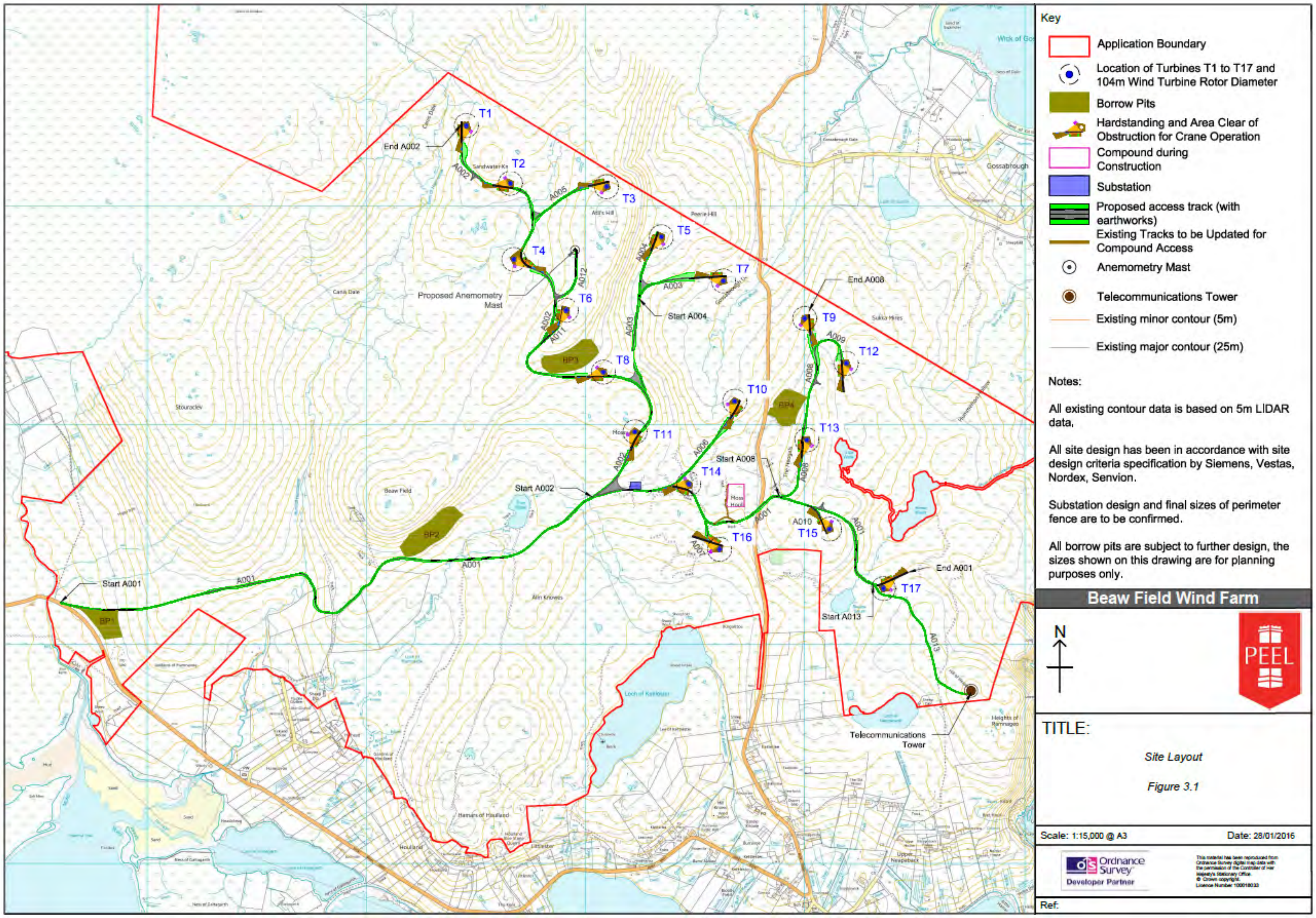

Figure 1 - Site Layout Plan

Appendix A
Conditions

Conditions

This is a list of conditions relating to peat landslide risk for energy developments, which may be applied if consent is granted.

1. No work shall commence on site within any area identified with a peat landslide hazard ranking of ‘significant’ or greater. Works can only proceed once further investigation and assessment has been carried out and mitigation proposals have been submitted and approved by the Planning Authority. Thereafter the approved mitigation proposals shall be incorporated in the geotechnical risk register and implemented in full.
2. No work shall commence on turbine foundations, other foundations, crane hardstandings, drainage, cabling or track construction until the Applicant has complied with the conditions attached to the consent.
3. Excess peat excavations shall not be placed onto another peat surface until the adequacy of the ground to support the load has been determined, the additional risk of peat landslide has been assessed and the Planning Authority has given its approval.
4. All water discharged from excavations shall be directed into suitably designed drainage system which complies with statutory requirements. The drainage network design must be submitted for approval to the Planning Authority in consultation with Scottish Environment Protection Agency and Scottish Natural Heritage.
5. During the period of consent, all excavations shall be suitably supported to prevent collapse and where peat is present to prevent the development of tension cracks. Peat removed from drainage ditches as part of maintenance shall be considered as excavated peat.

Conditions relating to Construction Method Statements

6. Prior to the Commencement of the Development, plans showing the details of peat/soil stripping at the site and the storage and proposed use and replacement of peat, topsoil and subsoil shall be submitted to the Planning Authority for approval. All soil stripping, storage and replacement operations shall accord with the details as approved by the Planning Authority and the scheme shall be implemented in full. In particular the scheme shall incorporate a method statement setting out the measures to protect and store peat.
7. No work shall commence on site until the Applicant has obtained written approval from the Planning Authority of a Construction Method Statement which shall cover all the activities specified below. Thereafter; the Construction Method Statement as approved by the Planning Authority, shall be implemented. The Construction Method Statement shall cover:
    a. Geotechnical Risk Management System incorporating the range of site-specific mitigation measures identified during the peat landslide risk assessment;
    b. Track construction. This method statement shall reflect the conclusions and recommendations of the peat landslide risk assessment. Geo-textile floating track (where proposed) should be at a gradient of 1:10 or under. If tracks cannot be implemented at this gradient, full details of proposed alternative layouts and routes should be submitted to the Planning Authority for approval prior to the commencement of the track. This method statement will also address the issues of track restoration and 'cut and fill' heights/widths;
    c. A track construction/reinstatement plan;
    d. A peat and soil stripping management plan incorporating the mineral and slope stability of the site identified in the peat landslide risk assessment and outlining the storage and

proposed use and replacement of peat, topsoil and subsoil. The scheme shall have regard to the drainage implications of soil movement and storage;

e. The height and location of all stockpiles of roadstone following approval by the Planning Authority.

8. The Applicant shall undertake an on-going assessment and call out service provided by professionally qualified geotechnical personnel, whose appointment has been approved by the Planning Authority. The Applicant shall develop and adopt a formalised reporting procedure which records ground conditions, site workings, monitoring results and construction progresses pertinent to the stability of all development works. In addition, changes in the anticipated ground conditions and monitoring results shall be used to update the Hazard Ranking and the Geotechnical Risk Register regularly. The Geotechnical Risk Register is to be submitted to the Planning Authority at quarterly intervals per annum (or other interval to be determined by Planning Authority). Should a change in the Hazard Ranking be identified, the Applicant shall carry out corrective action, re-design and/or mitigation as appropriate and as recommended by the geotechnical personnel and approved by the Planning Authority in consultation with SEPA and SNH.

9. The geotechnical personnel approved in terms of condition 8 shall undertake regular walkover inspections of the Site as construction progresses. This inspection should cover the whole of the site, to note any natural changes over time, in addition to changes within the construction areas. Any changes to the peat environment shall be recorded and used to update the Hazard Ranking and the Geotechnical Risk Register regularly. The Geotechnical Risk Register is to be submitted to the Planning Authority at quarterly intervals per annum (or other interval to be determined by Planning Authority).

10. No extraction of peat shall be undertaken from any part of the site other than in accordance with the construction method statement referred to in condition 7.

Appendix 4.1g

Marine Scotland Correspondence

marinescotland science

T: +44 (0)1796 472060 Ext: 4429 F: +44 (0)1796 473523

The Scottish Government

Ms Joyce Melrose
Local Energy and Consents
Scottish Government
5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

Our ref: FL/59-7
March 31st 2016

Dear Joyce,

BEAW FIELD WIND FARM, BURRAVOE, YELL, SHETLAND

Thank you for consulting Marine Scotland Science (MSS) to provide comment on the Environmental Statement (ES) for the proposed Beaw Field wind farm. The proposed development will be located in the southern half of the island of Yell within the Shetland Isles, 1km northwest of Burravoe. The proposal consists of up to 17 turbines and crane pads, access tracks (including 5 major and one minor mapped watercourse crossings), an electrical substation and control building, 4 borrow pits, underground cables, one anemometry mast, a telecommunications tower and a temporary site compound.

The majority of the proposed development area is heather moorland characterised by degraded blanket bog. Recorded peat depths varied from 0 to 4.35m, with an average depth of 1.1m. The proposed site is drained by a number of watercourses. The Burn of Hamnavoe and its tributaries, drain the majority of the site. No salmon were recorded during site characterisation surveys, although there are previous records of salmon in the Burn of Arisdale. There were records of eel and trout within the study area. The European eel is protected by EU regulation (EC No 1100/2007) and brown trout are a UKBAP species, listed as a priority species for conservation. Therefore mitigation measures (e.g. avoiding in stream works from October to May, the design of the watercourse crossings to maintain the passage of fish and not increase the potential for flood risk) should ensure these fish populations are protected throughout the development.

The ES outlines surface water quality results from 4 locations on one sampling occasion. It is not clear if these results were analysed in a laboratory or obtained from field based equipment. Site characterisation surveys for water quality should consist of laboratory analysed samples taken over a range of flows at sites likely to be impacted as a result of the development. Further details are provided at the following website: http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/onshoreren. We note the proposed water quality monitoring locations upstream and downstream of the watercourse crossings. We suggest additional monitoring points to ensure potential impacts are assessed as a result of construction activities associated with access tracks, turbine/crane pads, borrow pits and other infrastructure. We also recommend control sites to be selected, sites out with the potential impact of the present and adjacent developments. As stated in our response to the scoping and gate check reports, full details regarding the proposed water quality monitoring programme (design strategy, methodology and data analysis) should be presented in the ES. A more accurate measurement of parameters in a UKAS approved laboratory is recommended as opposed to the limitations imposed by field based meters. In addition to the parameters listed in the ES we would also recommend the measurement of alkalinity (Acid Neutralising Capacity (ANC), a better predictor than pH of the distribution of salmonids, can be calculated using alkalinity and DOC). Further parameters are listed in the above web site.

We welcome the macroinvertebrate surveys which in addition to identifying rare species provide a very useful augmentation to hydrochemistry sampling. MSS therefore encourages similar macroinvertebrate sampling during and after construction as a means of assessing the water quality, using a range of biotic indices, throughout the construction period.

The ES states that no significant cumulative effects arising from other developments are predicted however it is not clear if the potential cumulative impacts of the present proposal and Arisdale smolt hatchery are considered by the developer.

We note that the applicant is committed to an additional consultation one year in advance of the year of decommissioning and to implement best practice decommissioning methods at the time of decommissioning. We outline in our generic scoping guidelines that further survey work may be required at least one year prior to decommissioning to fully assess the likely impacts on water quality, macroinvertebrates and fish populations.

We welcome the use of floating roads to minimise the impact on peat and its natural drainage, buffer zones of at least 50m from watercourses and the appointment of an Ecological Clerk of Works (ECoW). We encourage the ECoW to carry out regular visual observations of all watercourses, paying particular attention to watercourses downstream of on-going construction activities and during and after periods of prolonged precipitation.

In summary, insufficient information regarding the proposed water quality monitoring programme is presented in the ES. Further details, including, additional sampling sites to monitor all potential impacts associated with the proposed development, control sites and a full list of laboratory derived parameters should be included within the water quality programme.

Kind regards,

Dr Emily E Bridcut

Appendix 4.1h

Carbon Calculator Objection Letter

Melrose J (Joyce)

From:
Sent: 15 April 2016 13:13
To: Representations Mailbox
Cc: development.management@shetland.gov.uk
Subject: objection 005 - Beaw Field Wind Farm (ECDU ref. EC00003121)
Attachments: Beaw Field letter PJB.pdf

Please find attached a representation on the above case.

Thank you.

Tel.

By email

15 April 2016

The Scottish Government
Energy Consents & Deployment Unit
4th Floor, 5 Atlantic Quay
150 Broomielaw
Glasgow G2 8LU

Dear Sir/Madam

Beaw Field Wind Farm Proposal, Yell, Shetland (ECDU ref. EC00003121)

I wish to lodge an OBJECTION to the above application on two grounds as set out below.

1. Carbon Rich Soil, Deep Peat and Priority Peatland Habitat (CPP)

Chapter 12 of the ES discusses soil and peat issues. It acknowledges (para 12.5.3) that CPP is a constraint on onshore wind development as per SPP Table 1. It refers to SNH's January 2015 consultation and accompanying draft "carbon map" (of which a final version remains pending at the time of writing), to which reference is also made in the planning authority's draft Spatial Framework dated July 2015.

I understand that the Beaw Field site includes CPP land as identified by the draft carbon map, which is a "Group 2 Area of significant protection" under SPP Table 1. The text in Table 1 continues: *"Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation"*.

It is not clear to me whether the analysis presented by the Applicant satisfies the "further consideration" test set down in SPP Table 1. Nor am I aware that the Applicant's argument at ES para 12.2.9, that the proposed development would only affect a small part of the peat resource of Yell, has any basis in SPP as a material consideration.

2. Carbon calculation

This is discussed in Chapter 14 of the ES.

Unusually (and uniquely in my experience), the Applicant has submitted a carbon calculation using the unprotected sub-version (2.9.1) of the current release of the carbon calculator. This is at variance with the instructions at www.gov.scot/WindFarmsAndCarbon, which clearly state in bold that **"planning applications require the use of the protected version"**. Accordingly I expect to see this carbon calculation rejected by SEPA's statutory validation.

The Applicant should take up any concerns about the fixed values at tab 5b (ES para 14.3.3) with the Scottish Government's (SG's) maintenance authority. Past amendments to the calculator have been initiated by many users, as recorded at tab "Changes in version 2.9.0". In addition, the Applicant should justify the values proposed for use at tab 5b row 10.

I would make the following further observations based on a cursory examination of the submitted carbon calculation and the notes in ES Table 14.1.

- The efficiency factors used (core data row 16) are extremely high. Reference is made to Appendix 3.4 as a data source, but I cannot find a derivation or justification for the efficiency factors in that appendix.
- Maximum carbon payback is highly sensitive to maximum drainage extent (core data cell G27). Higher values of this parameter (which would increase maximum payback) were suggested by objectors to the Viking proposal. The technical instructions for the use of the carbon calculator clearly state that "site specific survey information" should be used. In contrast the Applicant cites "assumed values" in the absence of water table measurements on site (cf. also row 28).
- The expected fossil fuel mix counterfactual (core data cell C41) is taken from DUKES 2015 Table 5D; the coal factor is marginally misquoted. The DEFRA source for grid mix is not approved by SG; the equivalent DUKES 2015 value is 0.394 t CO_2 $(MWh)^{-1}$. The +/-10% maximum and minimum counterfactual allowances are neither conventional nor justified.
- The Applicant correctly notes the downward trend in fossil fuel and grid mix counterfactuals and the underlying reason (which will cause this trend to continue as coal-fired stations such as Longannet close). However no reference is made to the proposal by the carbon calculator authors (Smith et al 2013 http://dx.doi.org/10.1016/j.enpol.2013.10.066) that carbon payback should be based on future counterfactuals across the life of the proposed wind farm, an issue considered (but not resolved) by Professor Waldron's recent report for ClimateXChange which I understand was sponsored by SG and SEPA.
- Results cell E38 shows a maximum carbon intensity 50% above the SG decarbonisation target for 2030 (www.gov.scot/Publications/2013/06/6387/downloads para 4.2.3). A higher value would result if an error in the calculation of this ratio (confirmed to me by the maintenance authority Professor Smith in March 2015) were corrected. Furthermore, substituting values from the official protected version 2.9.0 at tab 5b row 10 results in the *expected* carbon intensity at Beaw Field exceeding the 2030 national target.

In short, the submitted carbon calculation is open to technical criticism on a number of counts. It is possible that the proposed wind farm might be carbon adverse and/or make a negative contribution to achieving the SG's 2030 carbon intensity target.

This proposal should not be approved without intensive scrutiny of the data underlying the Applicant's carbon balance assessment.

Yours faithfully

cc. Shetland Islands Council

Appendix 4.2

Commentary on CH2M Conditions

Conditions

1. No work shall ~~commence on site~~ be carried out within any area identified ~~with~~ as having a peat landslide hazard ranking of 'significant' or greater unless and until~~. Works can only proceed once after~~ further site investigation and assessment work has been carried out in the identified areas and, where necessary, mitigation proposals have been developed to minimise the risk of peat slide as part of the development. The identified surveys, including ~~has been carried out and mitigation proposals have been submitted and approved by the Planning Authority. Thereafter the approved~~ mitigation proposals must be submitted to and agreed in writing by the Local Planning Authority prior to their implementation or any development in the identified areas and shall be incorporated in the geotechnical risk register~~ and implemented in full~~.

~~2. No work shall commence on turbine foundations, other foundations, crane hardstandings, drainage, cabling or track construction until the Applicant has complied with the conditions attached to the consent.~~

~~3. Excess peat excavations shall not be placed onto another peat surface until the adequacy of the ground to support the load has been determined, the additional risk of peat landslide has been assessed and the Planning Authority has given its approval.~~

4. All water discharged from excavations shall be directed into a suitably designed drainage system~~ which complies with statutory requirements~~. Prior to development commencing ~~T~~the drainage network design must be submitted to and approved by ~~for approval to~~ the Local Planning Authority in consultation with Scottish Environment Protection Agency and Scottish Natural Heritage.

5. Prior to the commencement of development a scheme detailing the method(s) of support to be used to ensure that areas of excavation are protected from collapse shall be submitted to and approved by the Local Planning Authority. The approved scheme shall be implemented in full ~~D~~during the construction period~~ of consent, all excavations shall be suitably supported to prevent collapse and where peat is present to prevent the development of tension cracks. Peat removed from drainage ditches as part of maintenance shall be considered as excavated peat.~~

Conditions relating to Construction Method Statements

~~6. Prior to the Commencement of the Development, plans showing the details of peat/soil stripping at the site and the storage and proposed use and replacement of peat, topsoil and subsoil shall be submitted to the Planning Authority for approval. All soil stripping, storage and replacement operations~~

Comment [SWS1]: Reworded to give clarity that areas that remain subject to a 'significant' risk of peat landslide shall not be used in any circumstances.

Comment [SWS2]: This is superfluous as all conditions – in order to be valid – must have clear 'trigger' or time requirements. The developer would be in breach if development commenced without discharging all relevant conditions precedent.

Comment [SWS3]: This duplicates one of the central objectives of the Peat Translocation Plan, the production of which is required by a separate condition.

Comment [SWS4]: New text inserted to ensure that the scheme that is implemented is as approved by the LPA.

~~shall accord with the details as approved by the Planning Authority and the scheme shall be implemented in full. In particular the scheme shall incorporate a method statement setting out the measures to protect and store peat.~~

Comment [SWS5]: This duplicates the condition requiring the production of the Peat Translocation Plan.

~~7. No work shall commence on site until the Applicant has obtained written approval from the Planning Authority of a Construction Method Statement which shall cover all the activities specified below. Thereafter; the Construction Method Statement as approved by the Planning Authority, shall be implemented. The Construction Method Statement shall cover:~~

~~a. Geotechnical Risk Management System incorporating the range of site-specific mitigation measures identified during the peat landslide risk assessment;~~

~~b. Track construction. This method statement shall reflect the conclusions and recommendations of the peat landslide risk assessment. Geo-textile floating track (where proposed) should be at a gradient of 1:10 or under. If tracks cannot be implemented at this gradient, full details of proposed alternative layouts and routes should be submitted to the Planning Authority for approval prior to the commencement of the track. This method statement will also address the issues of track restoration and 'cut and fill' heights/widths;~~

~~c. A track construction/reinstatement plan;~~

~~d. A peat and soil stripping management plan incorporating the mineral and slope stability of the site identified in the peat landslide risk assessment and outlining the storage and proposed use and replacement of peat, topsoil and subsoil. The scheme shall have regard to the drainage implications of soil movement and storage;~~

~~e. The height and location of all stockpiles of roadstone following approval by the Planning Authority.~~

Comment [SWS6]: This duplicates the condition requiring the production of a Construction Environment Management Plan.

8. The Applicant shall undertake an on-going assessment and call out service provided by professionally qualified geotechnical personnel, whose appointment has been approved by the Planning Authority. The Applicant shall develop and adopt a formalised reporting procedure which records ground conditions, site workings, monitoring results and construction progresses pertinent to the stability of all development works. In addition, changes in the anticipated ground conditions and monitoring results shall be used to update the Hazard Ranking and the Geotechnical Risk Register regularly. The Geotechnical Risk Register is to be submitted to the Planning Authority at quarterly intervals per annum (or other interval to be determined by Planning Authority). Should a change in the Hazard Ranking be identified, the Applicant shall carry out corrective action, re-design and/or mitigation as appropriate and as recommended by the geotechnical personnel and approved by the Planning Authority in consultation with SEPA and SNH.

9. The geotechnical personnel approved in terms of condition 8 shall undertake regular walkover inspections of the Site as construction progresses. This inspection should cover the whole of the site, to note any natural changes over time, in addition to changes within the construction areas. Any changes to the peat environment shall be recorded and used to update the Hazard Ranking and the Geotechnical Risk Register regularly. ~~The Geotechnical Risk Register is to be submitted to the Planning Authority at quarterly intervals per annum (or other interval to be determined by Planning Authority).~~

Comment [SWS7]: This is already dealt with by the preceding condition.

~~10. No extraction of peat shall be undertaken from any part of the site other than in accordance with the construction method statement referred to in condition 7.~~

Comment [SWS8]: Duplication – covered by condition requiring production of CEMP and also Peat Translocation Plan.

Additional Conditions Suggested by Peel

A. Prior to the commencement of development, a scheme detailing further intrusive peat investigations to be undertaken by the developer shall be submitted to and agreed by the Local Planning Authority. The scheme shall as a minimum make provision for the following:

i) Additional peat coring using Gouge Auger or Russian Corers at around 10% of the locations where previous sampling occurred;
ii) Sampling and laboratory testing of peat cores to further characterise peat substrates.

The agreed scheme shall be implemented in full and the results used to inform production of the final Construction Environment Management Plan referred to in condition [X] of this consent.

B. Prior to the commencement of development, a scheme setting out the methods by which monitoring of rainfall, groundwater levels and ground movement will be achieved and reported upon shall be submitted to and approved by the Local Planning Authority. The approved scheme shall be implemented in full a minimum of twelve months before construction commences to ensure that satisfactory baseline information is available.

C. Prior to the commencement of development, the Hazard Ranking shall be updated by way of incorporation of information from the additional intrusive investigations required by condition [A] and [B]. The updated Hazard Ranking shall be incorporated into the production of the final Construction Environment Management Plan required by condition [X].

quarterly intervals per annum (or other interval to be determined by Planning Authority).

~~10. No extraction of peat shall be undertaken from any part of the site other than in accordance with the construction method statement referred to in condition 7.~~

Comment [SWS6]: Duplication – covered by condition requiring production of CEMP and also Peat Translocation Plan.

Additional Conditions Suggested by Peel

A. Prior to the commencement of development, a scheme detailing further intrusive peat investigations to be undertaken by the developer shall be submitted to and agreed by the Local Planning Authority. The scheme shall as a minimum make provision for the following:

i) Additional peat coring using Gouge Auger or Russian Corers at around 10% of the locations where previous sampling occurred;
ii) Sampling and laboratory testing of peat cores to further characterise peat substrates.

The agreed scheme shall be implemented in full and the results used to inform production of the final Construction Environment Management Plan referred to in condition [X] of this consent.

B. Prior to the commencement of development, a scheme setting out the methods by which monitoring of rainfall, groundwater levels and ground movement will be achieved and reported upon shall be submitted to and approved by the Local Planning Authority. The approved scheme shall be implemented in full a minimum of twelve months before construction commences to ensure that satisfactory baseline information is available.

C. Prior to the commencement of development, the Hazard Ranking shall be updated by way of incorporation of information from the additional intrusive investigations required by condition [A] and [B]. The updated Hazard Ranking shall be incorporated into the production of the final Construction Environment Management Plan required by condition [X].

Appendix 4.3a

Marine Scotland Clarification Correspondence

Energy

Dr Emily Bridcut
Marine Scotland Science
Freshwater Laboratory
Faskally
Pitlochry
Perthshire
PH16 5LB

1st June, 2016 **By post & email**

Dear Emily

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 | The construction and operation of a wind farm comprising up to 17 turbines with an installed capacity of over 50MW and including associated access tracks, anemometry mast, substation, radio communications tower, underground cabling from turbines to substation, temporary construction compound, lay down area, up to four borrow pits and a scheme of habitat enhancement and mitigation | Beaw Field Wind Farm, South of The Island Of Yell

With reference to your correspondence (Marine Scotland Science Reference FL/59-7) dated 31 March 2016, I would like to respond to the following issues which you raised:

(1) "*insufficient information regarding the proposed water quality monitoring programme is presented in the ES.*"

Appendix 3.6: Outline Construction Environment Management Plan (OCEMP) of the March 2016 Environmental Statement (ES) for Beaw Field Wind Farm provided outline details of the proposed Surface Water Monitoring Scheme (SWMS). In order to ensure that your suggestion of additional monitoring locations including more control locations, together with UKAS approved laboratory testing of samples, and a wider range of parameters to be monitored is acted upon, we propose (and have no objection to) a condition being imposed upon the Consent as follows:

'Prior to the commencement of construction, a detailed Surface Water Monitoring Scheme (SWMS) shall be submitted to and approved in writing by the LPA, in consultation with Marine Scotland. The SWMS will form an appendix to the CEMP and shall inform the CEMP. The SWMS must include:

1. A plan showing the monitoring positions and national grid references for all monitoring locations;
2. A detailed methodology for the gathering of baseline surface water quality information, including where necessary details of equipment to be used;
3. A detailed programme setting out the frequency of monitoring / surveying and reporting and the period(s) over which this will be conducted.

The SWMS shall be implemented as approved unless any revision thereto is first agreed in writing by the LPA in consultation with Marine Scotland.'

It should be recognised that prior to construction, the appointed contractor will prepare a final version of the CEMP to be submitted to and agreed by the LPA. It is the intention that the CEMP would reflect further detailed survey data and technical parameters derived from ground investigations, detailed construction designs and the SWMS.

As a consequence, the CEMP would provide additional detailed information on the surface water monitoring programme. This approach has been found to be acceptable on other projects and ensures that the CEMP is fully informed by current guidance and site specific surveys.

It is our view that attempting to fix the water quality monitoring programme now, in the absence of site specific information could be abortive. By way of illustration however, we would anticipate that the SWMS would make provision for daily monitoring throughout the entire construction period, and a minimum of six month's post-construction monitoring and reporting.

2) "*the ES outlines surface water quality results from 4 locations on one sampling occasion. It is not clear if these results were analysed in a laboratory or obtained from field based equipment. Site characterisation surveys for water quality should consist of laboratory analysed samples taken over a range of flows at sites likely to be impacted as a result of the development*."

The water quality results presented in Table 15.7 of the ES were produced by EnviroCentre Ltd on the 22 June 2011 by means of a field water quality analyser. No water quality samples were taken during the Site walkover survey in June / July 2015. As set out earlier, it is our intention that the SWMS, that will have to be agreed by the LPA, will be fully reflective of your requirements, and will inform the construction of the Proposed Development. Currently the development timescales are uncertain, but it is anticipated that the commencement of onsite works would not be until *c.* 2020, at the earliest. Therefore, once the commencement date is more certain, the pre-construction element of the SWMS will be implemented and will provide an up to date baseline against which the Proposed Development can be measured.

3) That "*the ES states that no significant cumulative effects arising from other developments are predicted however it is not clear if the potential cumulative impacts of the present proposal and Arisdale smolt hatchery are considered by the developer*."

The Arisdale smolt hatchery is an existing water user with a CAR licensed surface water abstraction. The potential impact of the Proposed Development on the ability of the hatchery to continue to abstract water was considered at an early stage of the assessment (Table 15.9 of the ES) and was determined *not* to be 'at risk', as the proposed Beaw Field Wind Farm would not change the flows within the Burn of Arisdale and hence would not influence the supply to the hatchery. Therefore the abstraction was not considered further within the assessment.

The water quality of the Burn of Arisdale was considered in the impact assessment in its current baseline condition, which includes the activities of the hatchery. The assessment determined that with appropriate mitigation the scale of potential impacts would be no greater than minor, which should not have a significant effect as shown in Table 15.12 and in Appendix 15.7 of the ES.

In EIA terms, cumulative impact assessment investigates the potential for two or more currently non-developed schemes (i.e. schemes lodged within the planning system or which are consented, but not built out) to impact the same receptor. As the hatchery is an existing operation it was considered within the baseline assessments as described above and not the cumulative impact section.

There are no other developments currently consented or within the planning process within the same catchments as the Beaw Field Wind Farm. The assessment also considered the potential cumulative impacts of any developments that may subsequently come forward. The assessment concluded that other future developments would have to comply with strict planning guidance and regulation in regard to the water environment be it CAR licensing or adhering to General Binding Rules. This means that the design of other developments would incorporate appropriate mitigation (such as pollution prevention measures) and discharges from these sites would be restricted to the sites' greenfield runoff rates, as is the case for the Proposed Development. Additionally, any development requiring permitted activities, e.g. water discharges or water abstractions, would be subject to control and regulation by the relevant issuing authority. Therefore, the potential for cumulative impacts arising from other developments within the same catchment as the Site is considered to be negligible, which has no significant effect.

Beaw Field Wind Farm will be constructed in accordance with the site specific Construction Environmental Management Plan (CEMP) which would incorporate the principals of good practice, legislation, regulations and guidance. With respect to protection of water resources, the CEMP would provide practical measures to avoid and minimise the impact of the Proposed Development on ground and surface waters, as well as providing emergency preparedness and corrective actions together with measures for monitoring, recording and disseminating information.

I trust that the above clarifies our approach and allays your concerns related to the points above. If you have any questions please do not hesitate to contact me.

Yours sincerely

Bernadette Barry
Development Manager
Peel Wind Farms (Yell) Ltd

marine scotland science

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The Scottish Government

Ms Joyce Melrose
Local Energy and Consents
Scottish Government
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Glasgow
G2 8LU

Our ref: FL/59/7
June 9th 2016

Dear Joyce,

BEAW FIELD WIND FARM, BURRAVOE, YELL, SHETLAND

Marine Scotland Science (MSS) received correspondence from the developer of the proposed Beaw Field wind farm, responding to our comments to the Environmental Statement (ES).

The developer proposes a condition, for a Surface Water Monitoring Scheme (SWMS) to be imposed upon consent. The developer also states a water quality monitoring programme established at this stage of the development, in the absence of site specific information, may be aborted at a future point. MSS has not found this to be the case in other developments where monitoring programmes have been prepared and details outlined in the ES and/or prior to consent being granted. Whilst some infrastructure may be amended throughout the initial stage of the development, it is unlikely that large changes to infrastructure do take place such that a water quality monitoring programme is aborted. Furthermore site characterisation surveys for water quality, macroinvertebrate and fish populations, recommended by MSS, provide site specific information which informs the proposed mitigation measures and monitoring programmes throughout the course of the development.

The proposed SWMS will form an appendix to the Construction Environment Management Plan (CEMP), the former will include details outlined in our response to the ES. We note

SEPA, in their response to the ES, requests a condition imposing a CEMP to be submitted at least two months prior to the proposed commencement of the development in order to provide consultees with sufficient time to assess the information. To enable the collection of at least 12 months pre-construction samples the CEMP would need to be submitted at least 14 months prior to the commencement of the development.

MSS recommends at least 12 months post-construction monitoring with a continuation of the monthly reporting (carried out during the construction phase) rather than six months proposed by the developer, this monitoring period post-construction is dependent on the results of monitoring during construction. Details relating to monitoring associated with decommissioning should also be outlined in the SWMS and/or decommissioning and restoration plan.

The developer does not discuss sampling of aquatic macroinvertebrates which MSS encourages as an additional form of water quality monitoring, further information on such sampling can be found at http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/onshoreren.

MSS noted the assessment of the Arisdale Smolt Hatchery in the ES but we also wish to highlight the need to consider this development in the selection of suitable control sites within the proposed monitoring programmes.

The proposed monitoring should be reflective of measures to ensure the trout and eel populations present within and downstream of the development site are protected whilst also ensuring no deterioration of water quality, the latter is a requirement of the Water Framework Directive.

Kind regards,

Dr Emily E Bridcut

Appendix 4.4

Carbon Calculator v2.9.1

This Appendix has been emailed separately.

Appendix 4.5

Local Representations Schedule

Beaw Field S36 Application – Summary of Public Representations

Summary Table of Objections

Public Comment	Where Addressed in ES / Response
Property Values would be affected in the area surrounding the Proposed Development.	The impact of the Proposed Development on property values is not a material planning consideration.
Carbon rich soil, deep peat and priority peatland habitat - Not clear that adequate analysis is provided to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.	Chapter 12 'Soils and Peat' of the ES assesses the impacts of the proposed development on soil and peat resource and concludes that minor positive effects are predicted following the implementation of mitigation measures. Mitigation measures to be implemented through the construction period are identified in the ES Chapter and an update to the Outline Peat Reinstatement Management Plan (OPRMP) which has been submitted as an appendix to this FEI. The updated OPRMP provides further clarity on the techniques to be used to re-use peat across the site for habitat creation and enhancement purposes.
Queries how excavated peat would be stored and disposed of.	Further details are provided in the updated OPRMP and ES Chapter 12 submitted with the FEI. It is proposed that all excavated peat would be reused on site to restore borrow pits area etc and to enhance or create habitat for ecological benefit.
The volume of peat removed is significantly higher than that used in the ES Chapters and associated appendices.	The updated OPRMP provides further clarity on this issue. Table 1 of that document 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 works across the site result 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.
Drainage proposals lack detail.	Chapter 15 'Hydrology and Hydrogeology' of the ES includes an assessment of the impacts of the proposed development on the surface water drainage network. It is acknowledged that further detailed drainage design proposals will need to be developed prior to the commencement of any development. It is anticipated this requirement can be addressed through appropriate planning conditions and detailed drainage proposals will be developed in tandem with SEPA and other consultees and submitted to the Council for approval prior to development commencing.
Carbon Calculator - Applicant has used the unprotected sub-version of the carbon calculator, rather than the protected version	Chapter 14 of the ES 'Carbon Balance' (paragraph 14.3.3) explains the reason for the use of version 2.9.1 of the Scottish Government Windfarm Carbon Assessment Tool, rather than version 2.9.0.

which the instructions state should be used.	Further commentary on this issue is set out in section 4 of this FEI.
Carbon calculations do not appear robust and have not been independently verified.	See commentary in section 4 of this FEI on 'Carbon Calculator' for explanation.
Landscape Impacts - The proposed development is considered too large in scale – both number and height of turbines.	See commentary in section 4 of this FEI for further detail on landscape and visual impacts. The final design submitted for approval was prepared following consultation feedback from the local community and was the result of several design iterations, as set out in the Design and Access Statement. The layout represents a significant reduction on the original Scoping Layout and has evolved in response to the identified potential constraints, including those of a landscape and visual nature. A significant proportion of respondents support the proposed development (84%) and ES Chapter 7 'Landscape and Visual Impact Assessment' concludes that there would be no likely significant effects on National Scenic Areas, Wild Land, Local Landscape Areas or Designated Landscapes, a point that SNH agrees with in its consultation response.
The Planning Statement should not dismiss the *Landscape Sensitivity and capacity Study for Wind Farm Development on the Shetland Islands 2009.*	The Planning Statement does not dismiss the referenced Study. It discusses the proposed development against the contents of the Study and acknowledges why the proposed development is not consistent with the terms of the Study in terms of capacity of development. The Planning Statement then considers why the proposed development can still be considered positively in the overall planning balance.
If the proposal is granted, this would set a precedent for more wind energy developments. **Cumulative impacts -** Cumulative impact of the proposed development with Viking Wind farm has not been addressed.	See commentary in section 4 of this FEI for further detail on landscape and visual impacts. Each application is required to be considered on its own merits and the approval of one scheme does not automatically pave the way for the approval of further wind farms. ES Chapter 7 assesses the cumulative impact of the proposed development and includes an assessment of the cumulative impacts of the proposed development with the consented Viking Wind Farm. Cumulative landscape and visual impacts of the proposed development with the Viking Wind Farm are assessed as not significant.
Impacts on Residential Amenity - Construction phase will have a detrimental impact on lives of local people.	Potential impacts of the construction phase of the proposed development on residential amenity are considered in ES Chapter 16 'Noise' and ES Chapter 17 'Air Quality'. All construction phase impacts are temporary and short-term and therefore will not give rise to any long-term effects. The predicted noise levels during construction are noted to be below the limits set by all relevant environmental standards. In terms of air quality, the existing residential receptors in the vicinity of the Proposed Development are located at least 700m from any dust generating operations. At these separation distances, the dust and particulate matter impacts would be minimal and with mitigation, the resulting impacts to human health and dust would be negligible, resulting in no

	significant environmental impacts in regards to air quality and dust. Similarly, the predicted impact, with mitigation, for countryside and recreational users of the footpaths and cycle routes is negligible, resulting in no significant environmental effects. Mitigation in the form of a dust management plan would be developed and approved prior to the commencement of development to ensure the appointed contractor follows appropriate mitigation measures. The Council's Environmental Health Officer raised no objection on the application.
7 homes are located within 1k of the turbines, these are too close and this may result in health issues.	ES Chapter 16 'Noise' reports the findings of a noise impact assessment and concludes that predicted operational noise levels and measured background noise levels indicate that for noise sensitive receptors neighbouring the Proposed Development, wind turbine noise would meet the noise criteria derived in accordance with ETSU-R-97 and would not result in a significant effect. At some locations, under some wind conditions and for a certain proportion of the time wind farm noise will be audible; however, it would be at an acceptable level in relation to the ETSU-R-97 guidelines. ES Chapter 17 'Air Quality' considers that predicted human health impacts are low for earthworks, construction and trackout activities for both residential receptors and transient countryside users (without mitigation measures). With site specific dust mitigation measures dust can be contained at the source and any particulate matter, which is a by-product of the dust, would be negligible. The Council's Environmental Health Officer raised no objection on the application.
The proposed development would ruin the enjoyment of the natural beauty of the area for many people.	There are no nationally designated landscapes within the site and while the proposed development would be visible from some sections of the Shetland National Scenic Area, they are not considered to be significant. SNH agrees with this assessment and concludes that there would be no significant impact upon the Wild Land Area on mainland Shetland either. Some localised landscape impacts will arise but these would not affect designated landscapes and are not considered to be significant in EIA terms.
A detailed map of how Ulsta would look during and after the project needs to be produced and made publicly available.	The potential landscape and visual impacts on Ulsta have been assessed in ES Chapter 7 'Landscape and Visual Impact Assessment'. Viewpoint 4 of the Landscape and Visual Impact Assessment represents the views available to local residents of Ulsta. The LVIA concludes that the proposed development would have a potential moderate visual effect on this viewpoint.
Turbines in the Burravoe area are impacting on the ability of local people to obtain planning	Each application must be treated on its own merits having regard for the existing baseline environment in the area including existing and proposed residential properties. Potential impacts

permission for housing which has an impact on maintenance of a steady population. The proposed development, at such a large scale, is therefore of considerable concern.	upon residential properties in terms of noise, dust and shadow flicker have all been considered in the ES, and all assessments show no significant residual effects following mitigation. It is also important to note that the Council's Environmental Health Officer raised no objection on the application.
Concerned about significant noise effects at nearest properties.	ES Chapter 16 'Noise' considered potential noise effects arising from the construction, operational and decommissioning phases and concluded that at all properties noise levels would be below relevant technical standards and no significant residual effects are anticipated as regards noise. The Council's Environmental Health Officer raised no objection on the application.
Impacts on Tourism - The proposed development would have a negative impact on the possible expansion of ornithology / ecology related tourism.	ES Chapter 6 'Socio-Economic, Tourism and Recreation Assessment' assesses the impacts of the proposed development on tourism receptors. Chapter 6 concludes that mitigation measures have been incorporated into the design to minimise impacts on tourism receptors. The proposed development is assessed as being likely to have an overall minor and not significant impact on tourism receptors. SNH also welcomes the applicants proposals to implement measures to improve the condition of peatland and the nesting habitat of merlin red-throated diver. Visit Scotland did not object to the proposed development and the socio-economic and tourism assessment carried out as part of the EIA was consistent with the relevant publications identified by Visit Scotland.
Ecology Impacts - Peat lands should not be developed – their restoration and care is promoted by several organisations.	There is no ban on development, including wind farms, on peat. The potential impacts of the proposed development on the peat resource have been considered in detail in the ES and through the updated OPRMP. All excavated peat will be re-used on site with the objective of restoring or enhancing habitats for long term ecological gain. Final details of the proposed Habitat Management Plan and the OPRMP will be developed should permission be granted to ensure peat is extracted, stored and used appropriately.
There is potential for negative impacts on curlew and snipe populations.	ES Chapter 10 'Ornithology' reports the findings of the ornithology assessment and considers both snipe and curlew. Both snipe and curlew have been considered in the ES and no significant adverse ornithological effects are identified upon these receptors. Curlew has been further considered in Section 3 of this FEI following a request for further information from SNH on this species. RSPB did not raise any concerns about the impact of the proposed development upon these particular species.
Outline Habitat Management Plan is not considered fit for purpose.	The respondents state that they think the OHMP is not fit for purpose and lacks necessary detail. Conversely, SNH support the measures proposed in the Outline Habitat Management Plan (OHMP)

	to improve the condition of peatland and the nesting habitat of merlin and red-throated diver. The OHMP has been prepared by experienced and qualified ecologists; Alba Ecology Ltd and will be further developed through consultation with relevant organisations and agencies to provide more site specific detail should the proposed development be approved.
Transporting of wind farm components - Lack of information on how the components will be transported to the site – the B9081 is single track and on peat. Widening the road would have a negative impact on the character and ecology of the areas.	ES Chapter 18 'Highways and Transportation ' assesses the impact of the proposed development on transport and highways receptors including a detailed assessment of the likely impacts on the B9081 and identification of mitigation measures. The ES Chapter concludes that increased traffic volumes would result during the construction phase of the proposed development and these would fall off considerably outwith the peak period of construction. No significant capacity issues are expected on any of the roads within the highways and transportation study area.
Grid connection Issues - Questions over how the wind farm would obtain a connection to the national grid.	ES Chapter 3 'Project Description' (paragraph 3.10) sets out information on the grid connection. If permission is granted for the proposed wind farm, a further permission would be required to construct the connection to the grid. This would be progressed under the relevant legislation in force at that time by the District Network Operator (DNO), most probably under Section 37 of the Electricity Act 1989, as an overhead line.
The application has been encouraged by the Viking Wind Farm to justify the inter-connector.	Not relevant planning consideration.
Potential benefits of the proposal have been over-stated - Construction of the wind farm does not justify the cost in terms of impacts on health and well being, the environment, wildlife and sea life.	The Planning Statement which accompanies the S.36 application balances the potential benefits of the proposed development against the potential significant adverse environmental impacts. There are relatively few instances where the Proposed Development is assessed as giving rise to significant adverse environmental impacts which are not capable of being satisfactorily mitigated. There is clear policy support for the continued development of renewable energy at a national and local level. The Proposed Development would make a positive contribution to renewable energy targets set at International, European, UK and Scottish Government level. In particular, the Proposed Development can assist in wider efforts to de-carbonise the electricity generation sector by 2030 in line with Scottish emissions target for the year 2050. The final decision on the application will be a balance between the renewable energy, employment generation and community benefits of the proposed development when considered against potential environmental effects.

Summary Table of Supporting Comments

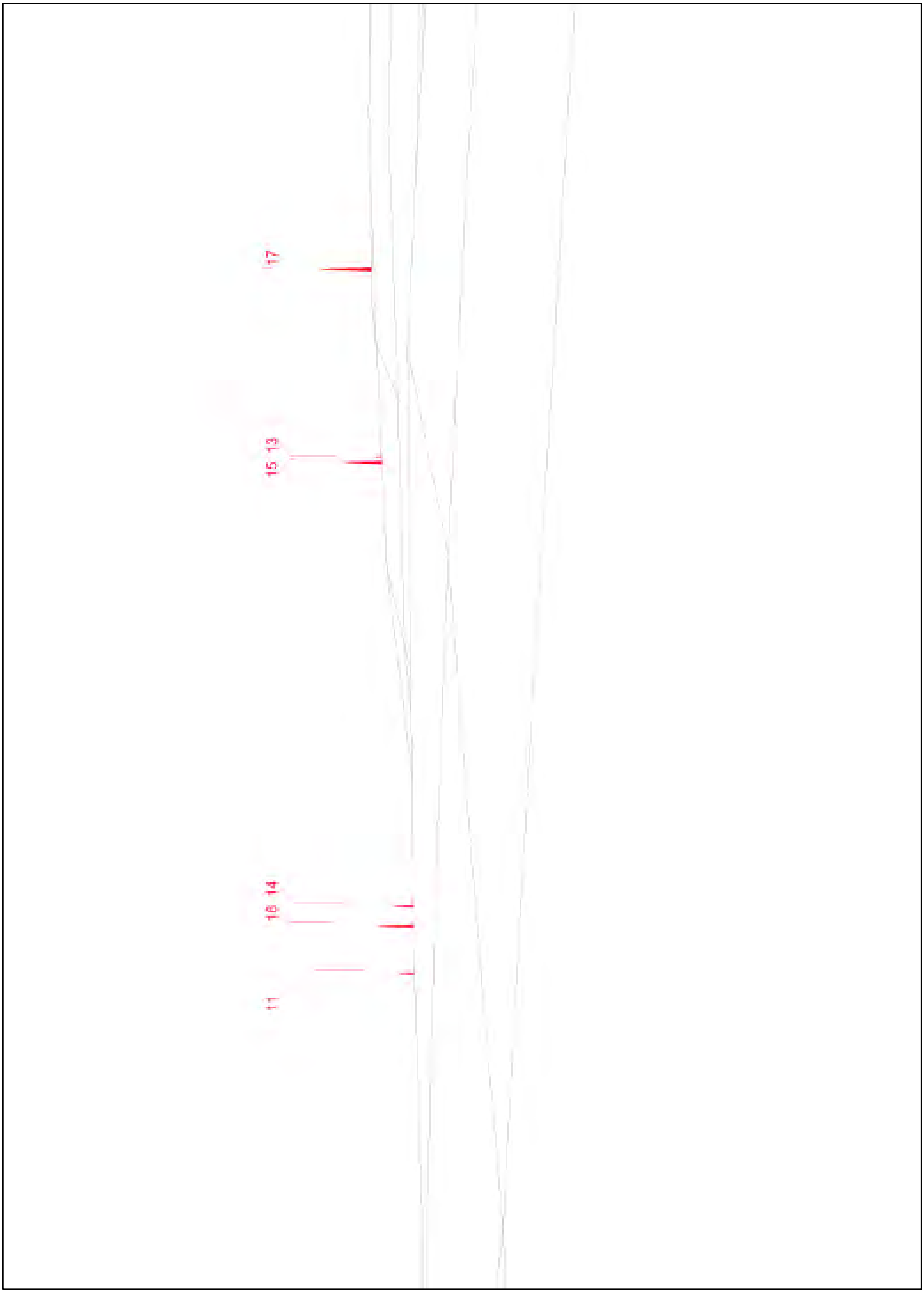
Public Comment	Response from Peel
Economic Benefits for the Community welcomed.	Welcome this positive response. The Applicant notes the Proposed Development would have wider socio-economic benefits due to the creation of the community benefit fund and development of business and the generation of up to £9.6 million for the local public purse over the 25-year operational life of the Proposed Development.
Welcome the **community benefit fund**	The provision of a Community Benefit Fund (CBF) is not a material consideration for the determination of the application, however, the Applicant acknowledges that the CBF is welcomed by the community. If granted permission, the Applicant will provide a fixed annual payment of £5,000 per megawatt (MW) of installed capacity, index-linked to account for inflation, into a CBF. This would amount to £250,000 for a scheme of 50MW and £289,000 for a 57.8MW scheme, resulting over the lifetime of the project in a total of approximately £6.25-£7.23million.
Job creation Creating job opportunities for the younger generations and helping to maintain the population	In terms of direct job creation, it is estimated that the proposed development would create an additional 19.6-21.9 net additional full time equivalent jobs. If the application is granted, the Applicant intends to host 'Meet the Developer' sessions to enable the local community to take advantage of the opportunities arising through a local employment and procurement scheme, which have been used successfully at other developments undertaken by the Applicant.
Renewable Energy is the way forward Help towards the UK's commitment to reducing its carbon footprint and meeting targets. Creates a positive image of the Islands as being "pure and clean". Important to harness local resources.	Agreed. The proposed development would generate enough electricity to meet the average annual energy usage of up to 60,000 homes and would lead to an overall reduction in greenhouse gas emissions of over 3,5 million tCO2e over the 25 year operational life, when compared to the same amount of energy being generated from fossil fuel power stations. The Proposed Development can therefore make a significant positive contribution to renewable energy targets set at International, European, UK and Scottish Government level. In particular, the Proposed Development can assist in wider efforts to de-carbonise the electricity generation sector by 2030 in line with Scottish emissions target for the year 2050.
Welcome the improvements to the **local habitat**	Proposed habitat enhancement measures are outlined in the Outline Habitat Management Plan contained in ES Appendix 10.4, these measures include peatland restoration, enhanced bird habitat and riparian woodland expansion. SNH also welcomes the measures set out in the Outline Habitat Management Plan which would be developed further should permission be granted.
The **design** of the proposed development has	The Design and Access Statement which accompanies the S.36 application details the design

been well thought out and pays heed to comments from the community.	iterations that the scheme has been through and the reasons for these changes. The Pre-Application Consultation Report submitted with the application sets out the consultation which was undertaken, the responses received, and alterations to the proposed development in light of feedback. The views of the local community have played an integral part in the design evolution process alongside consideration of environmental and technical issues.
No concerns about **visual impact** Looking forward to having the turbines in their view.	Welcome these comments. Responses received at the pre-application consultation events found that 82% of respondents were either strongly or reasonably supportive of the Proposed Development. Responses received in response to the application itself reveal similar levels of support with 42 out of 50 representations (84%) supportive of the proposed development. Of those commenting on the visual impact of the Proposed Development, eight respondents stated visual appeal as a reason for supporting the Proposed Development and only three respondents stated the visual impact of the Proposed Development as a reason for objecting.
New access tracks will benefit tourists and disabled people, enabling them to get to viewpoints. The scheme will create access roads for crofters.	The access tracks have been designed primarily to facilitate access to the wind turbines for construction and subsequent maintenance. They will be retained for the life of the proposed development and can be used for recreational purposes too.
Peel have taken on board the **community's views** throughout the development of the proposal. Consultation process has been thorough and comprehensive	Peel Energy is pleased to hear this positive feedback in relation to the consultation process. Community consultation forms an integral part of Peel Energy's approach to development and we have worked hard to reflect community feedback into the design of the scheme where possible. Further details of consultation steps taken prior to submission of the application are set out in the Pre-Application Consultation Report.
Renewable energy is providing **affordable electricity** across Scotland and can help to stabilise energy prices in the future	Renewable energy forms an integral component of our current energy mix and the Scottish Government wishes to see this contribution grow to assist with efforts to decarbonise the electricity sector by 2030. The proposed development will make a significant contribution to these efforts.

Appendix 4.6

Wireframe from Burravoe Caravan Site

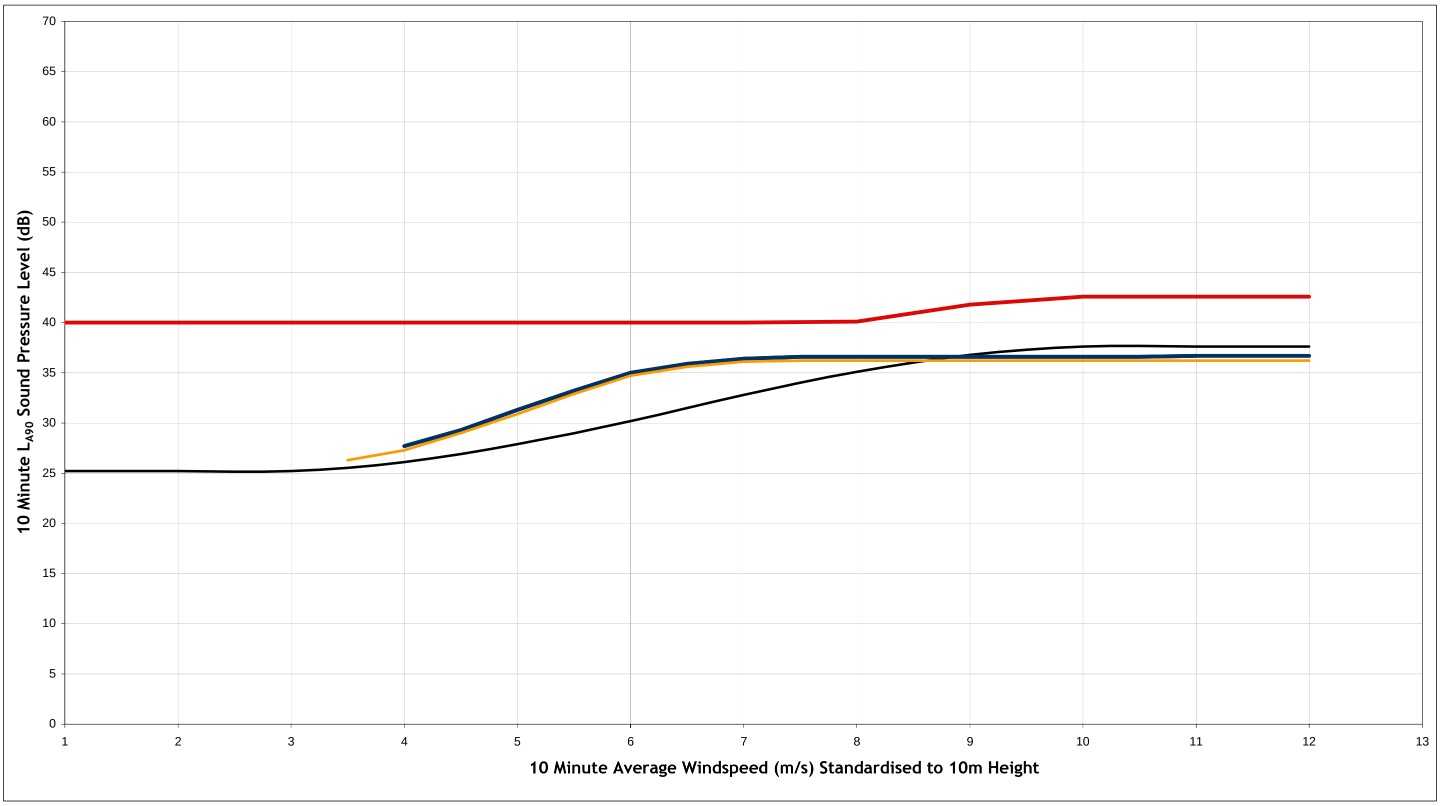
Appendix 4.6. Wireframe from Burravoe Caravan site/ Marina



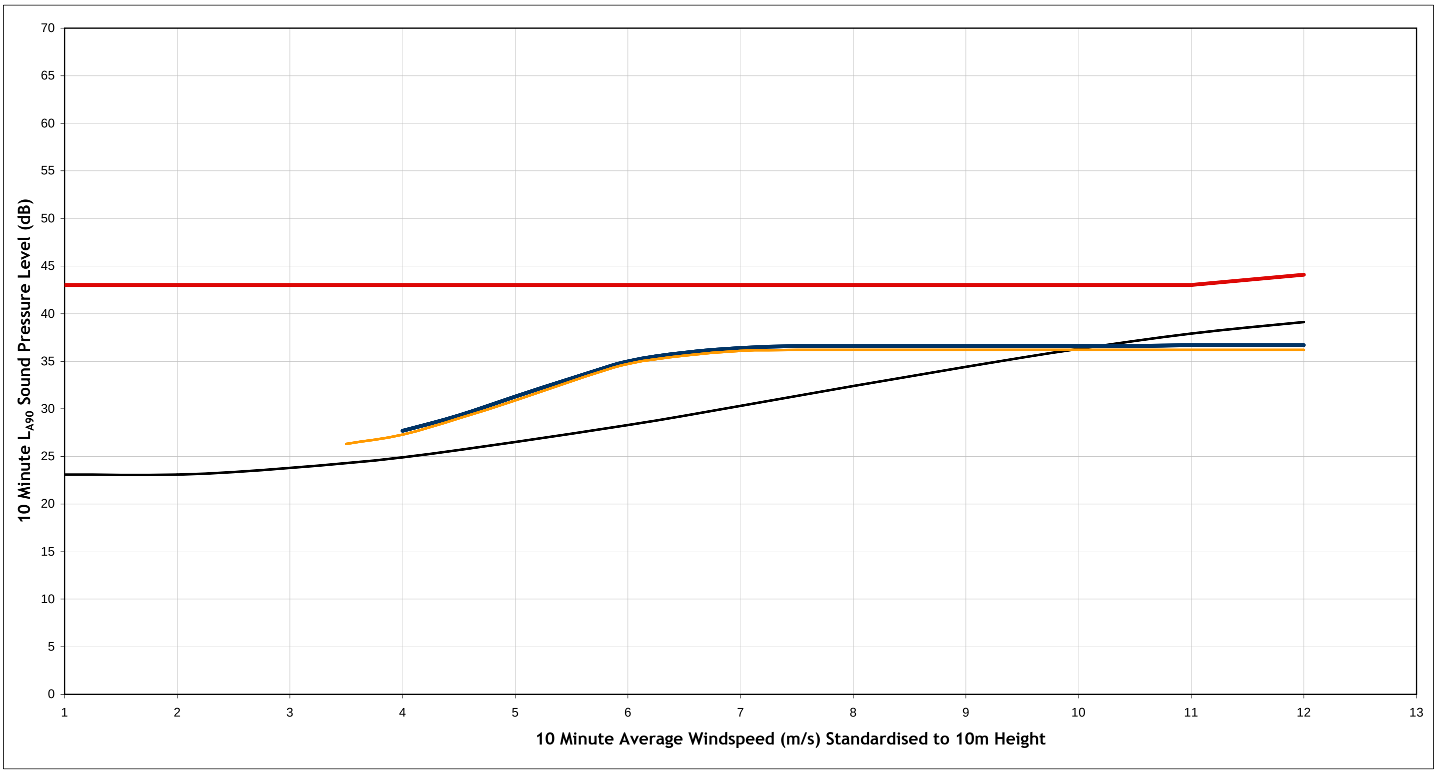
Appendix 5.1a

Noise Figures (Total) with Gossabrough Turbine

ETSU-R-97 QUIET DAYTIME - Lower Holligarth (H1)



ETSU-R-97 NIGHT-TIME - Lower Holligarth (H1)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Lower Holligarth (H1)
Figure Number	A1.4a
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

Energy

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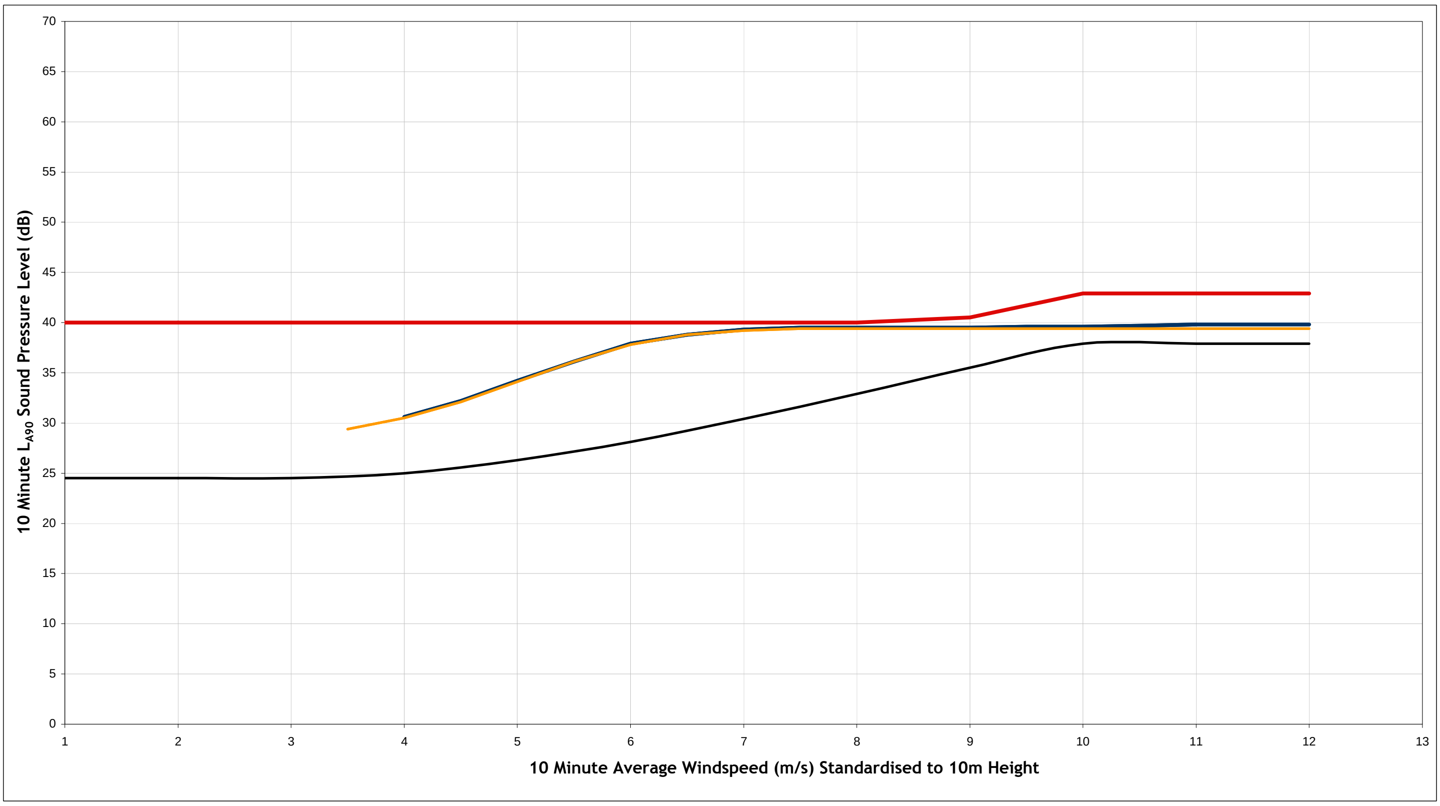
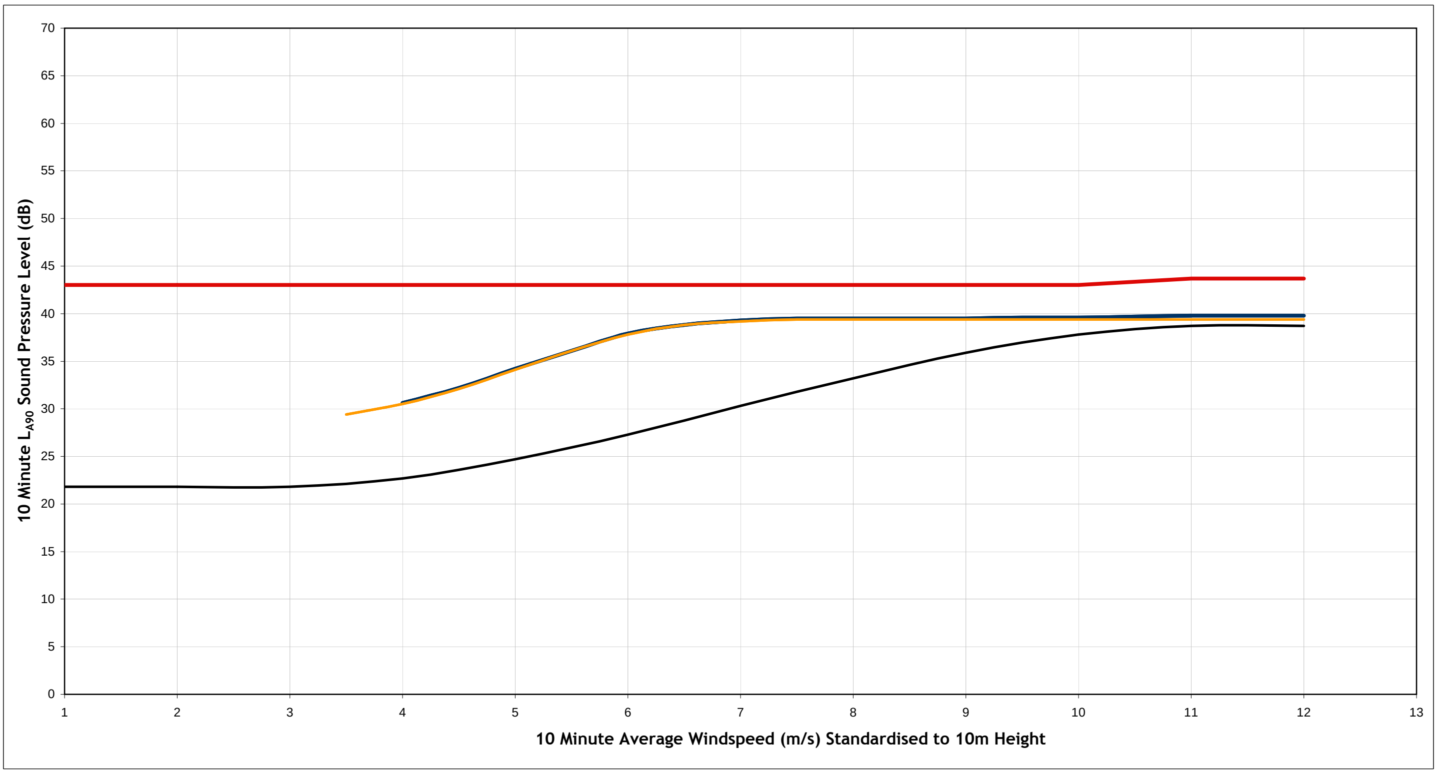
ETSU-R-97 QUIET DAYTIME - Whirliegarth (H2)



ETSU-R-97 NIGHT-TIME - Whirliegarth (H2)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Whirliegarth (H2)
Figure Number	A1.4b
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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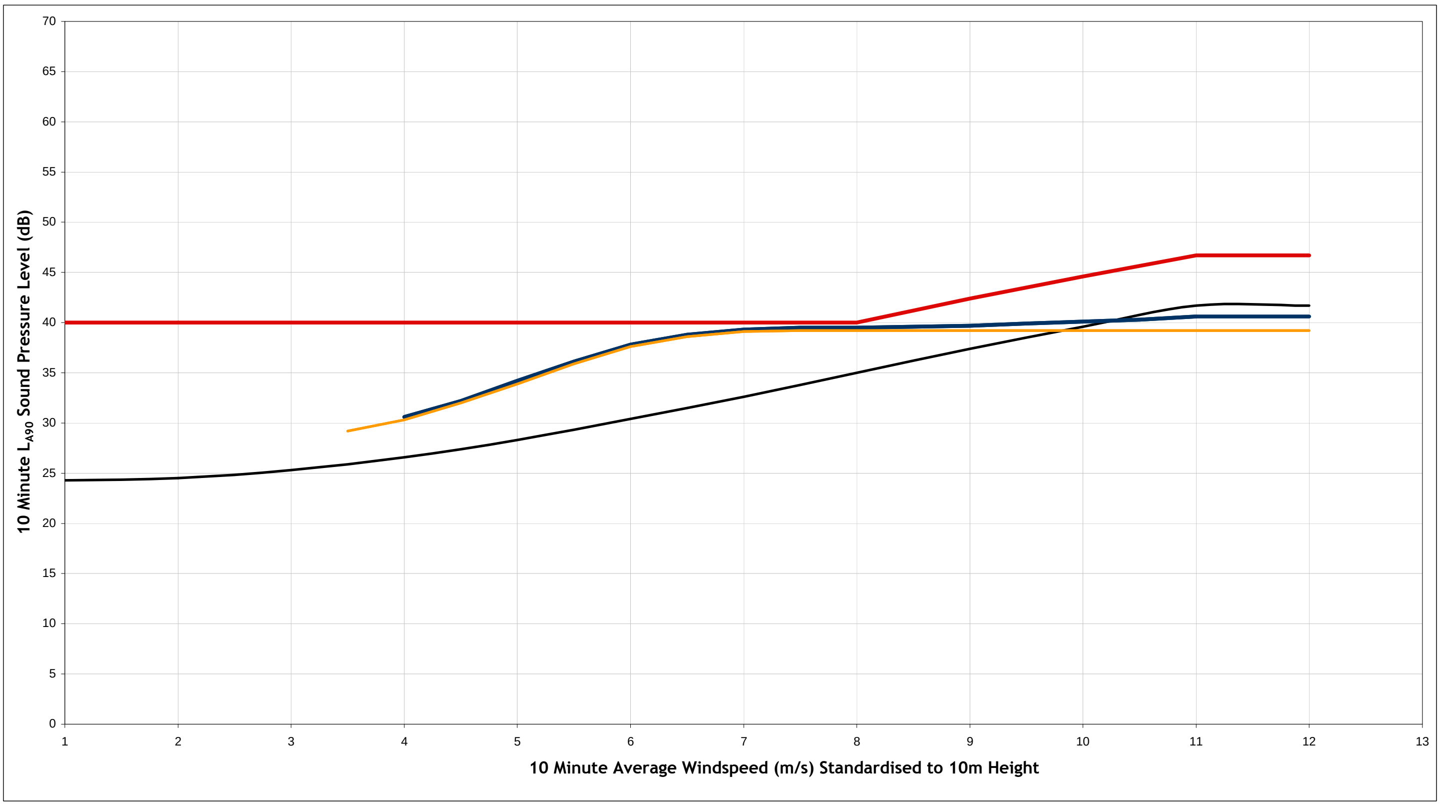
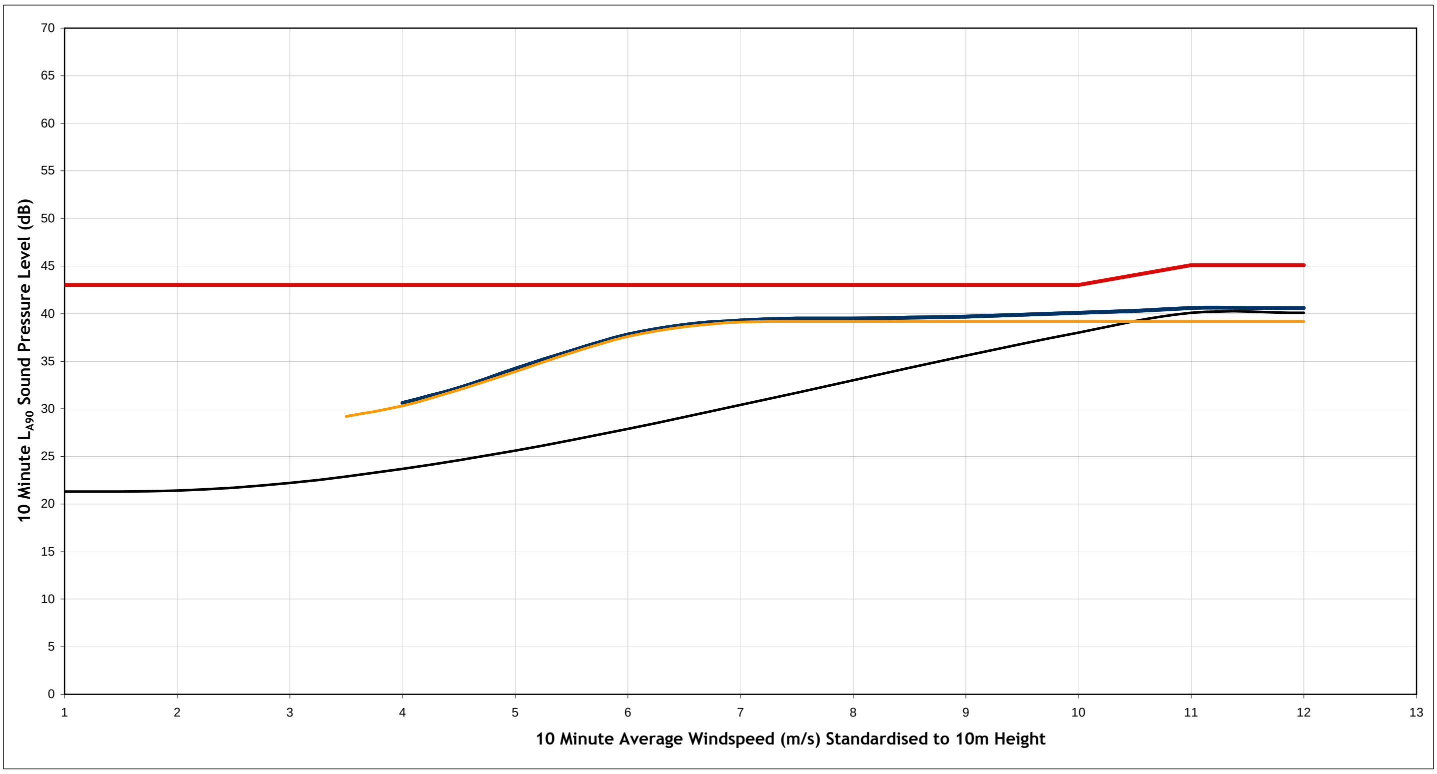
ETSU-R-97 QUIET DAYTIME - Easterlee (H3)



ETSU-R-97 NIGHT-TIME - Easterlee (H3)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Easterlee (H3)
Figure Number	A1.4c
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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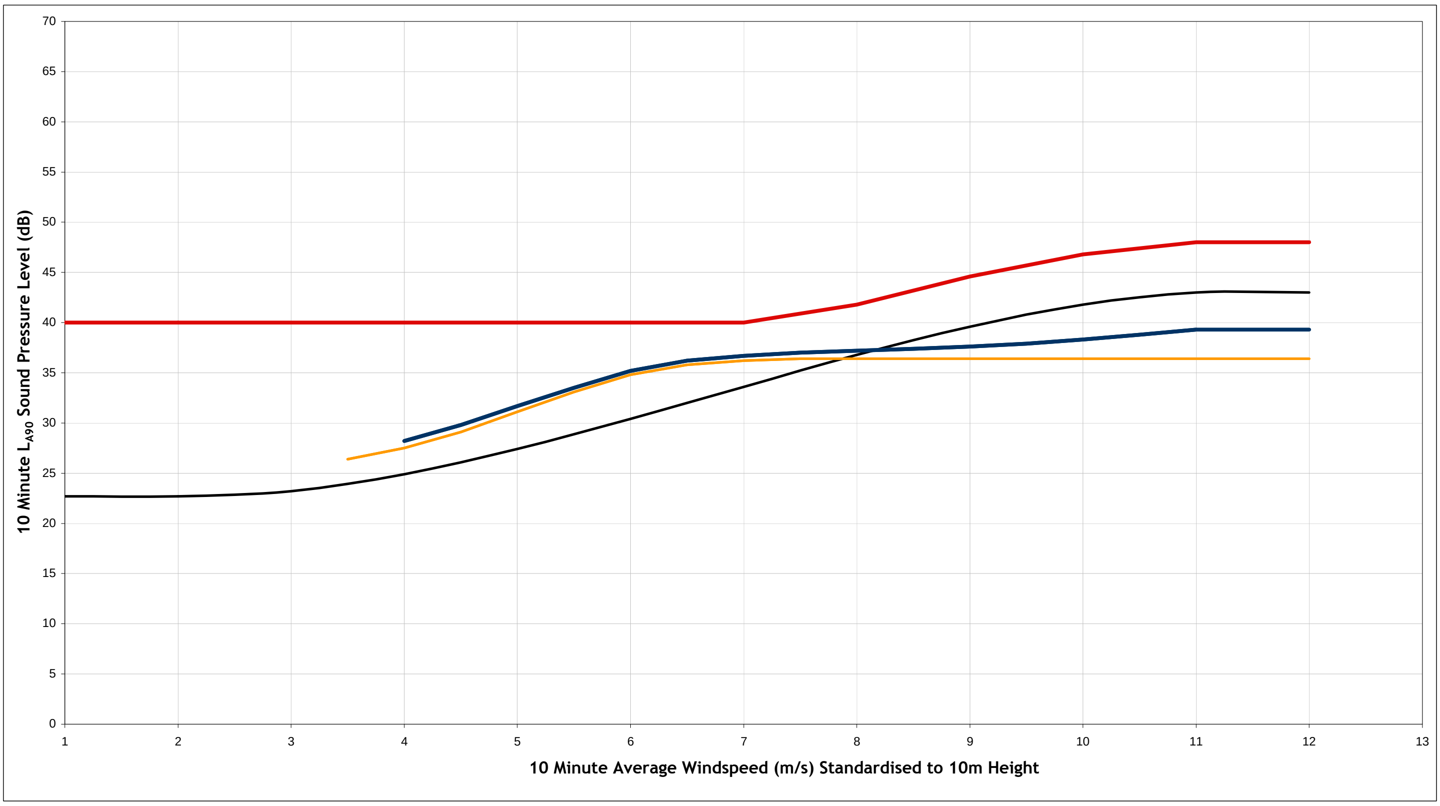
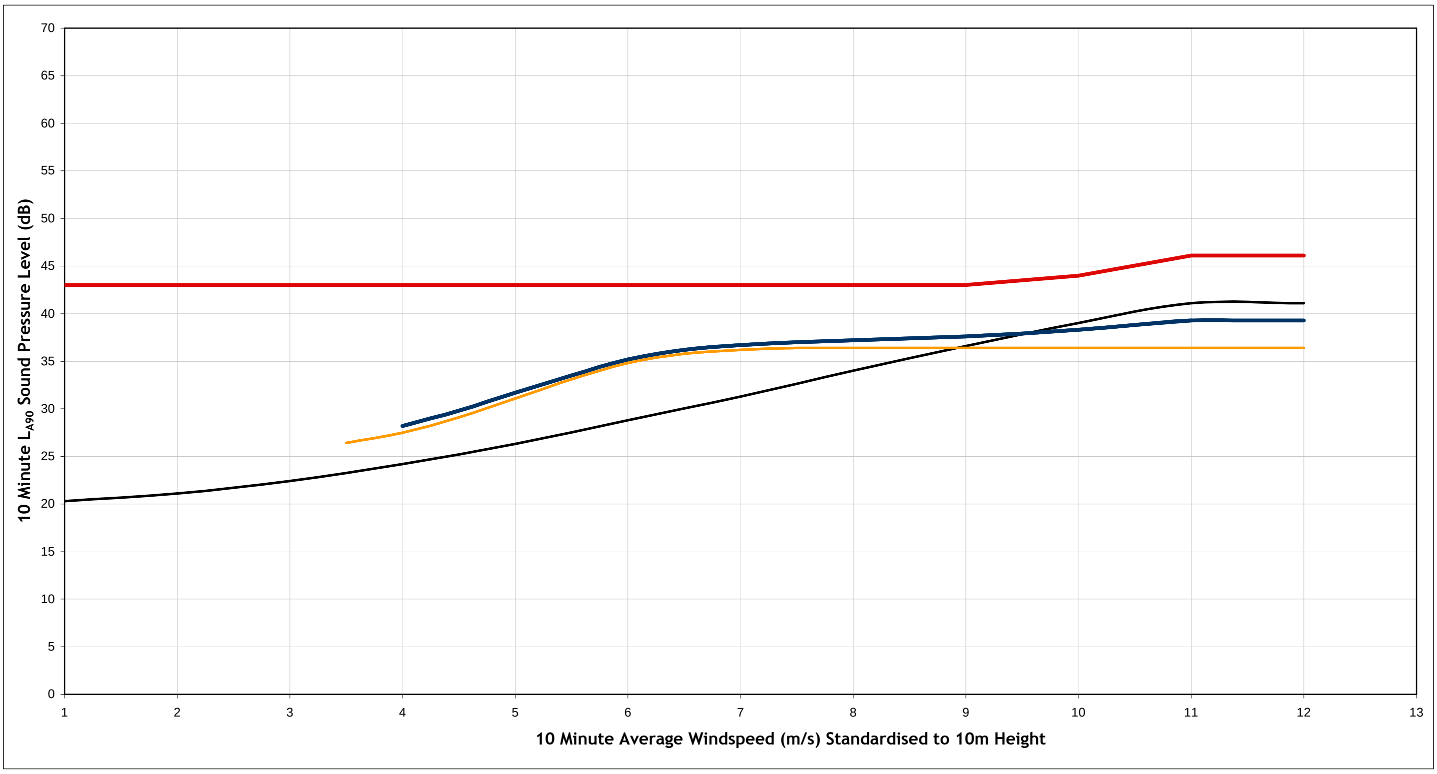
ETSU-R-97 QUIET DAYTIME - Gentletown (H4)



ETSU-R-97 NIGHT-TIME - Gentletown (H4)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Gentletown (H4)
Figure Number	A1.4d
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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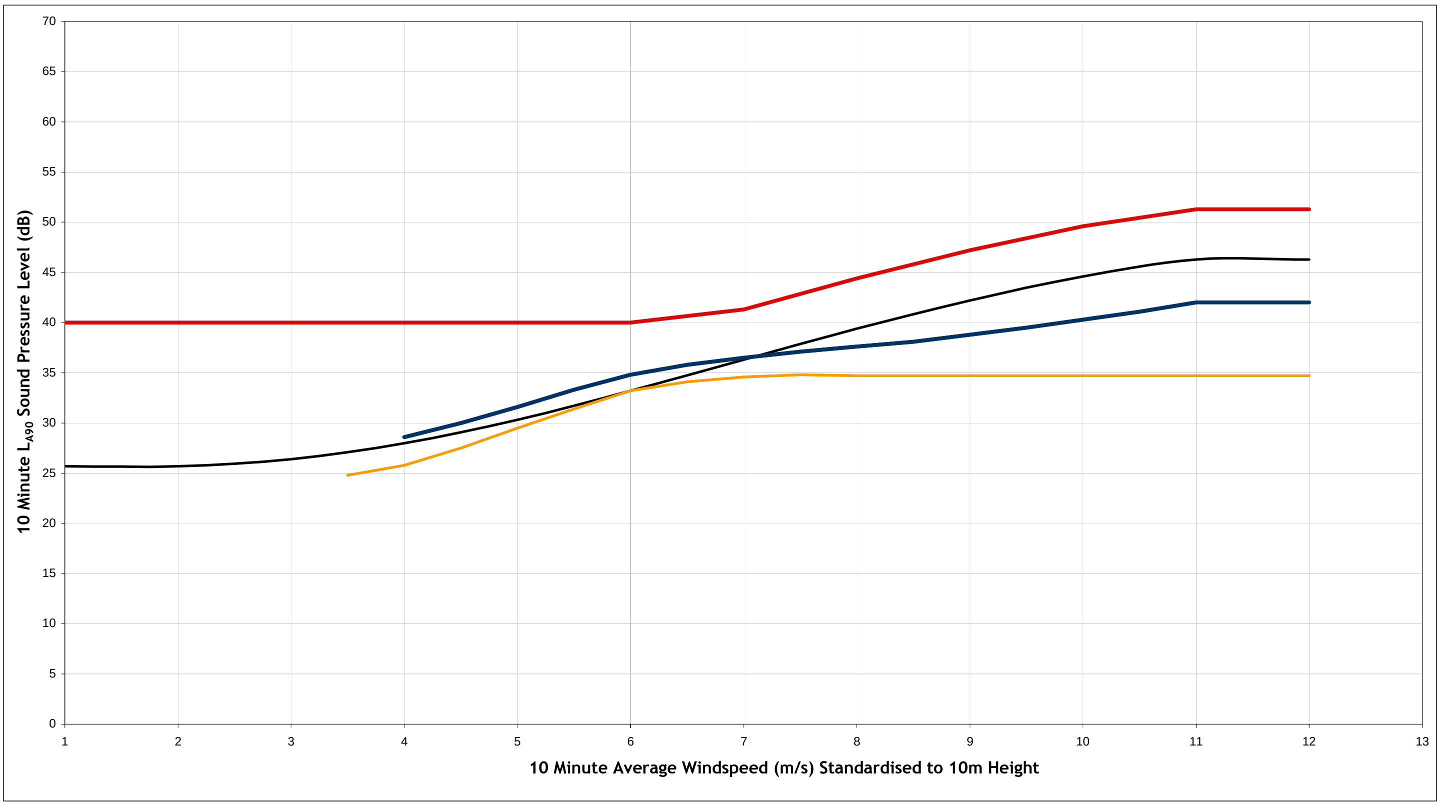
ETSU-R-97 QUIET DAYTIME - Littlester (H5)



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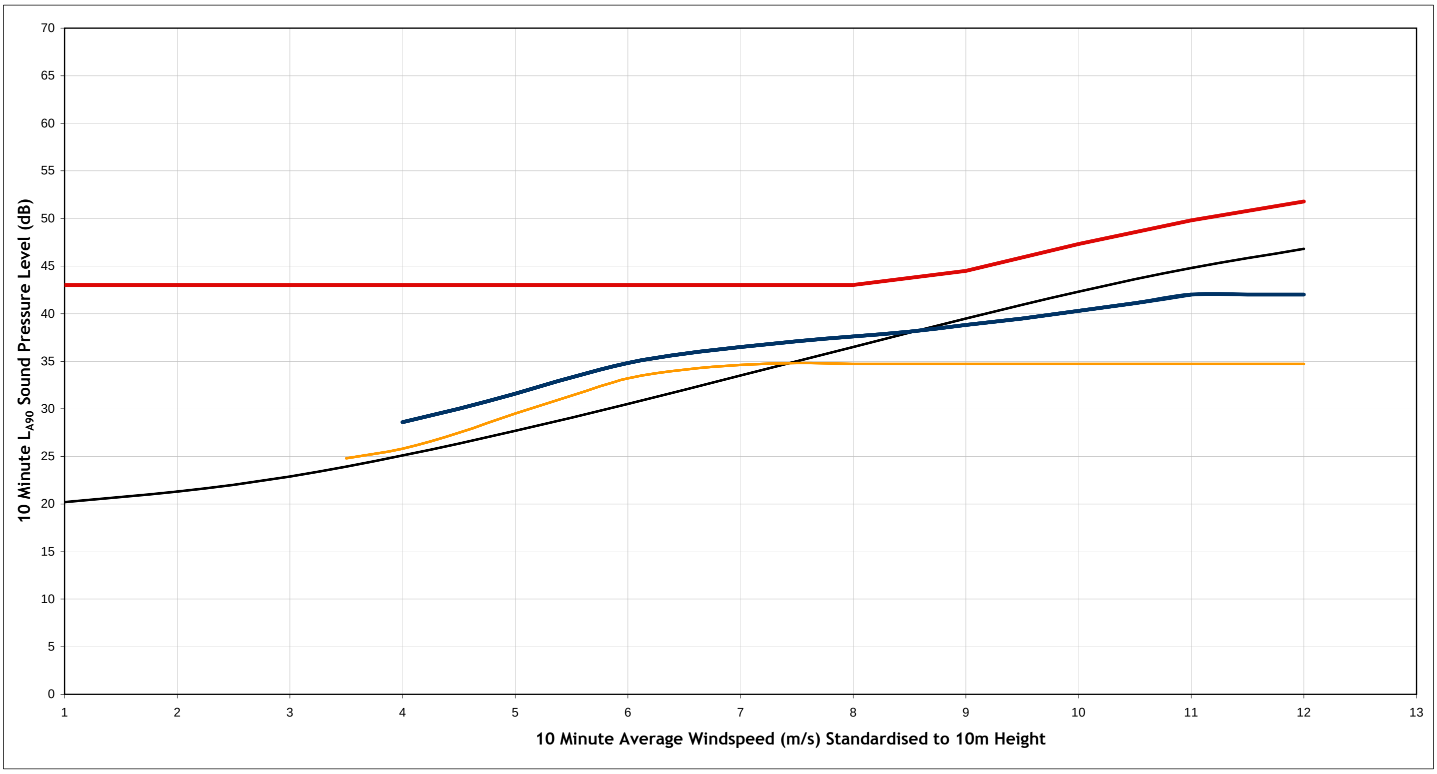

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Littlester (H5)
Figure Number	A1.4e
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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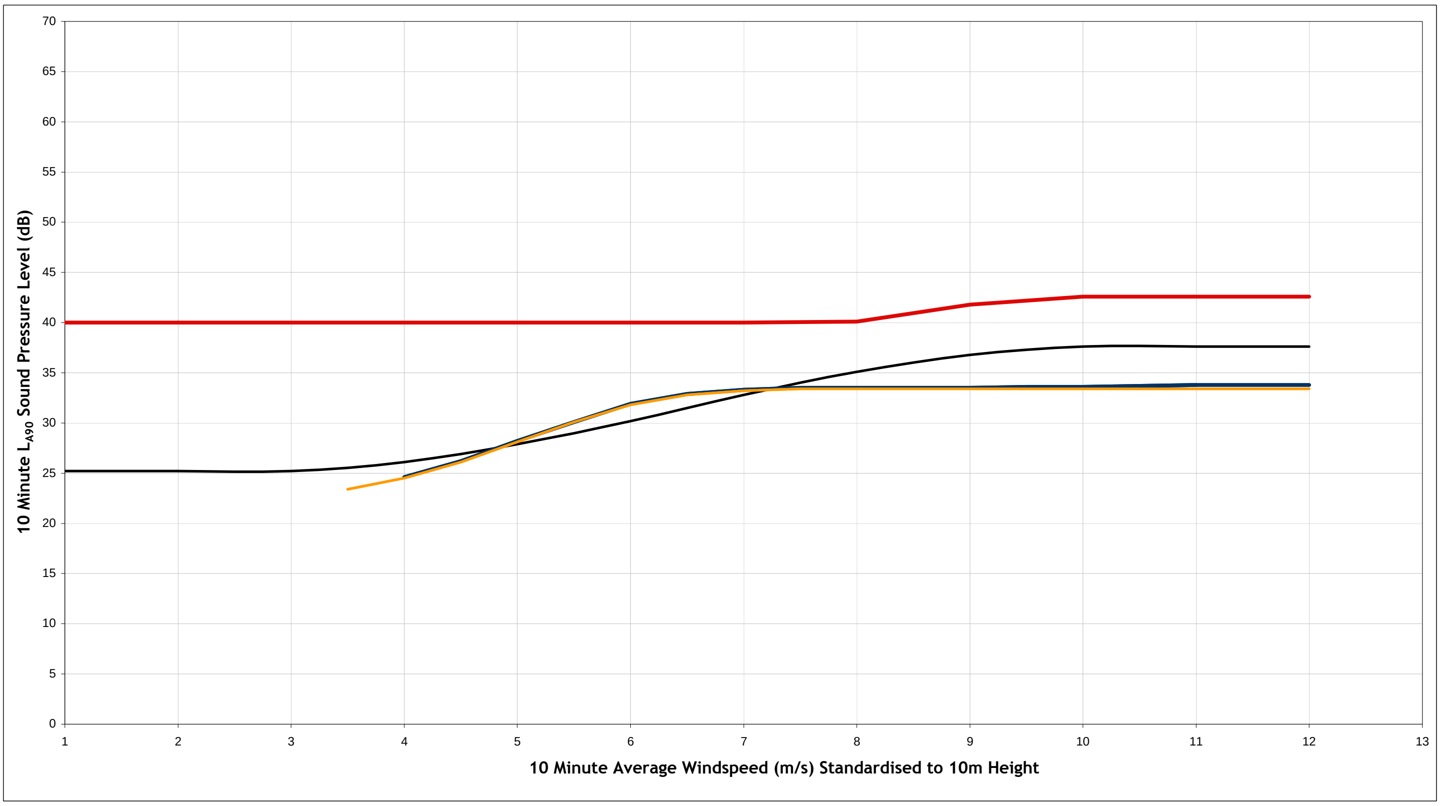
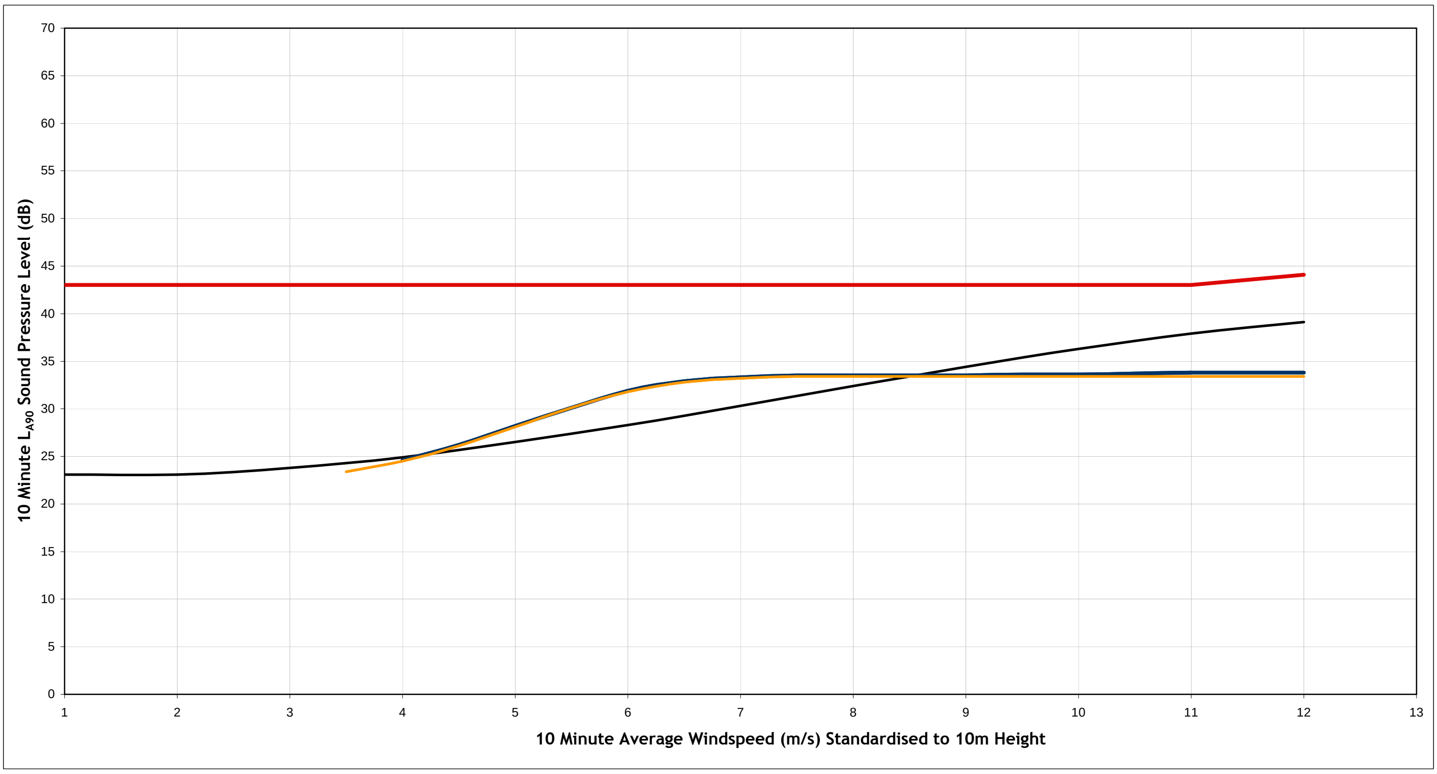
ETSU-R-97 QUIET DAYTIME - Hamnavoe (H6)



ETSU-R-97 NIGHT-TIME - Hamnavoe (H6)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Hamnavoe (H6)
Figure Number	A1.4f
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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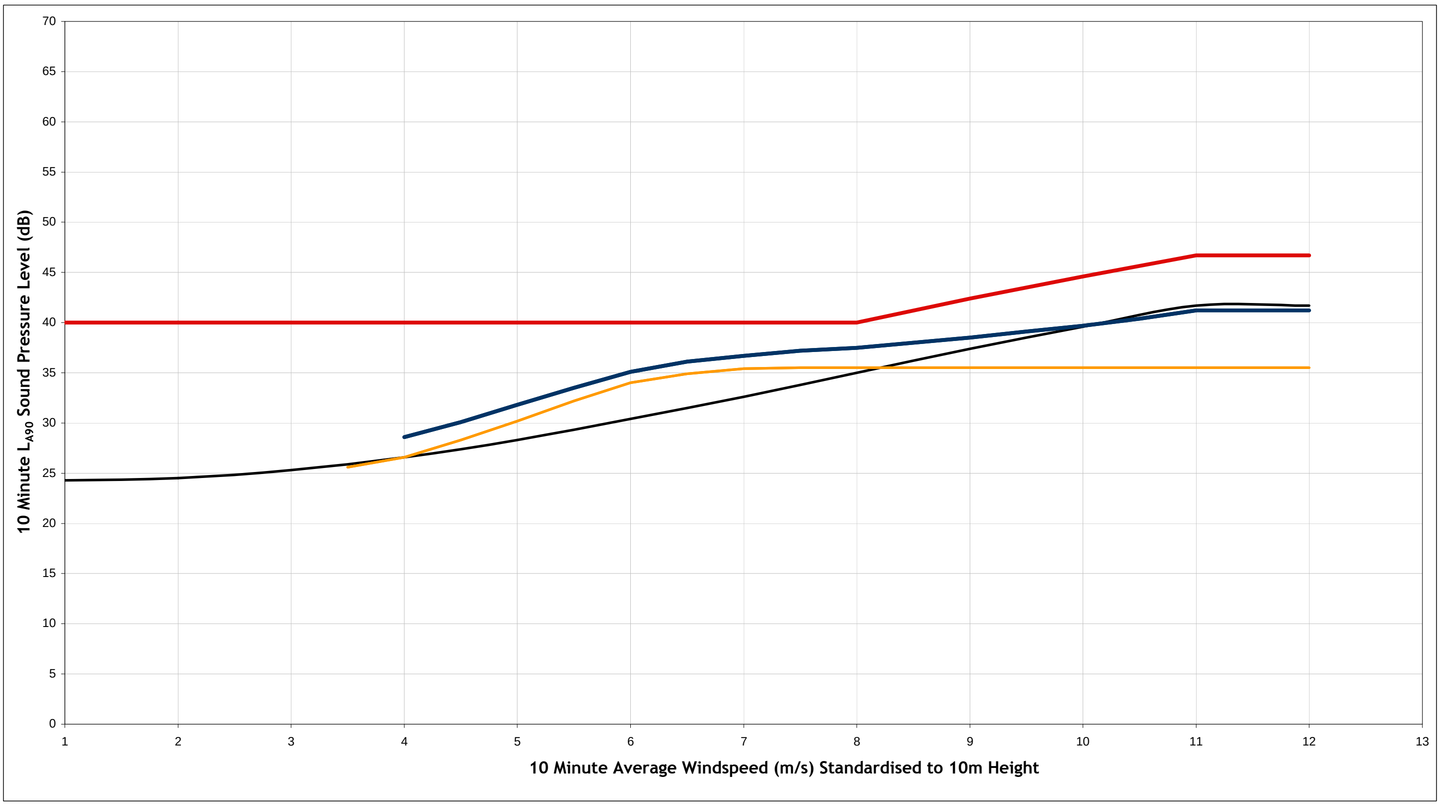
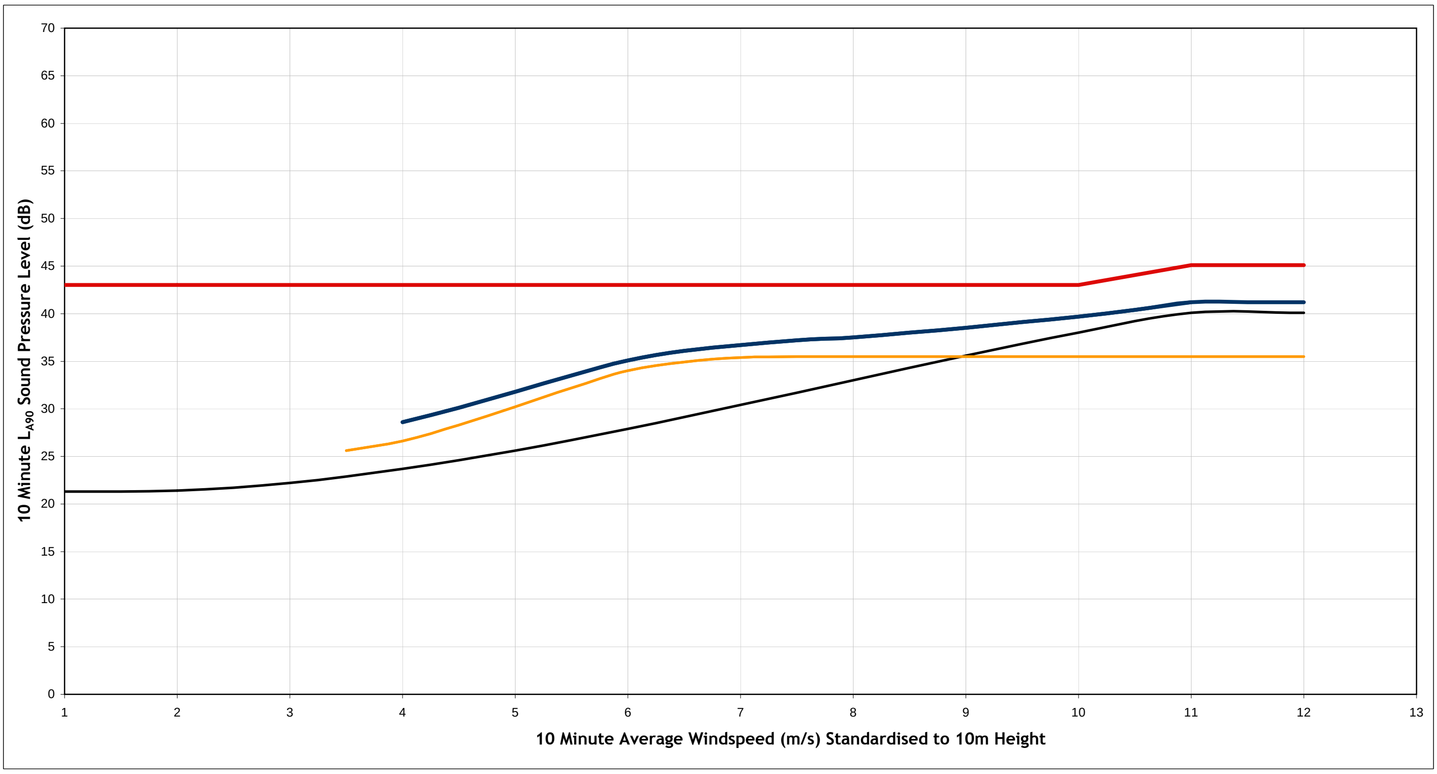
ETSU-R-97 QUIET DAYTIME - Helnaquhida (H7)



ETSU-R-97 NIGHT-TIME - Helnaquhida (H7)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Helnaquhida (H7)
Figure Number	A1.4g
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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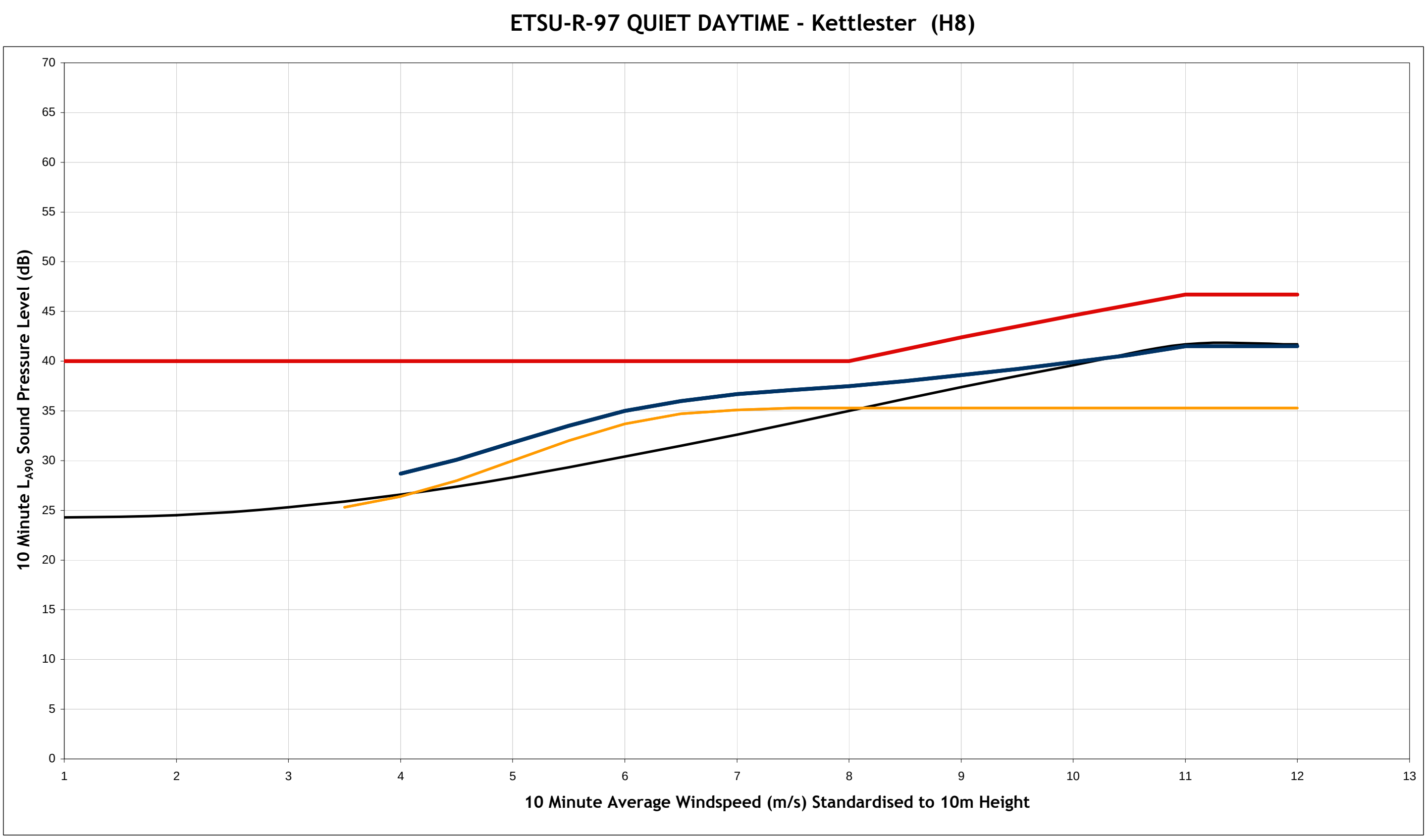

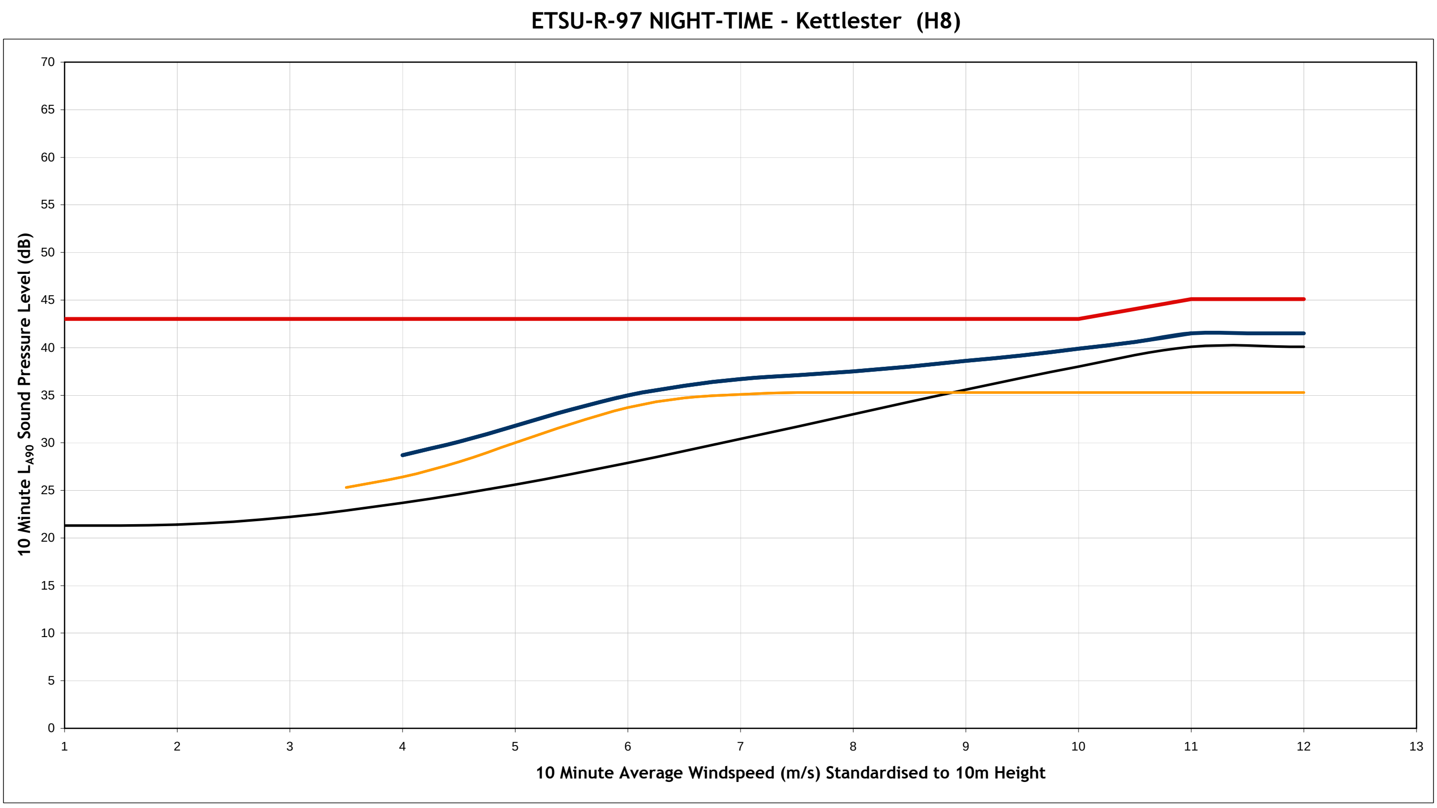

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Kettlester (H8)
Figure Number	A1.4h
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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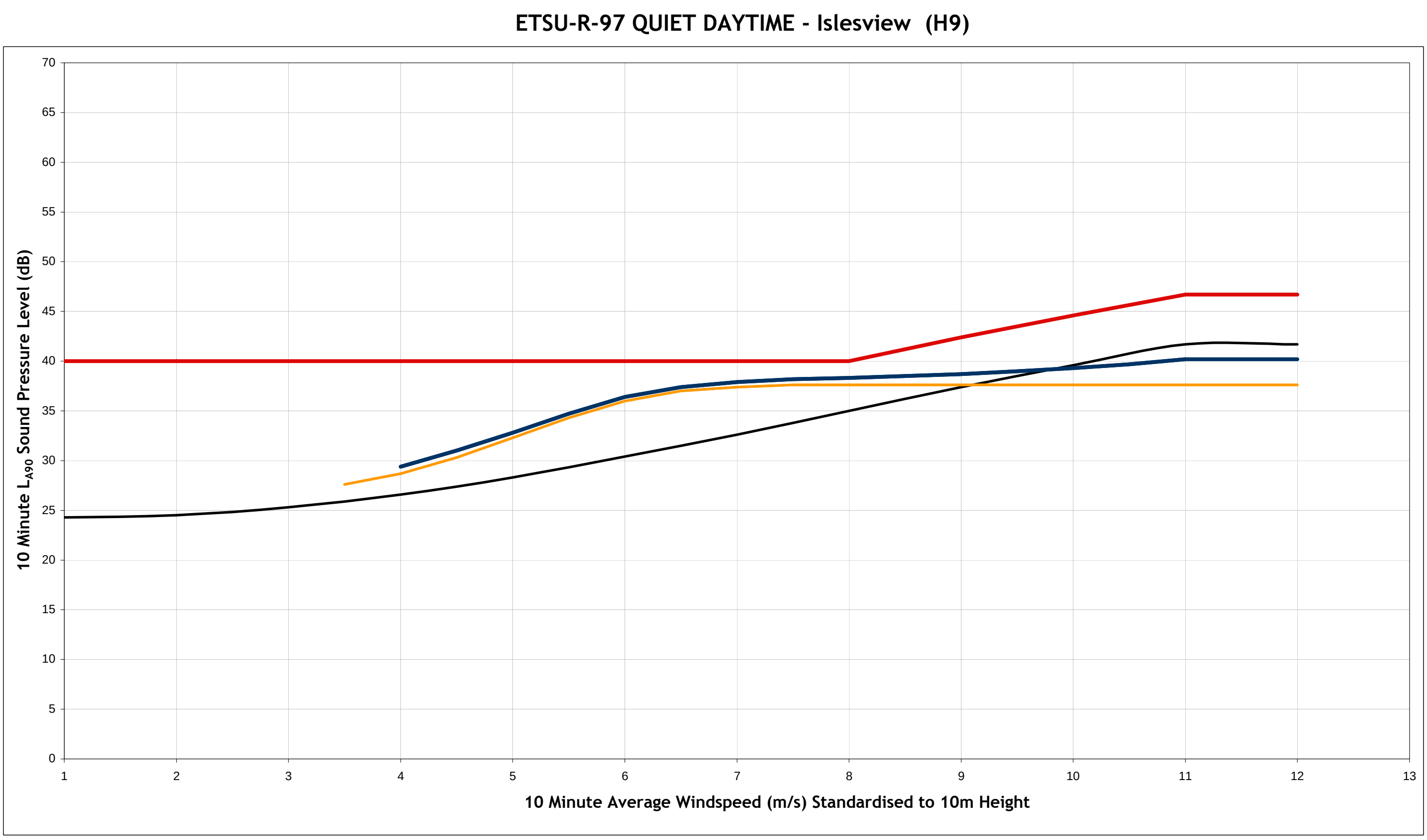

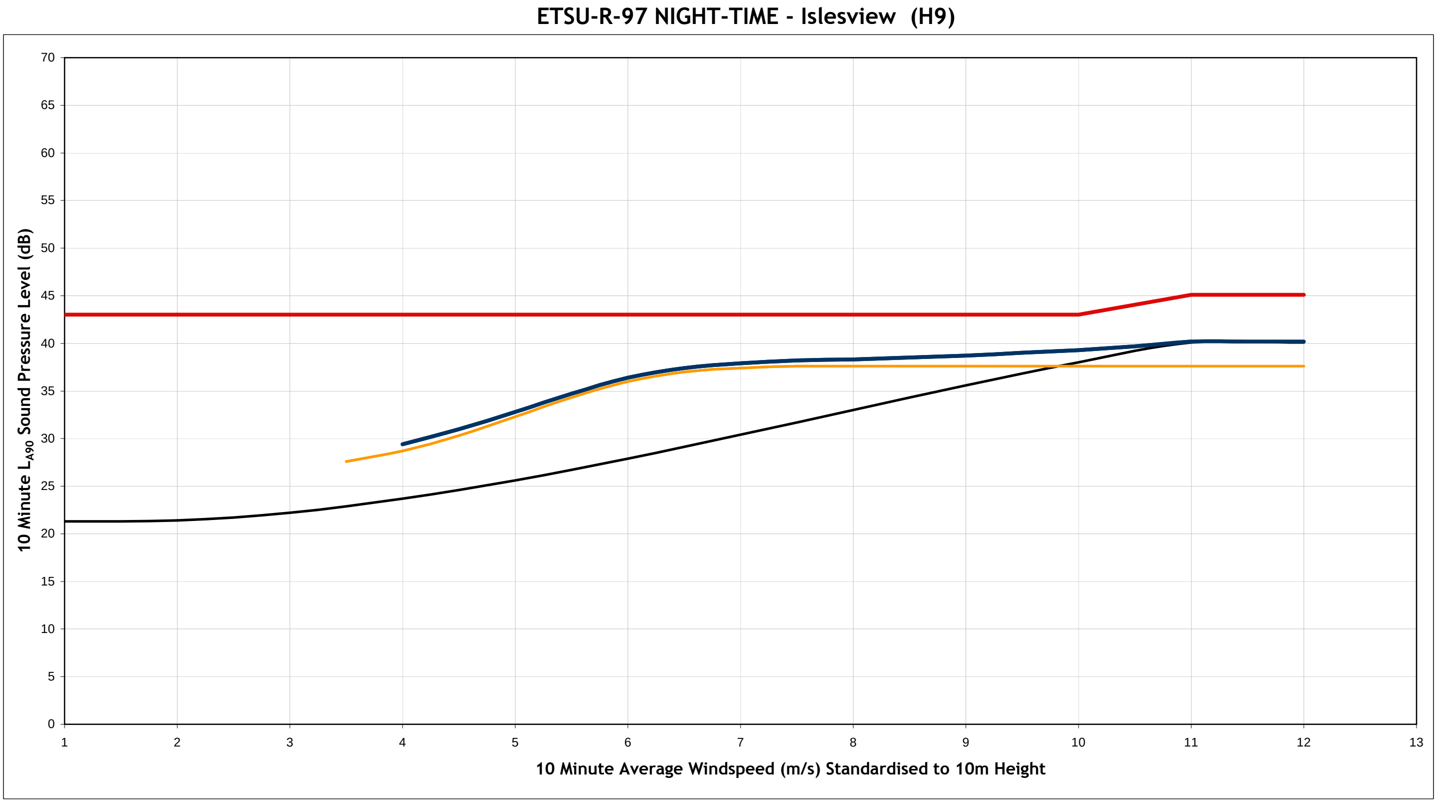

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Islesview (H9)
Figure Number	A1.4i
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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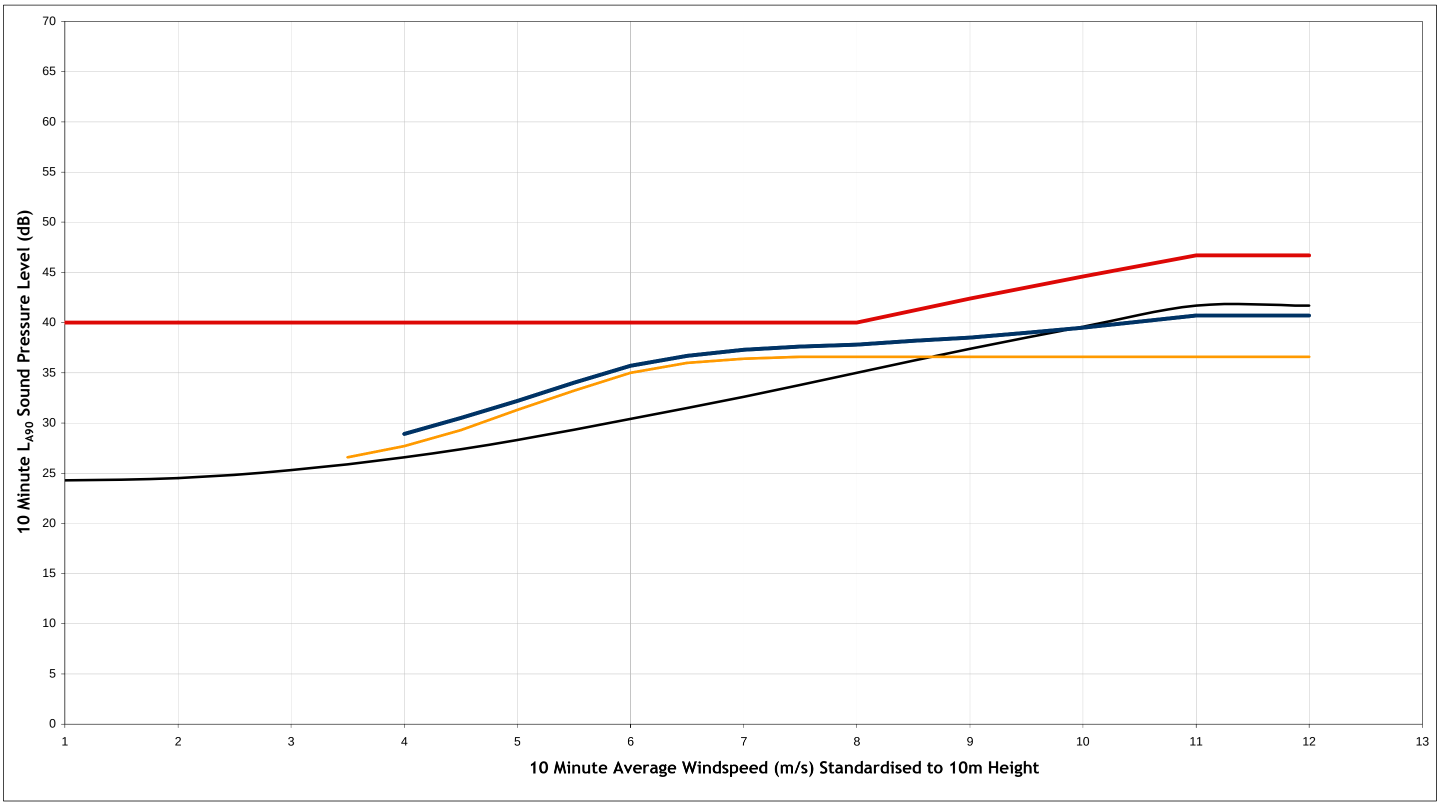
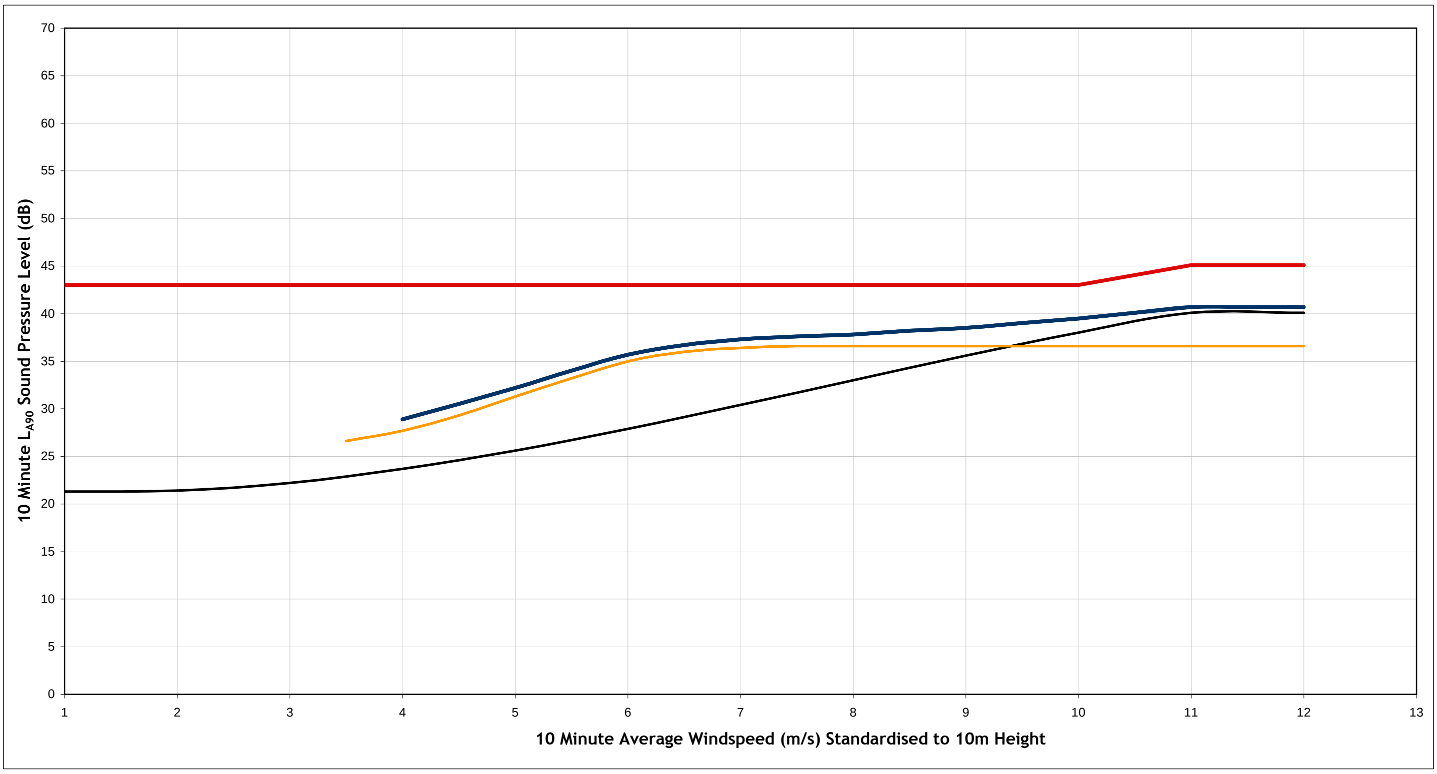
ETSU-R-97 QUIET DAYTIME - Westerlee (H10)



ETSU-R-97 NIGHT-TIME - Westerlee (H10)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Westerlee (H10)
Figure Number	A1.4j
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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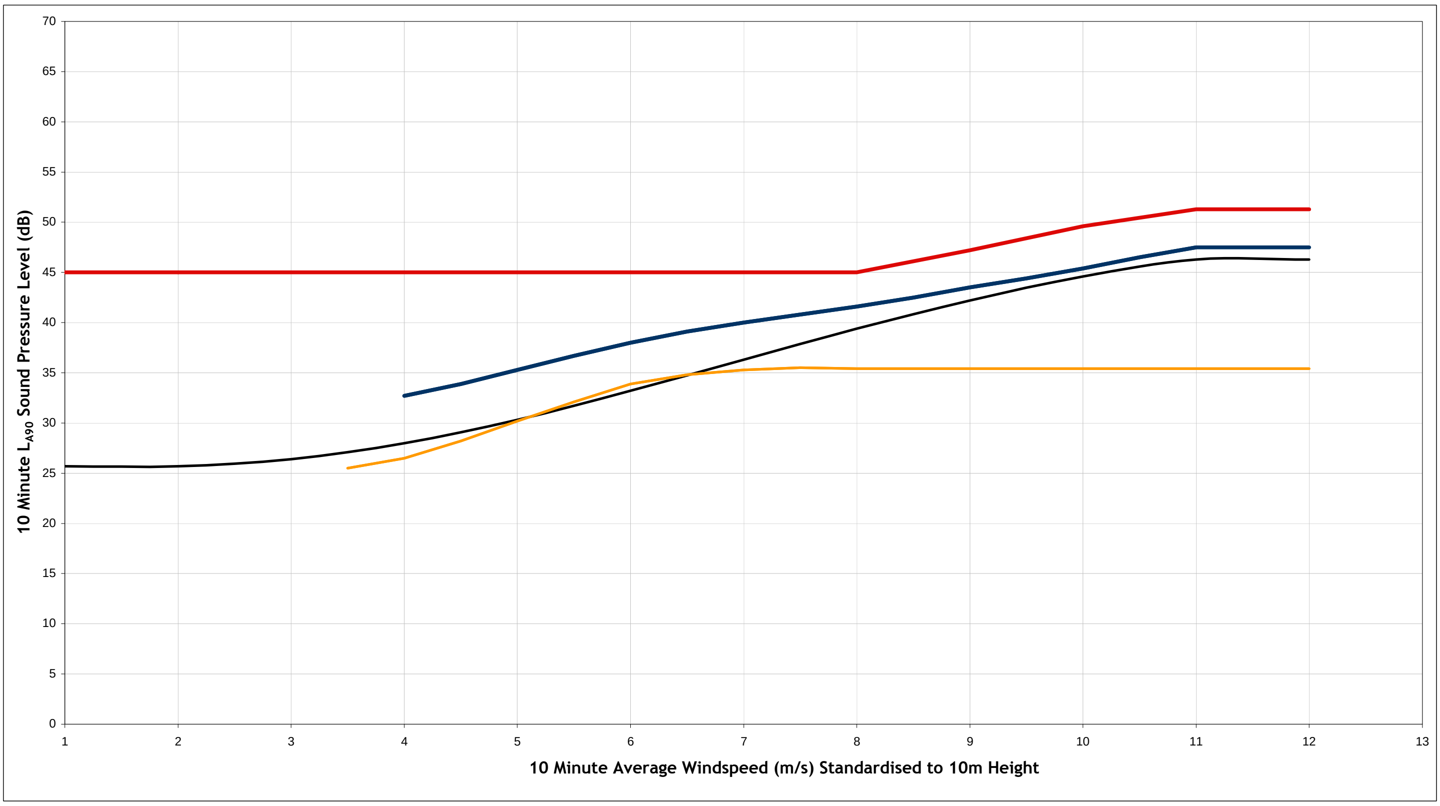
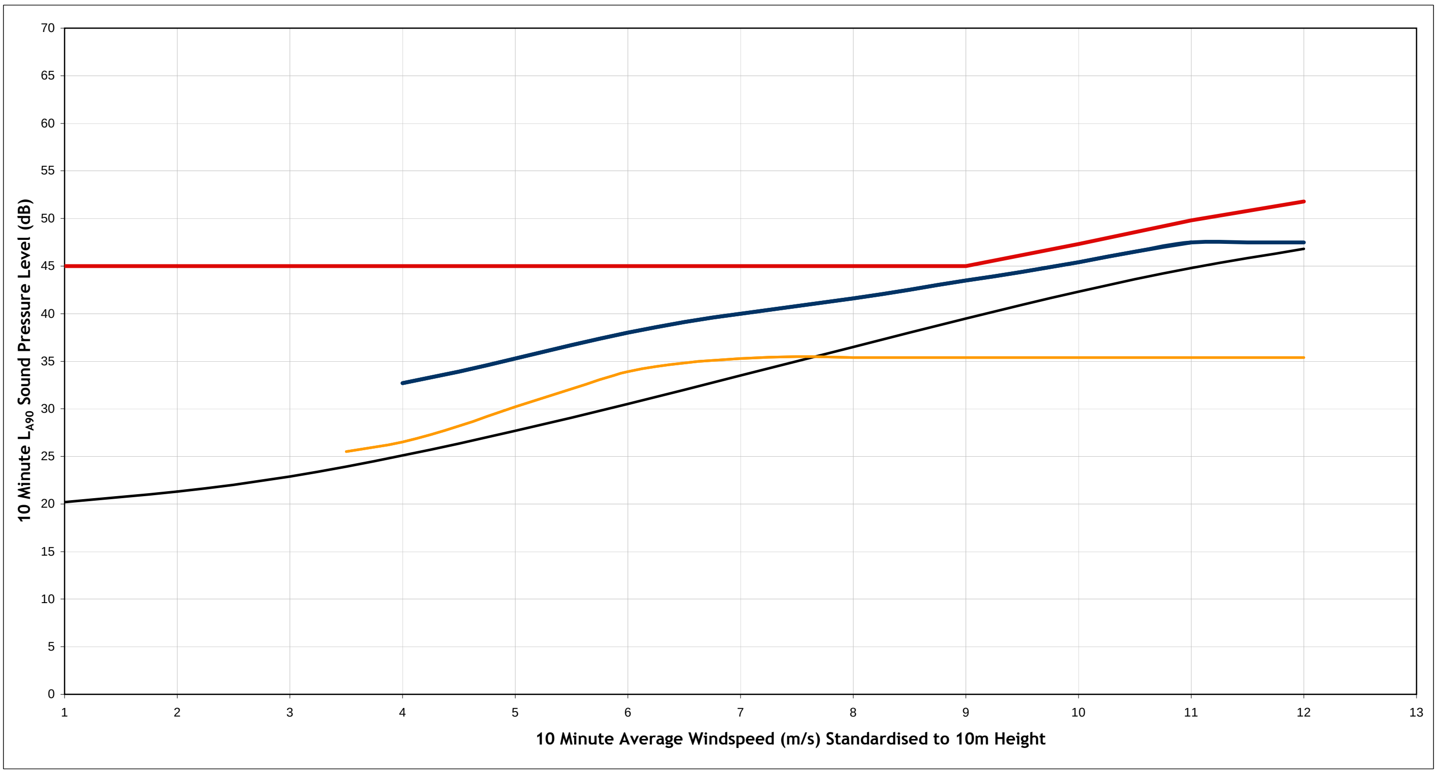
ETSU-R-97 QUIET DAYTIME - Kletterlea (H11)



ETSU-R-97 NIGHT-TIME - Kletterlea (H11)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Kletterlea (H11)
Figure Number	A1.4k
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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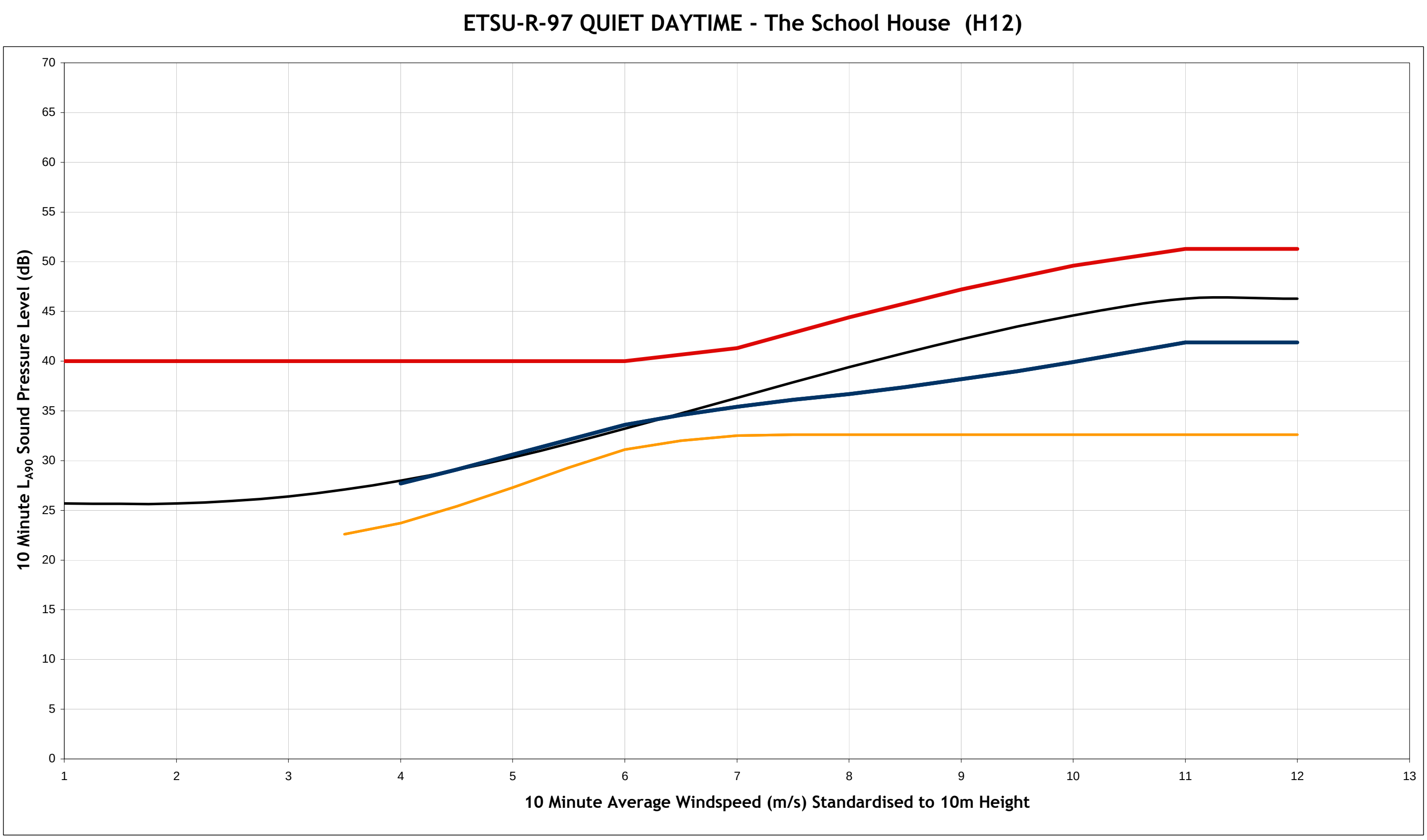

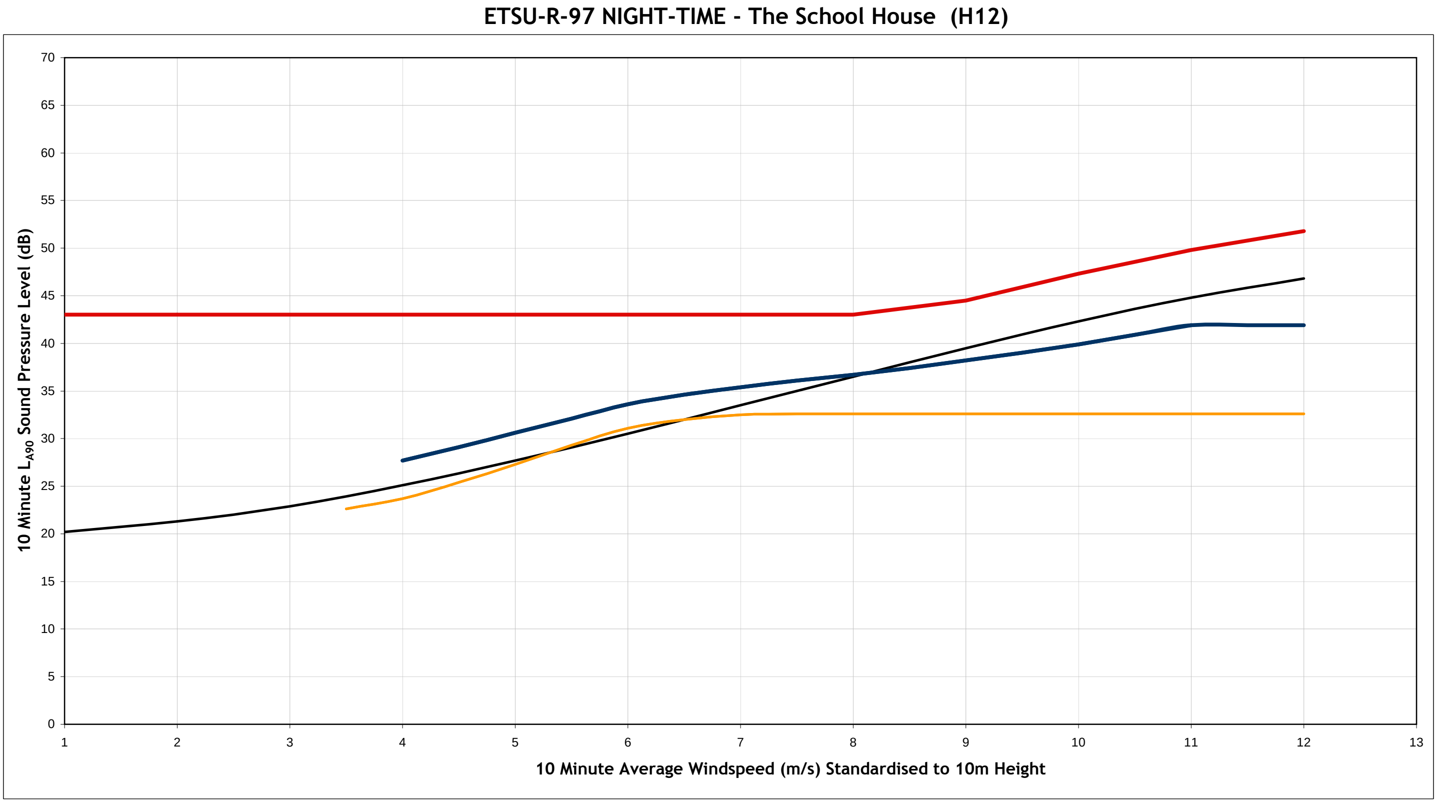

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits The School House (H12)
Figure Number	A1.4l
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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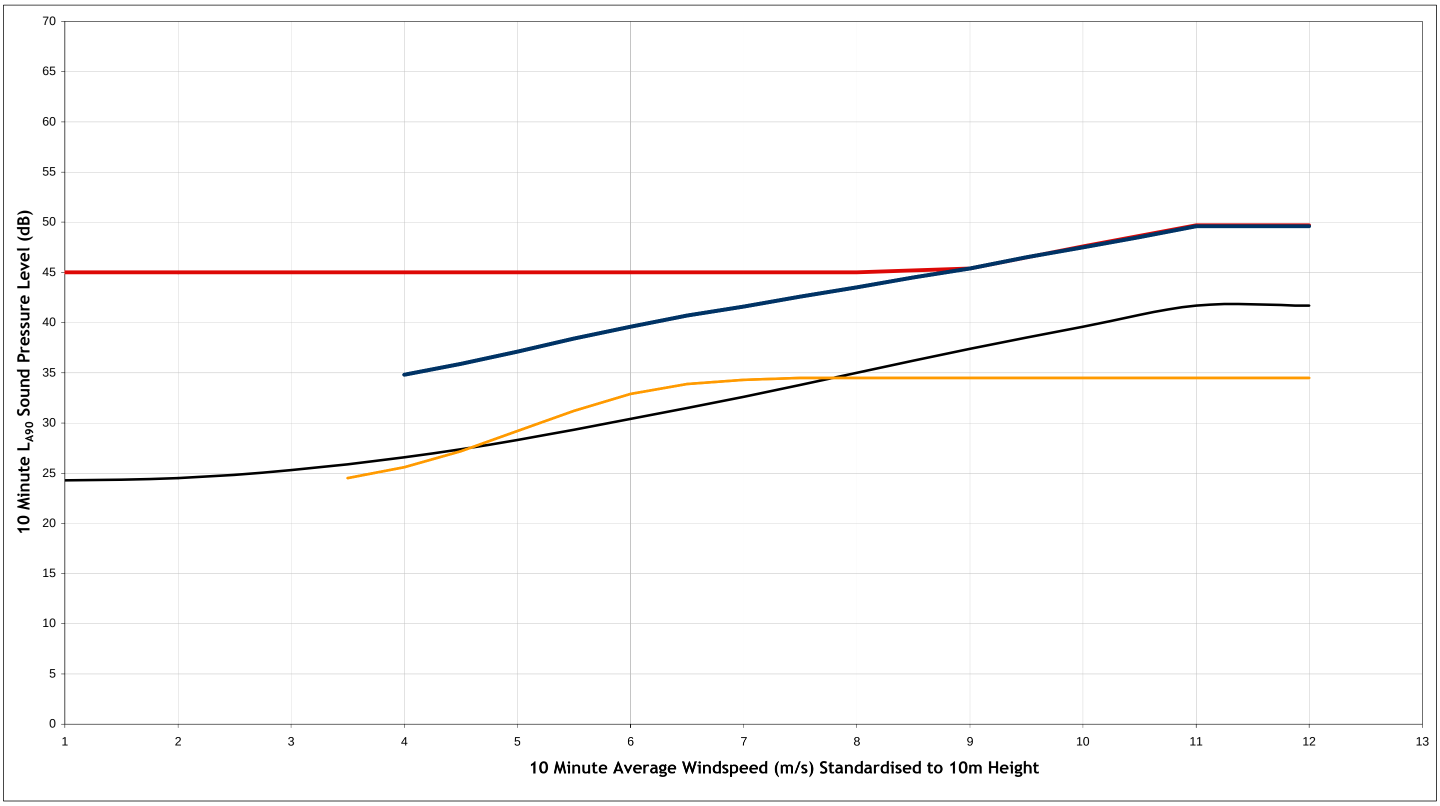
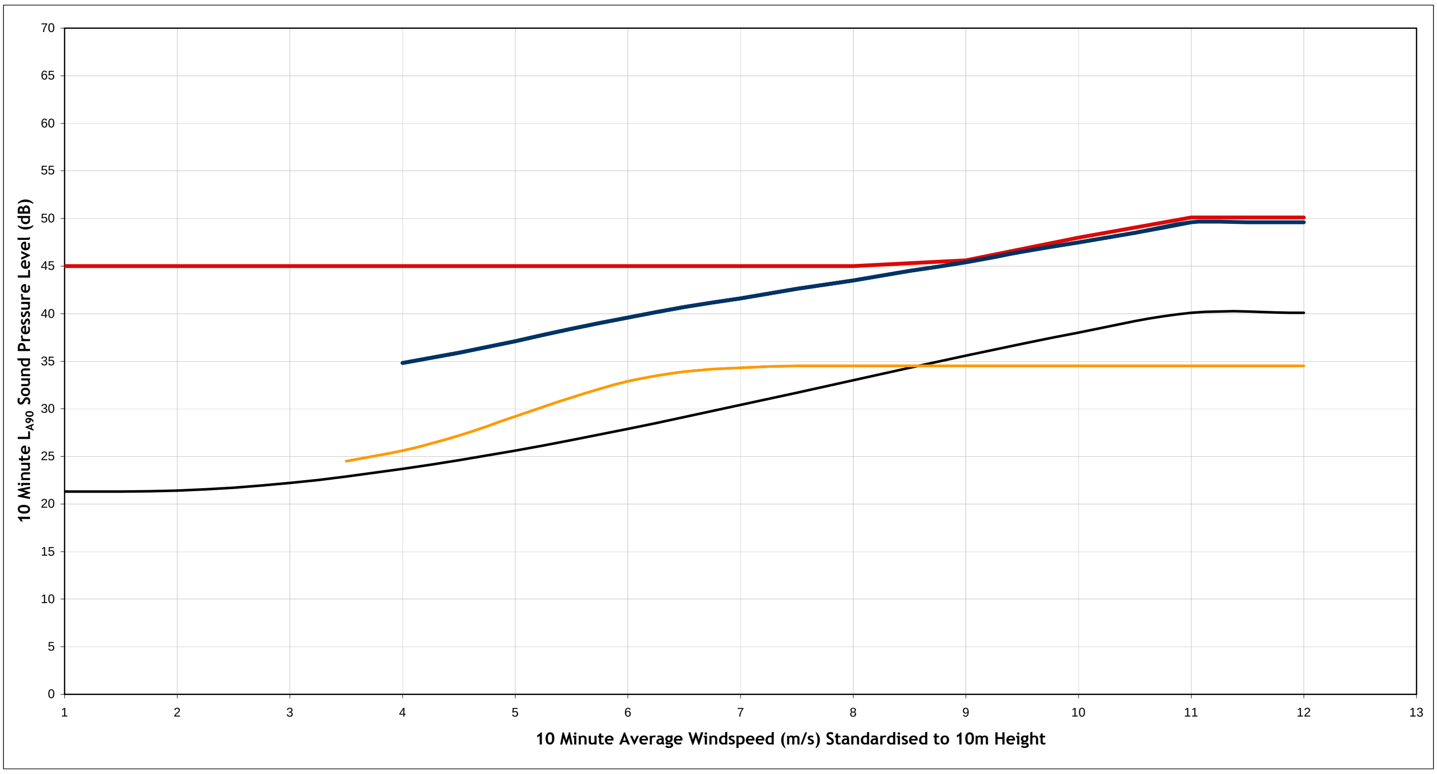
ETSU-R-97 QUIET DAYTIME - Cluness Cottage (H13)



ETSU-R-97 NIGHT-TIME - Cluness Cottage (H13)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Cluness Cottage (H13)
Figure Number	A1.4m
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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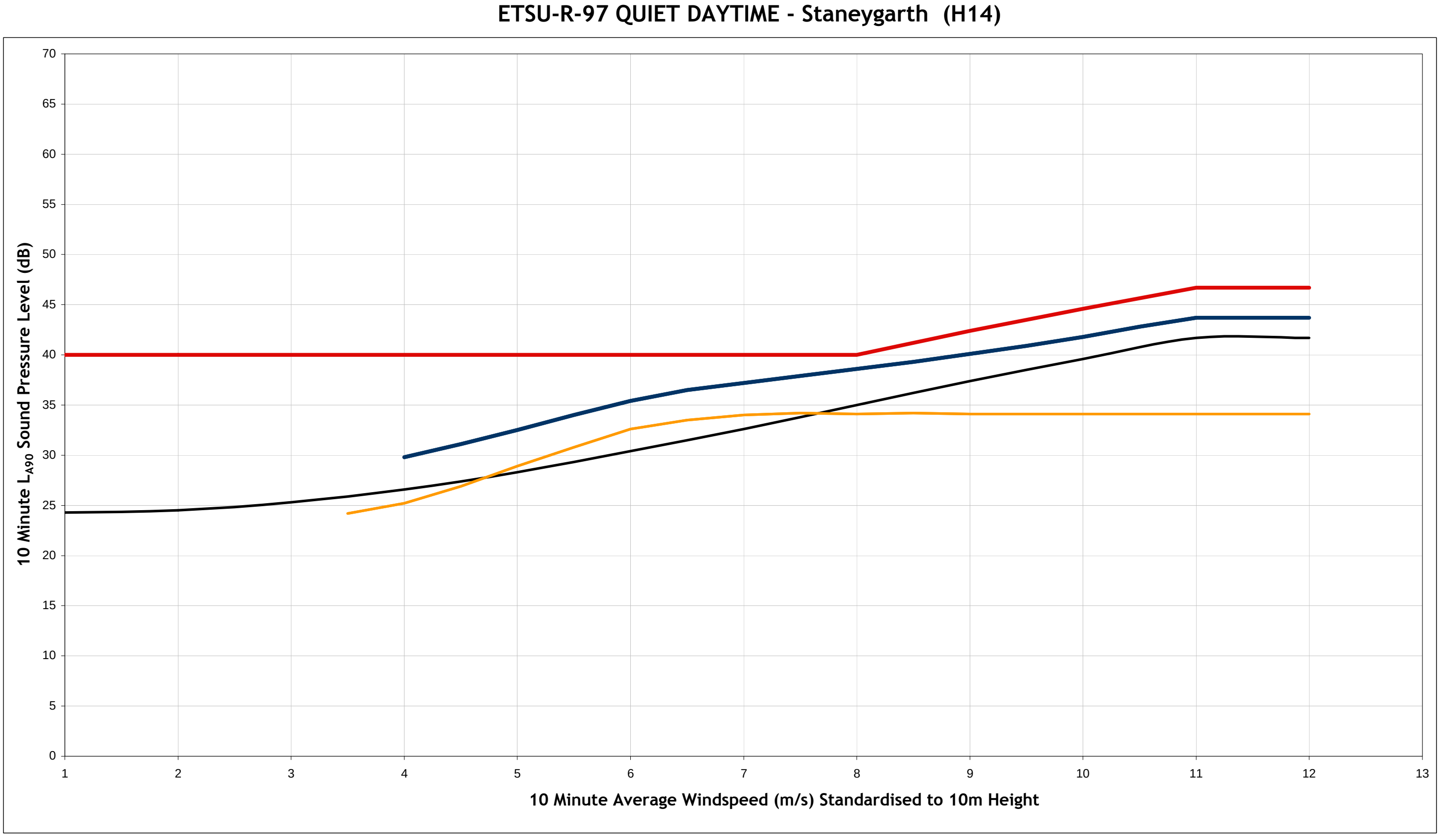

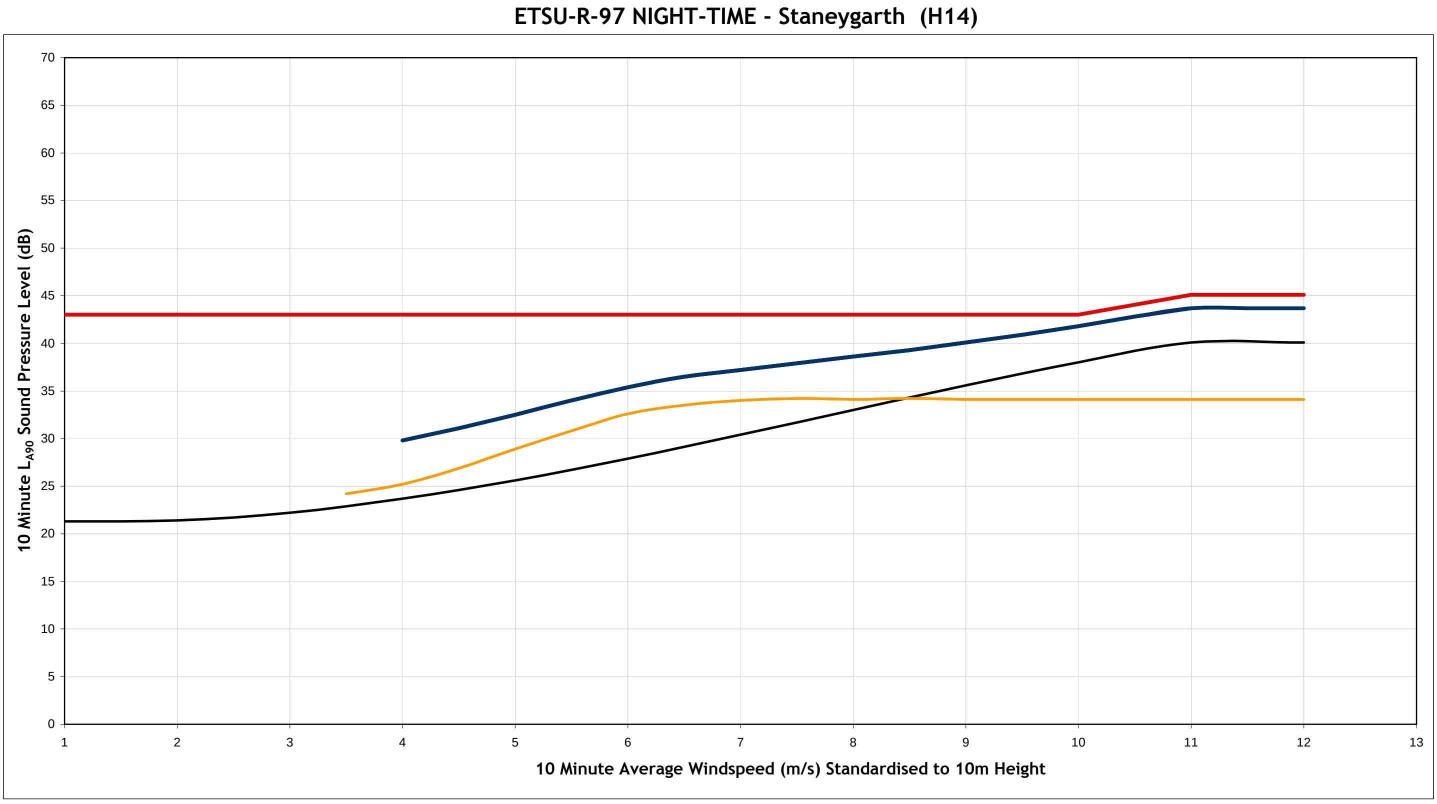

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Staneygarth (H14)
Figure Number	A1.4n
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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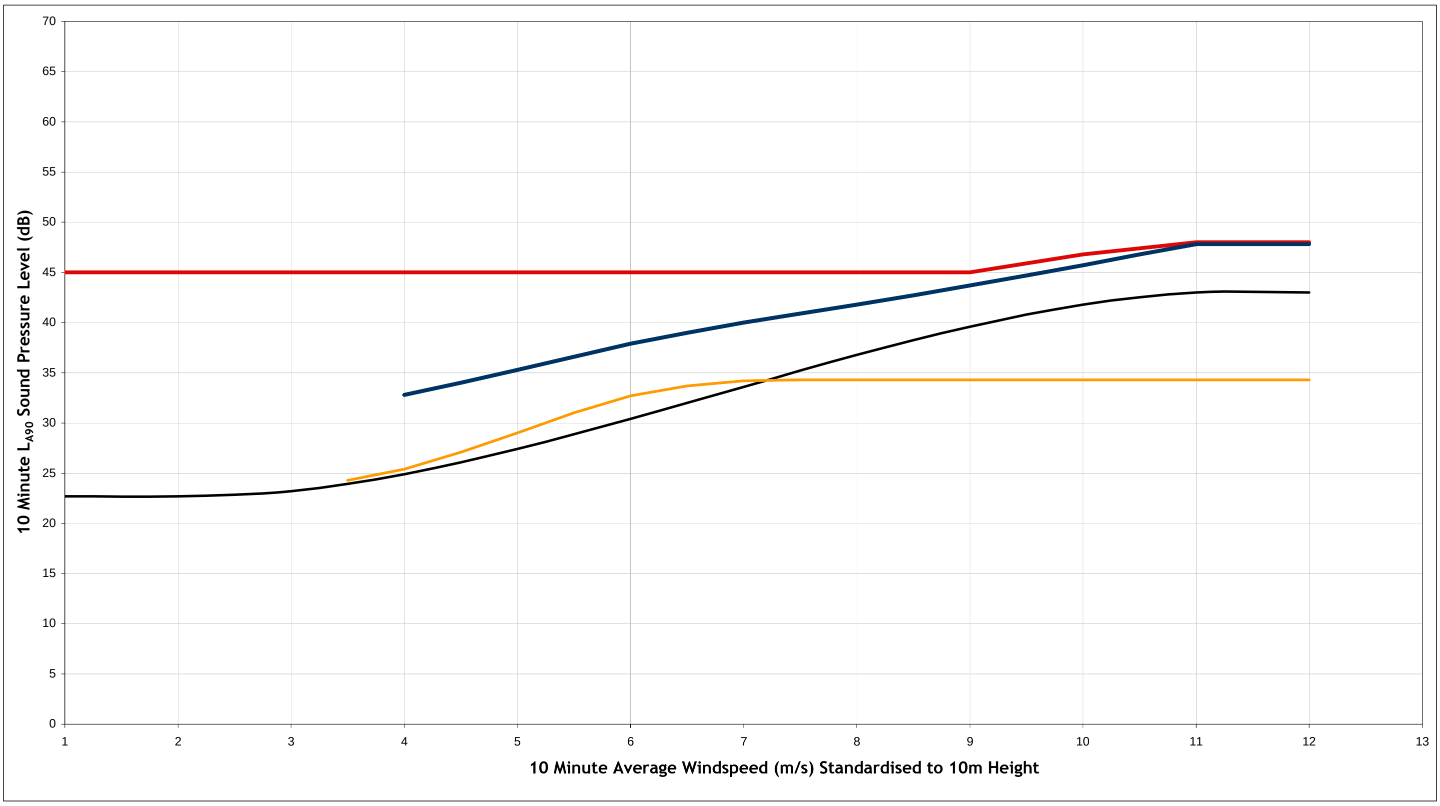
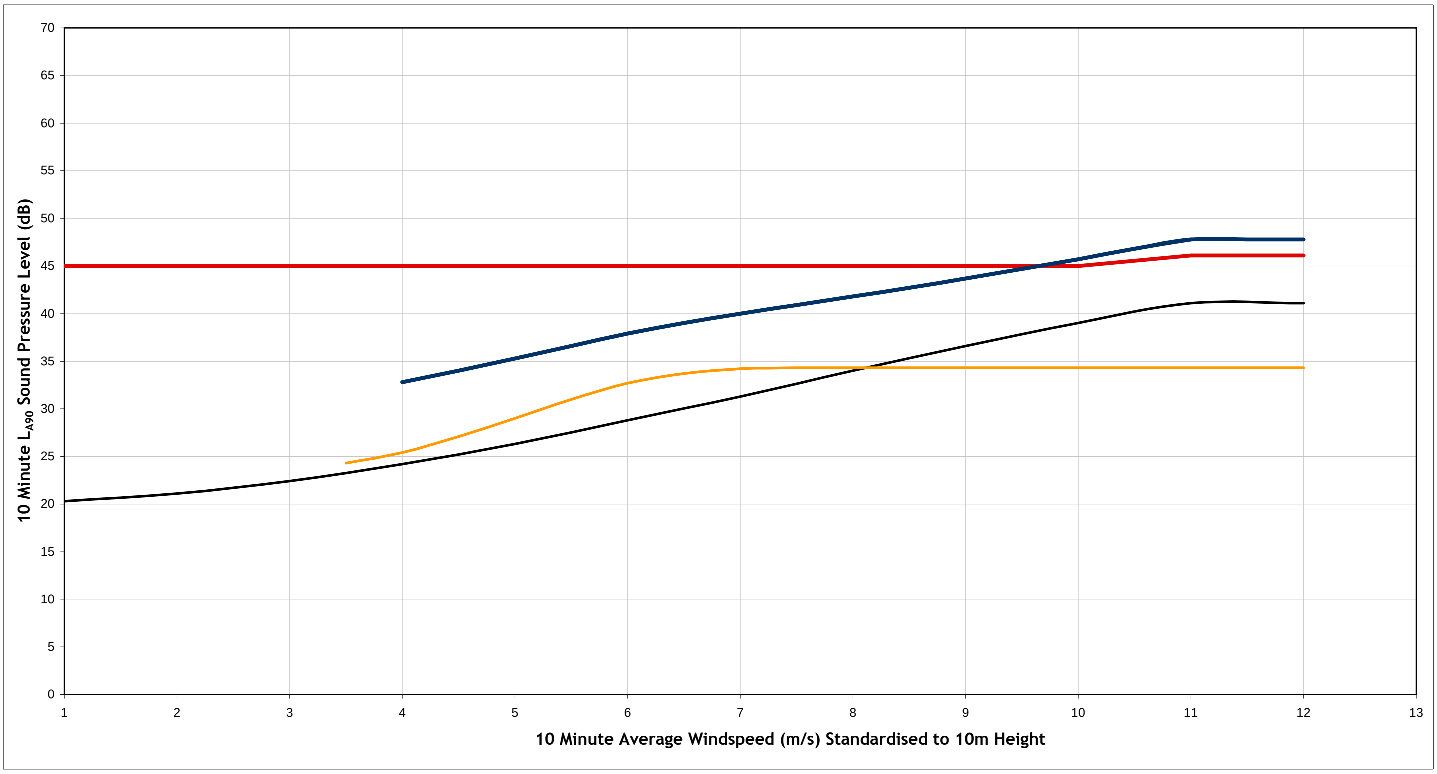
ETSU-R-97 QUIET DAYTIME - Giggleswick (H15)



ETSU-R-97 NIGHT-TIME - Giggleswick (H15)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- All Turbines
- Beaw Field Only - Senvion 3.4M

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Total Limits Giggleswick (H15)
Figure Number	A1.4o
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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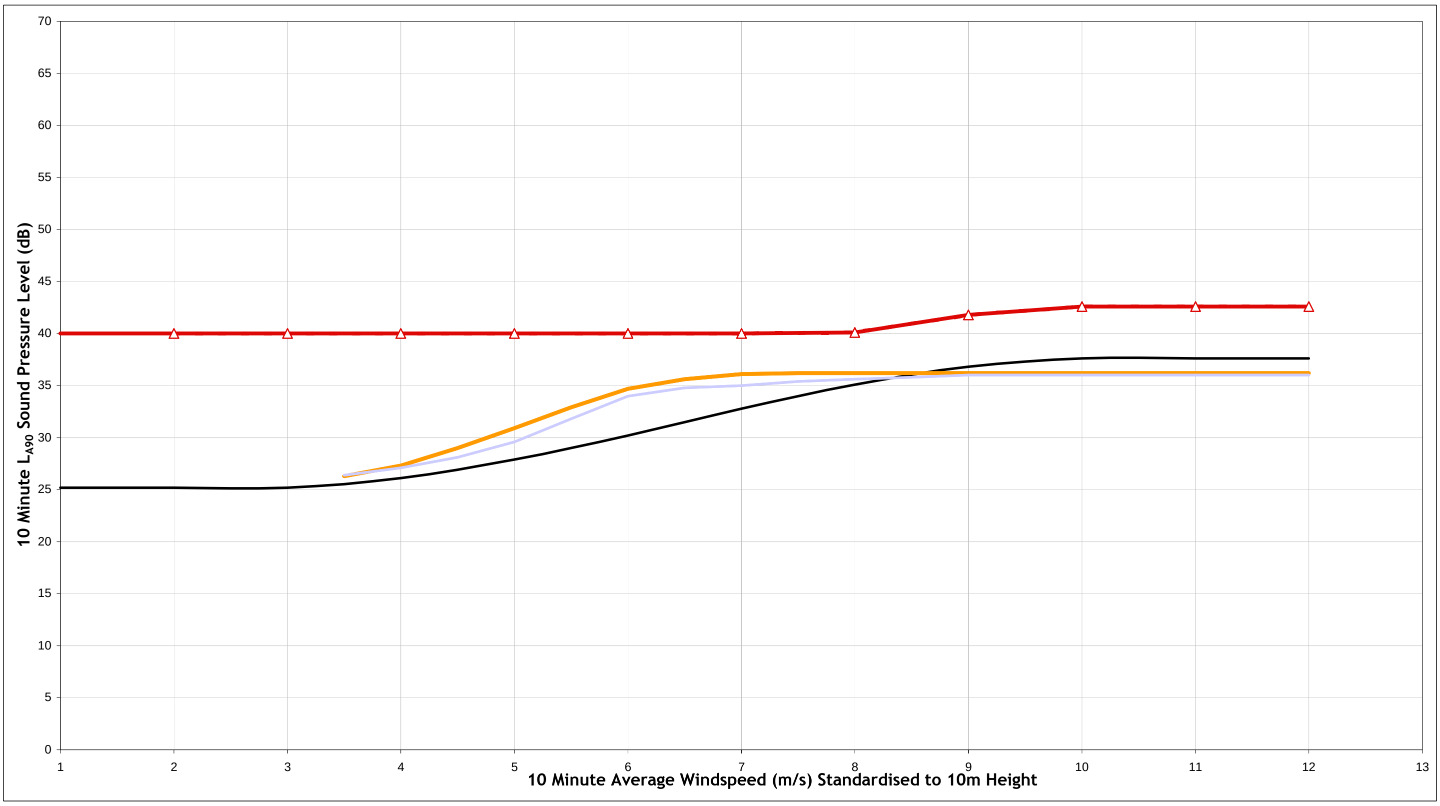
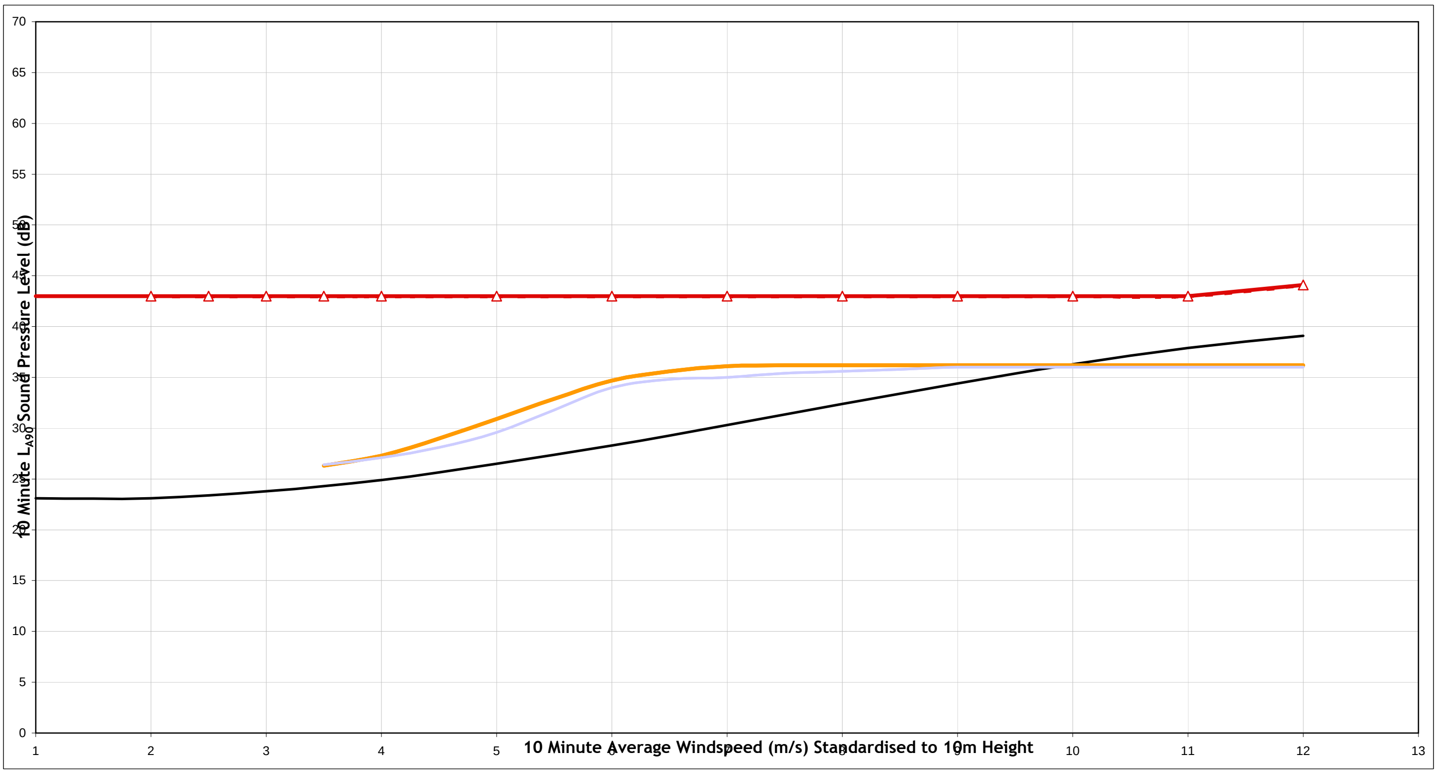
Appendix 5.1b

Noise Figures (Site Specific) with Gossabrough Turbine

ETSU-R-97 QUIET DAYTIME - Lower Holligarth (H1)



ETSU-R-97 NIGHT-TIME - Lower Holligarth (H1)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Lower Holligarth (H1)
Figure Number	A1.5a
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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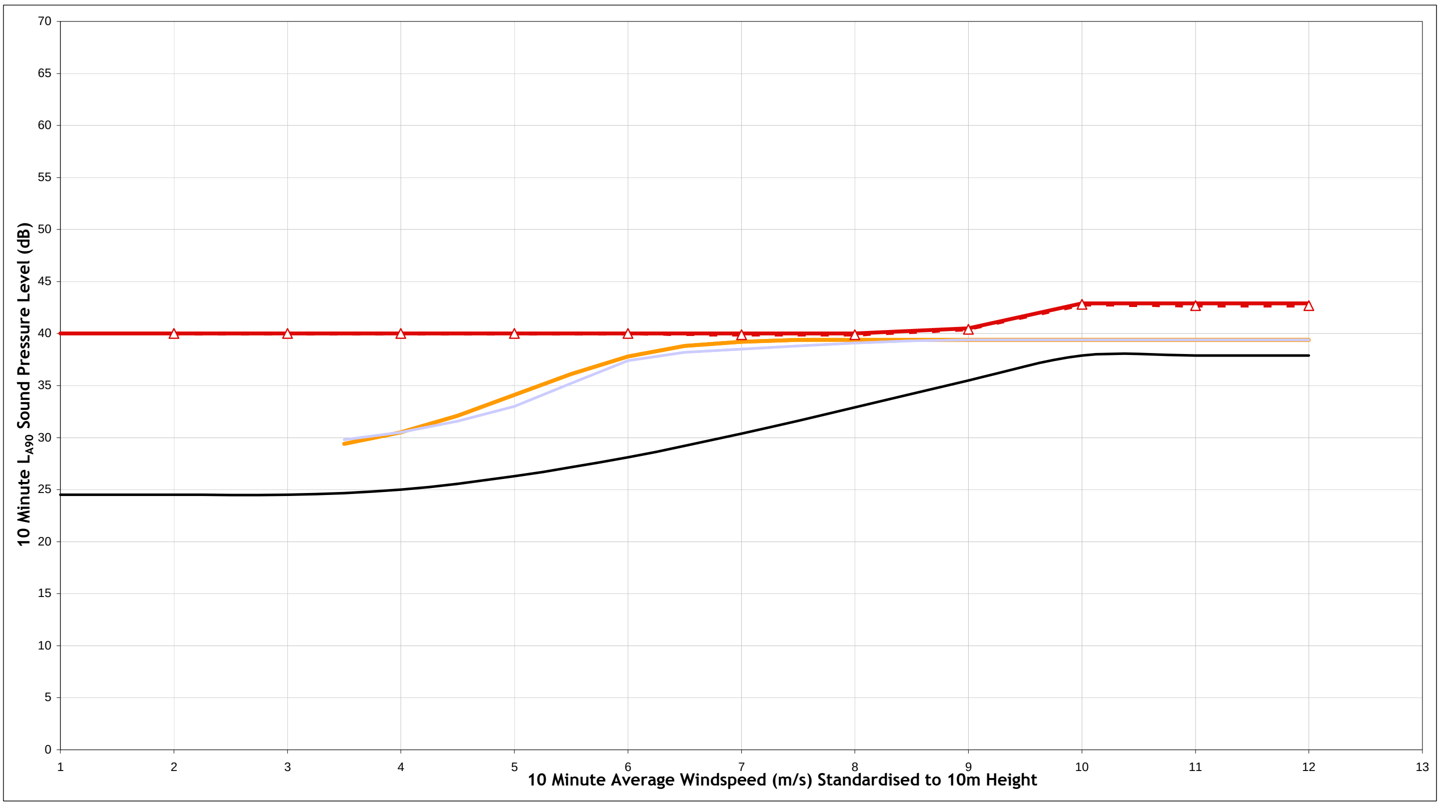
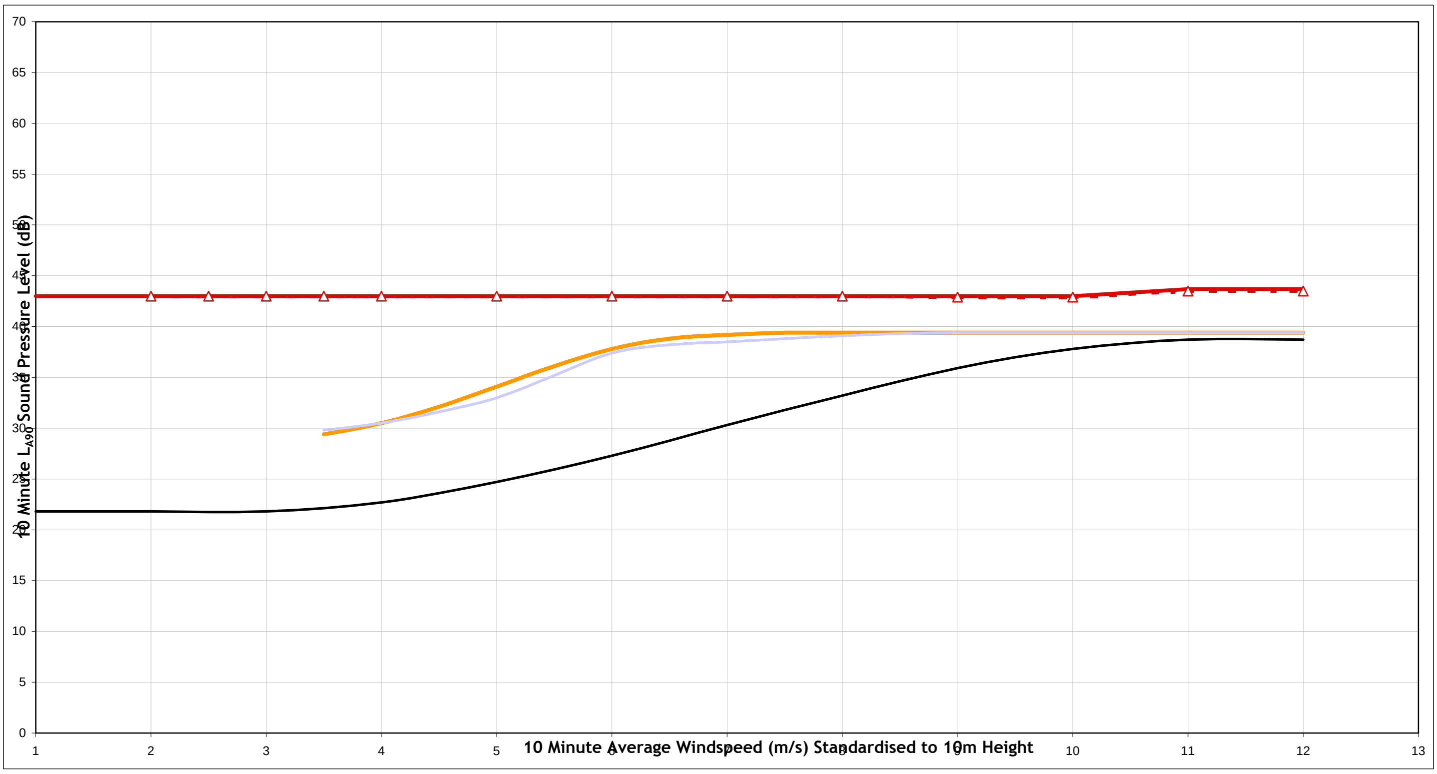
ETSU-R-97 QUIET DAYTIME - Whirliegarth (H2)



ETSU-R-97 NIGHT-TIME - Whirliegarth (H2)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Whirliegarth (H2)
Figure Number	A1.5b
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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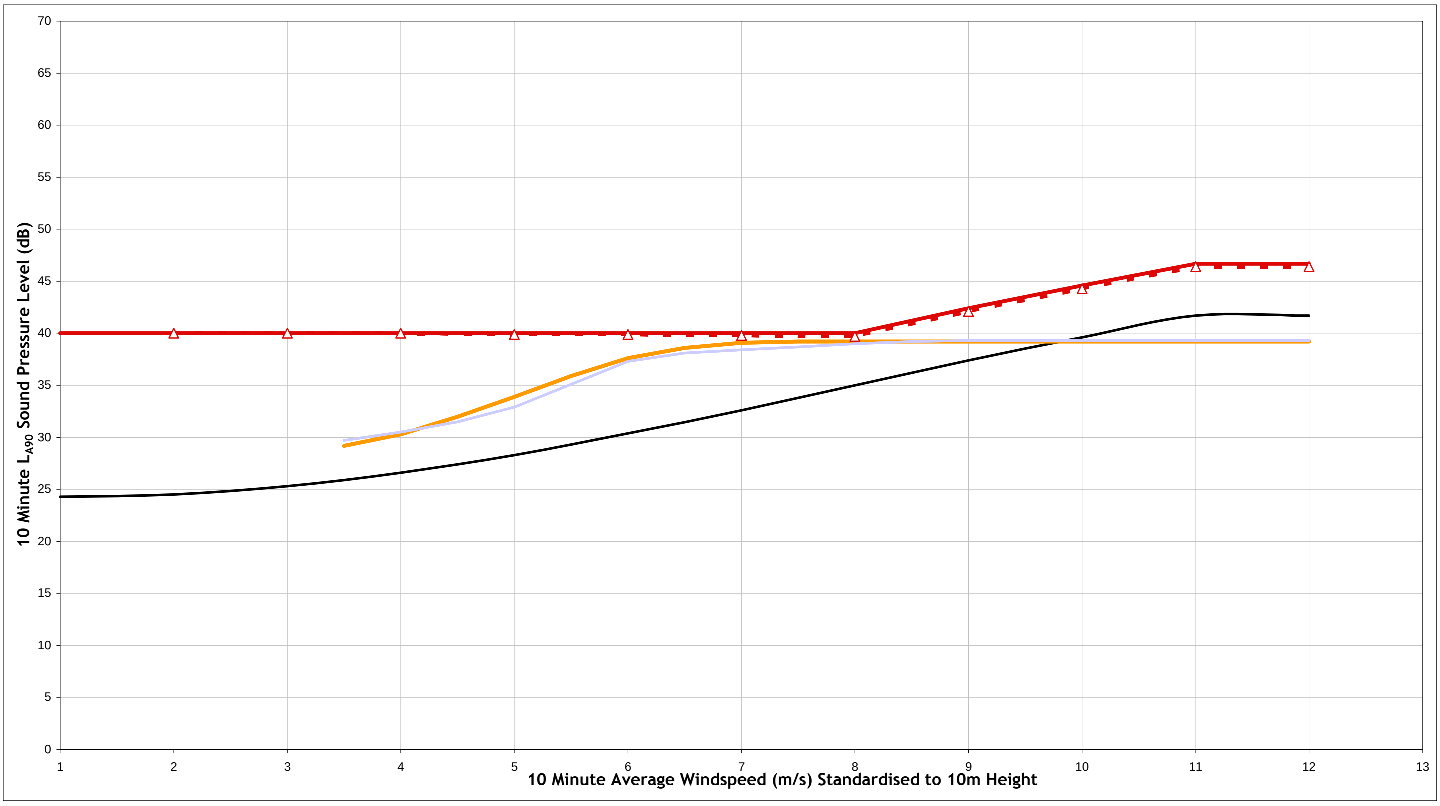
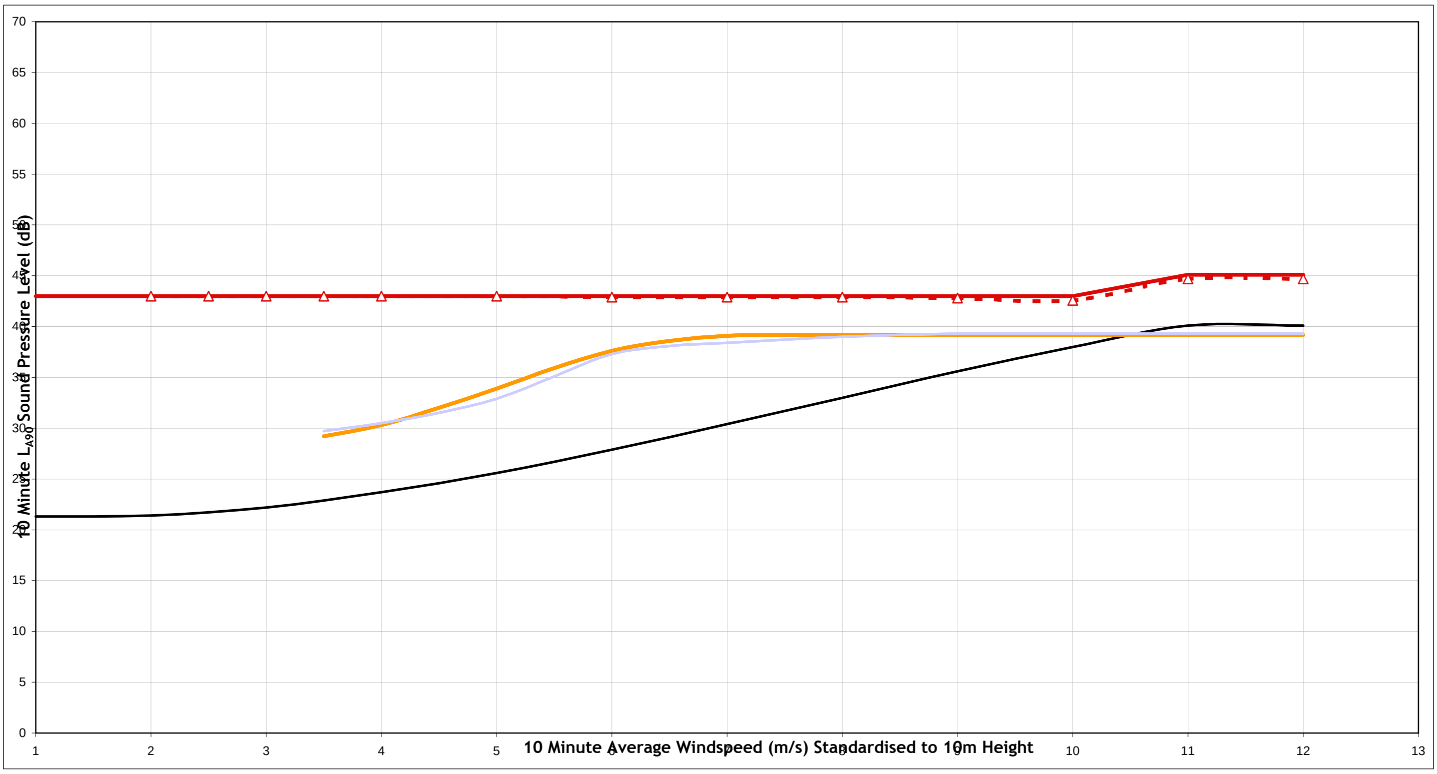
ETSU-R-97 QUIET DAYTIME - Easterlee (H3)



ETSU-R-97 NIGHT-TIME - Easterlee (H3)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Easterlee (H3)
Figure Number	A1.5c
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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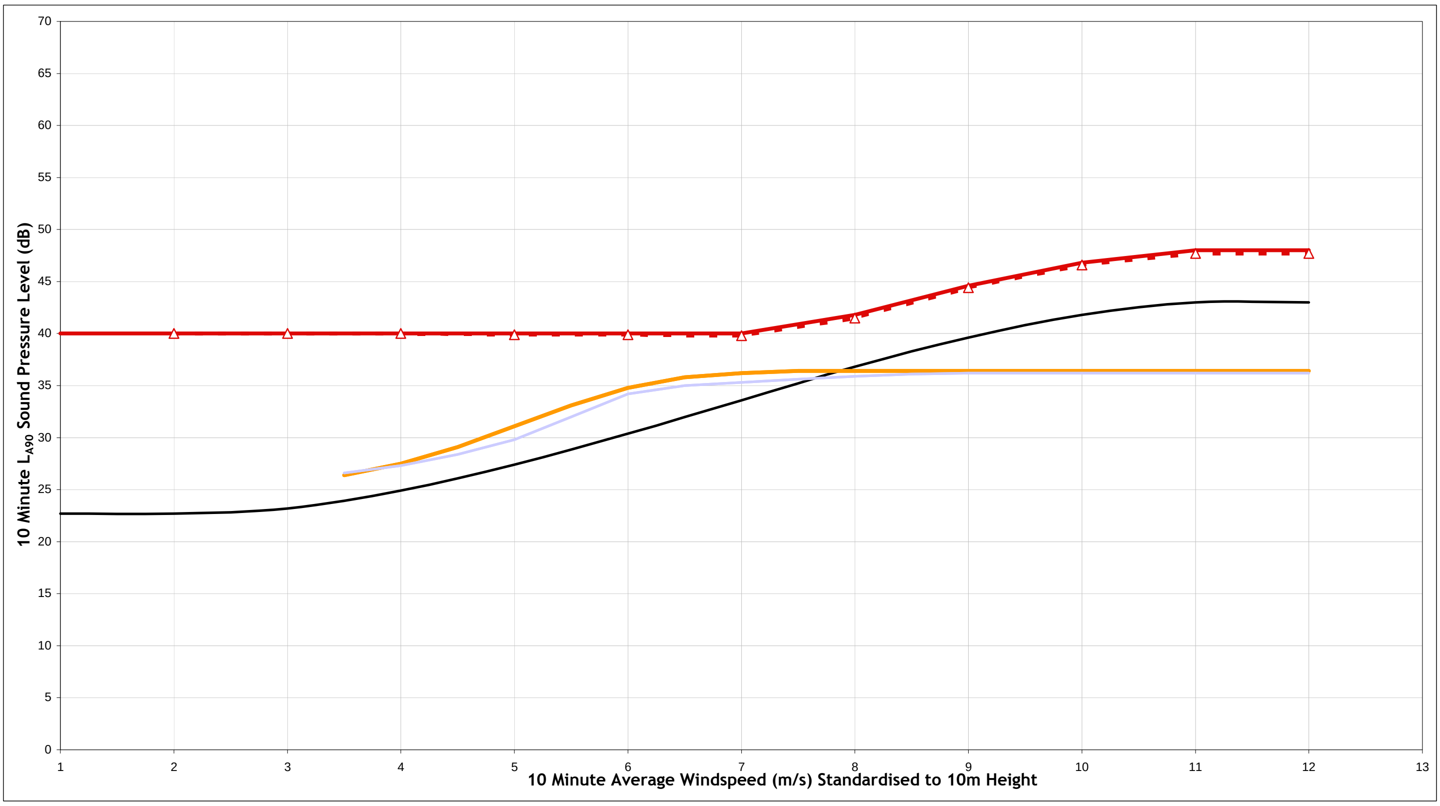
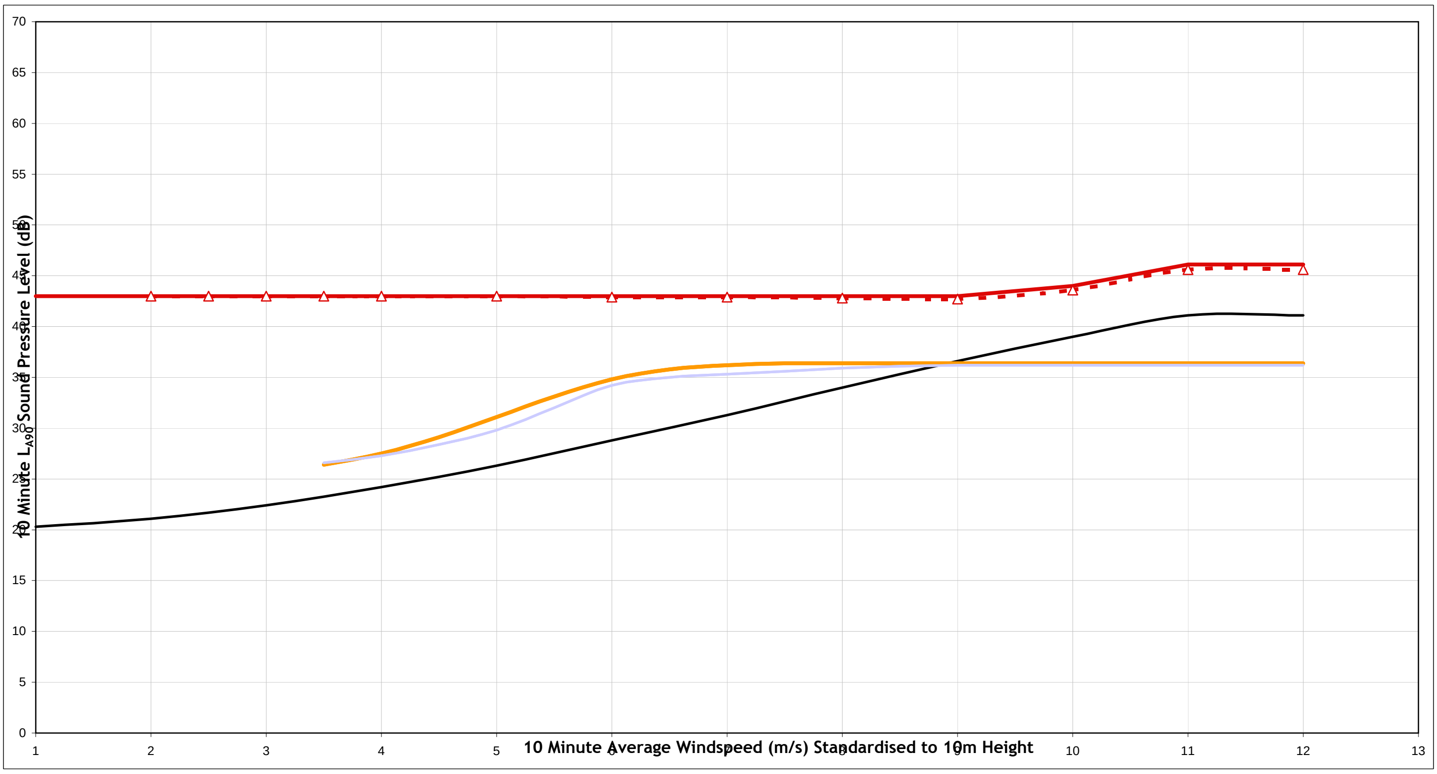
ETSU-R-97 QUIET DAYTIME - Gentletown (H4)



ETSU-R-97 NIGHT-TIME - Gentletown (H4)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Gentletown (H4)
Figure Number	A1.5d
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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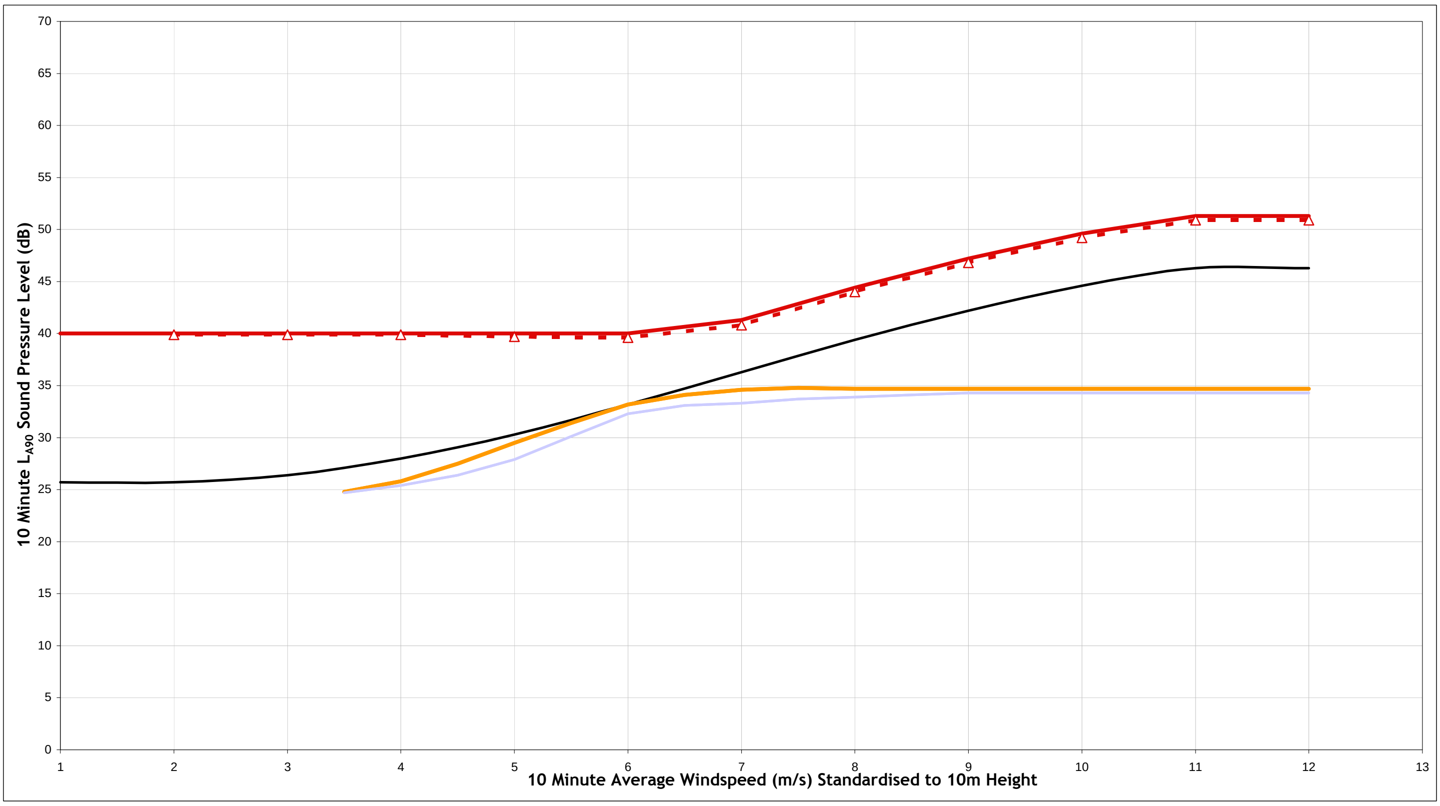
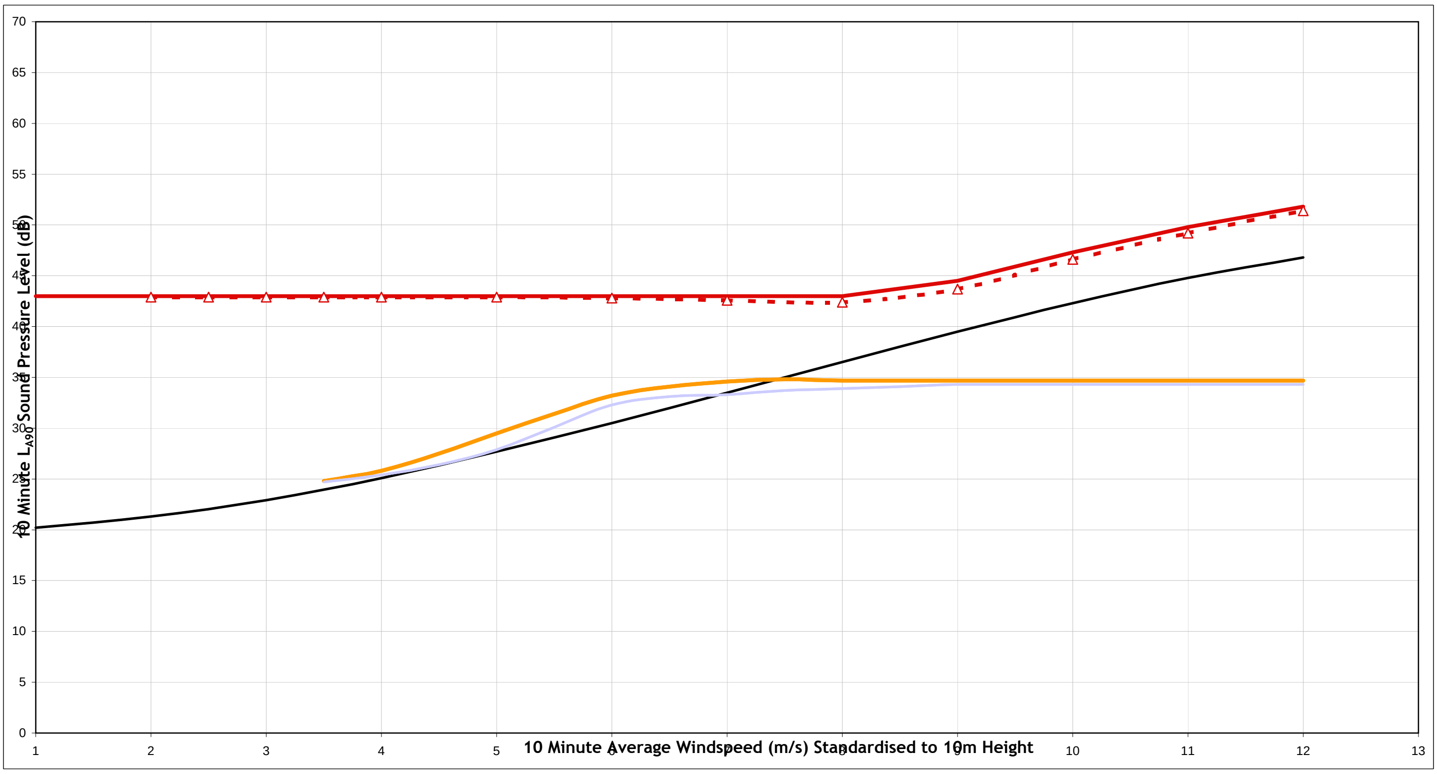
ETSU-R-97 QUIET DAYTIME - Littlester (H5)



ETSU-R-97 NIGHT-TIME - Littlester (H5)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Littlester (H5)
Figure Number	A1.5e
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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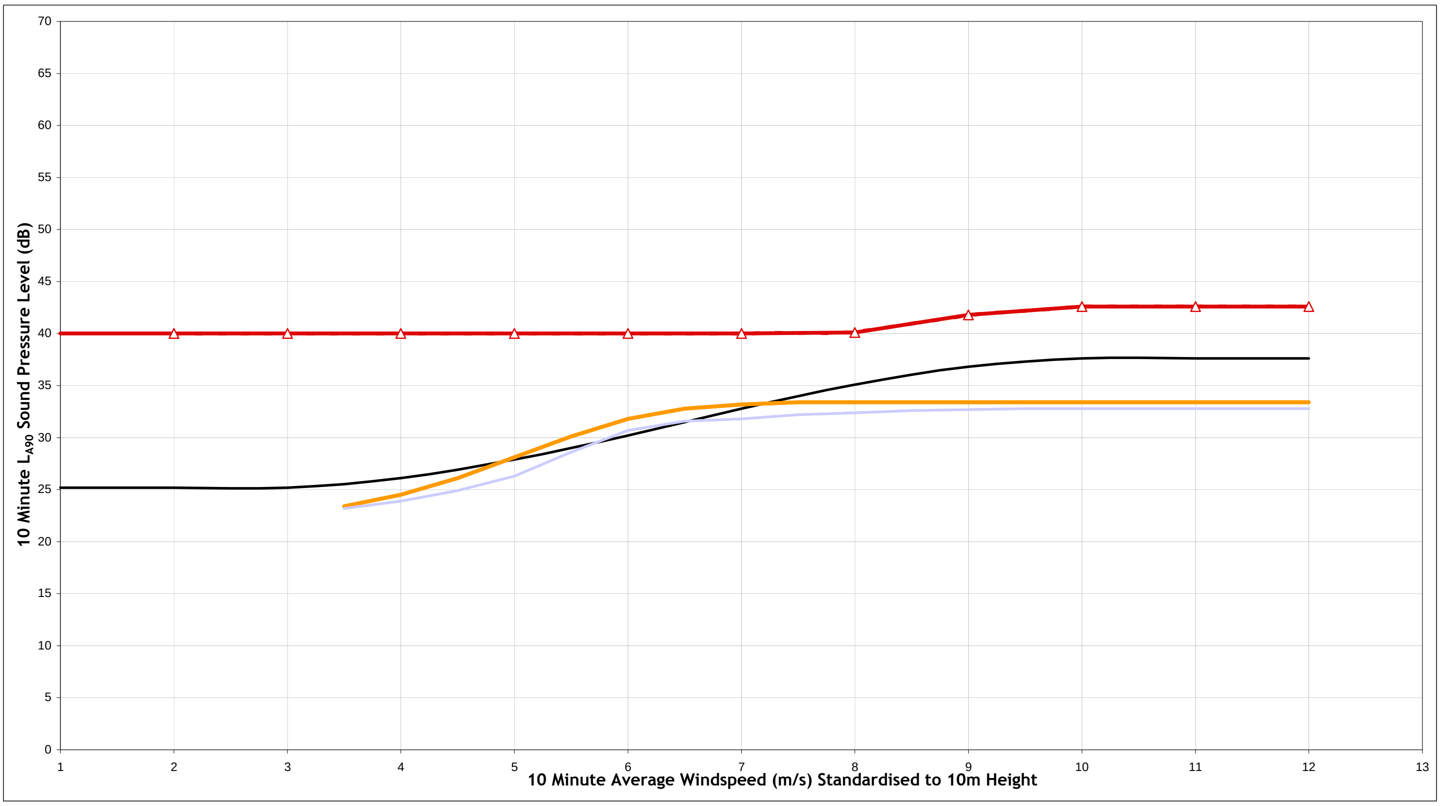
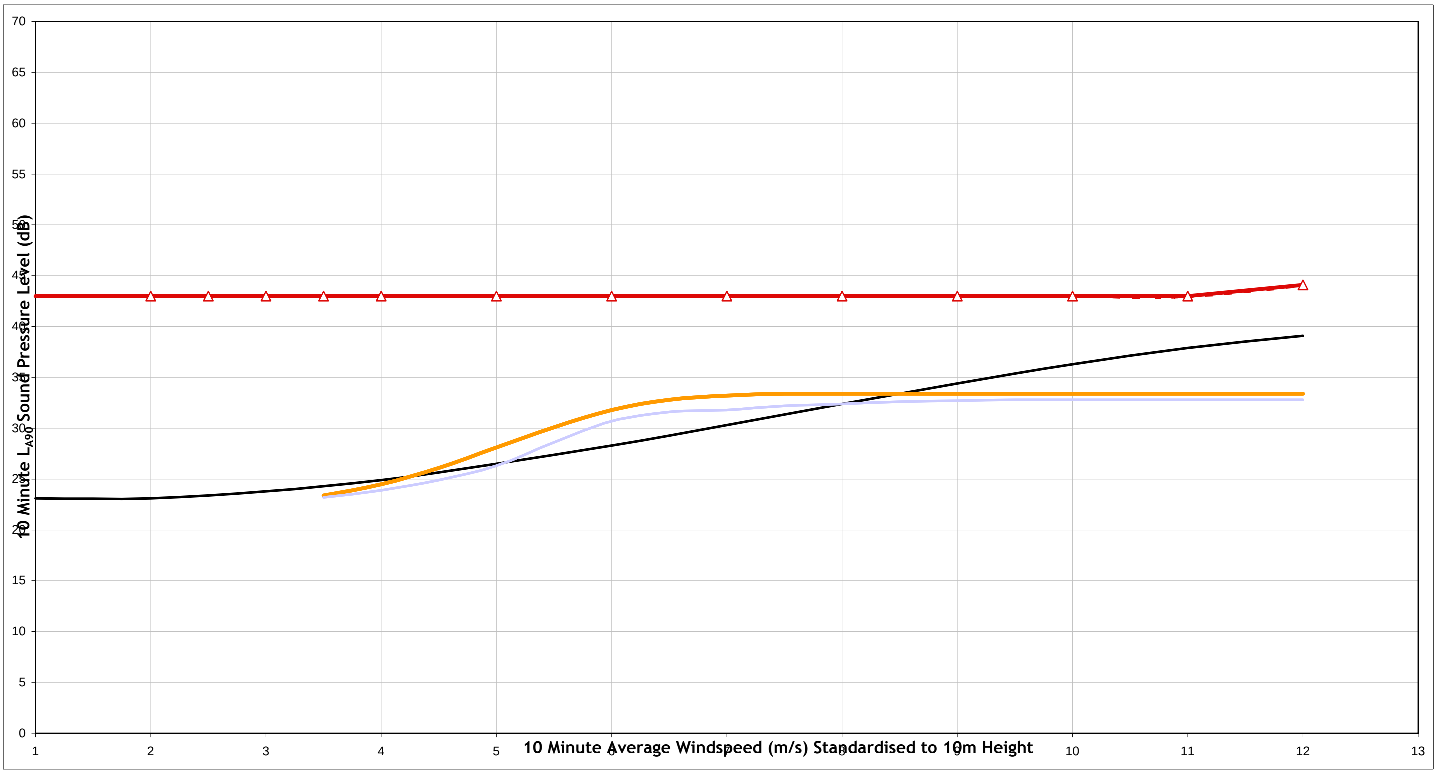
ETSU-R-97 QUIET DAYTIME - Hamnavoe (H6)



ETSU-R-97 NIGHT-TIME - Hamnavoe (H6)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Hamnavoe (H6)
Figure Number	A1.5f
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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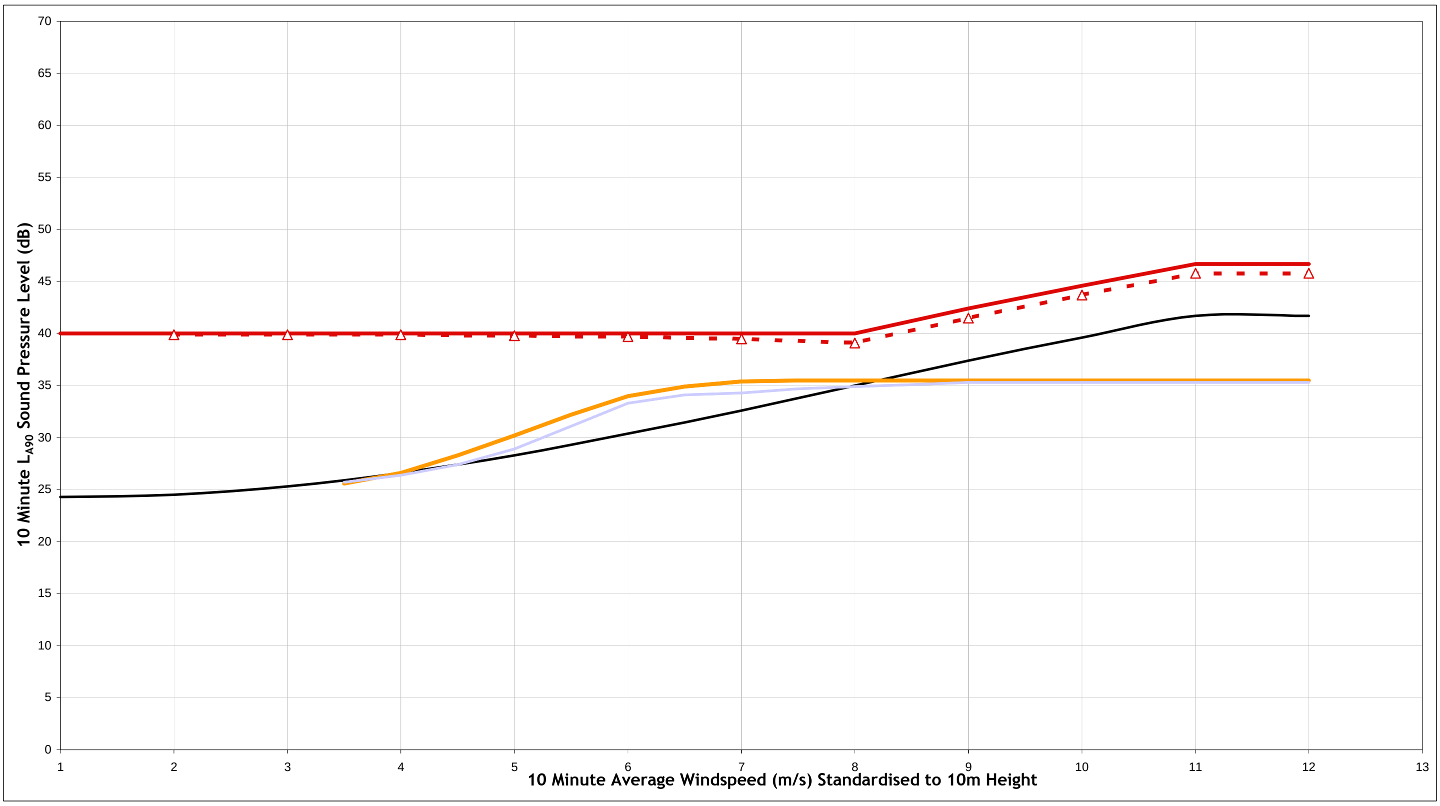
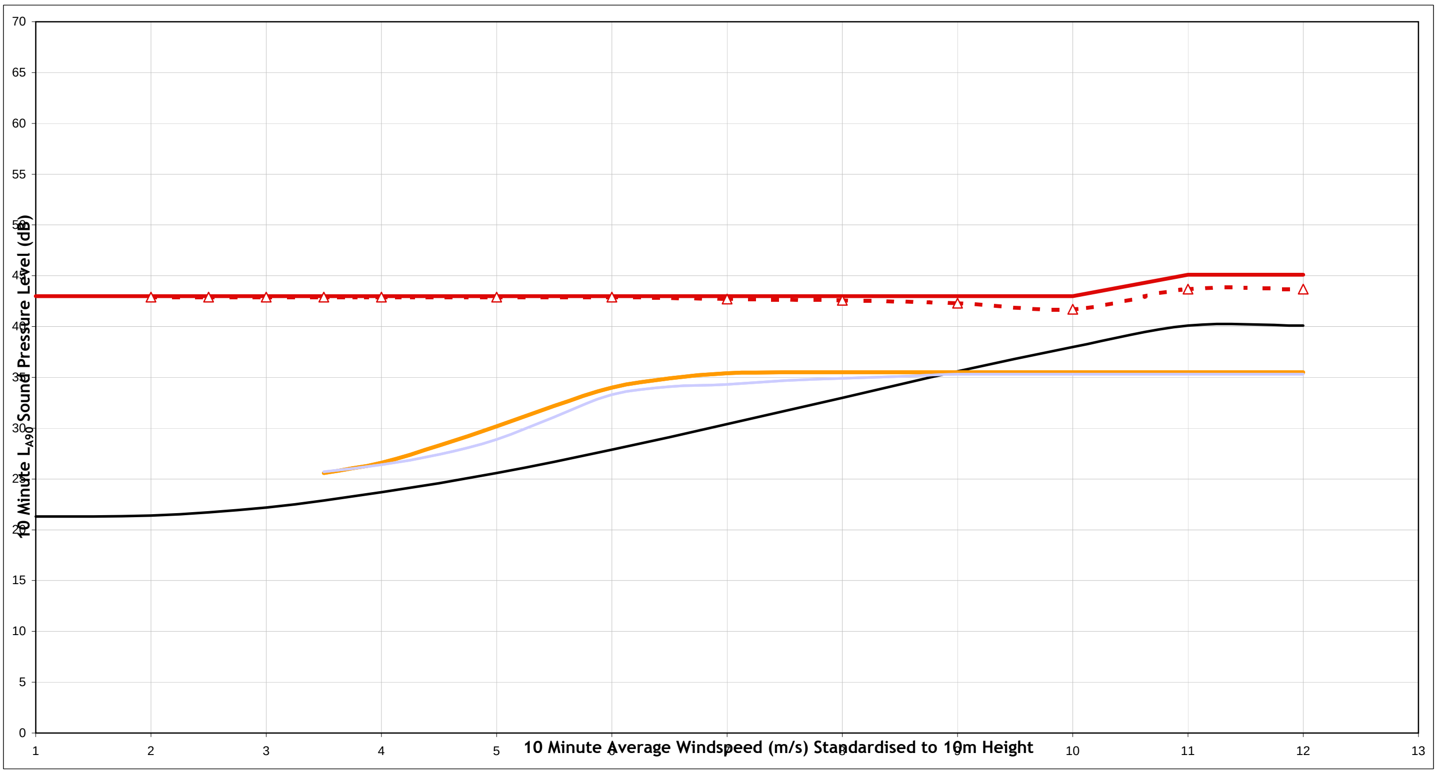
ETSU-R-97 QUIET DAYTIME - Helnaquhida (H7)



ETSU-R-97 NIGHT-TIME - Helnaquhida (H7)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Helnaquhida (H7)
Figure Number	A1.5g
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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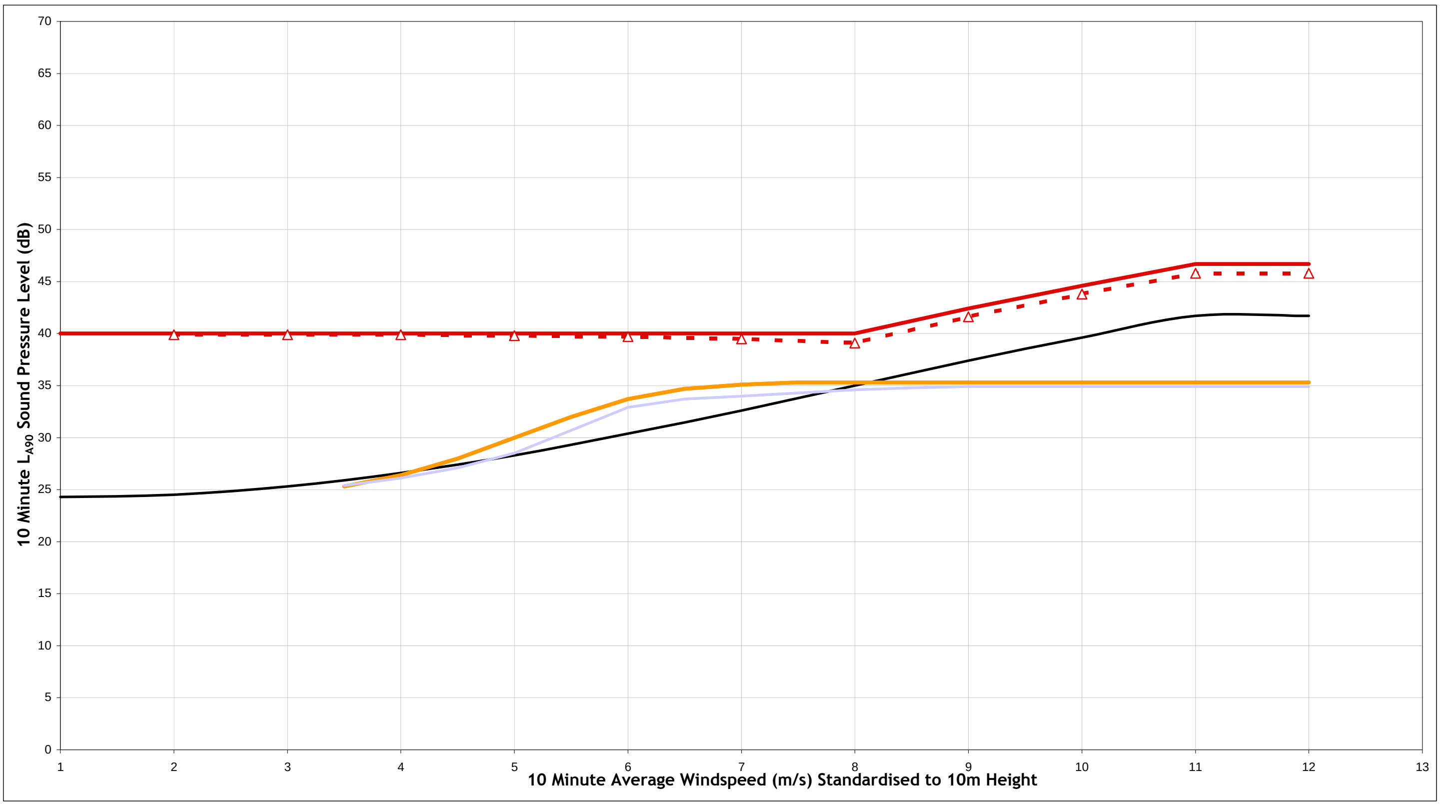
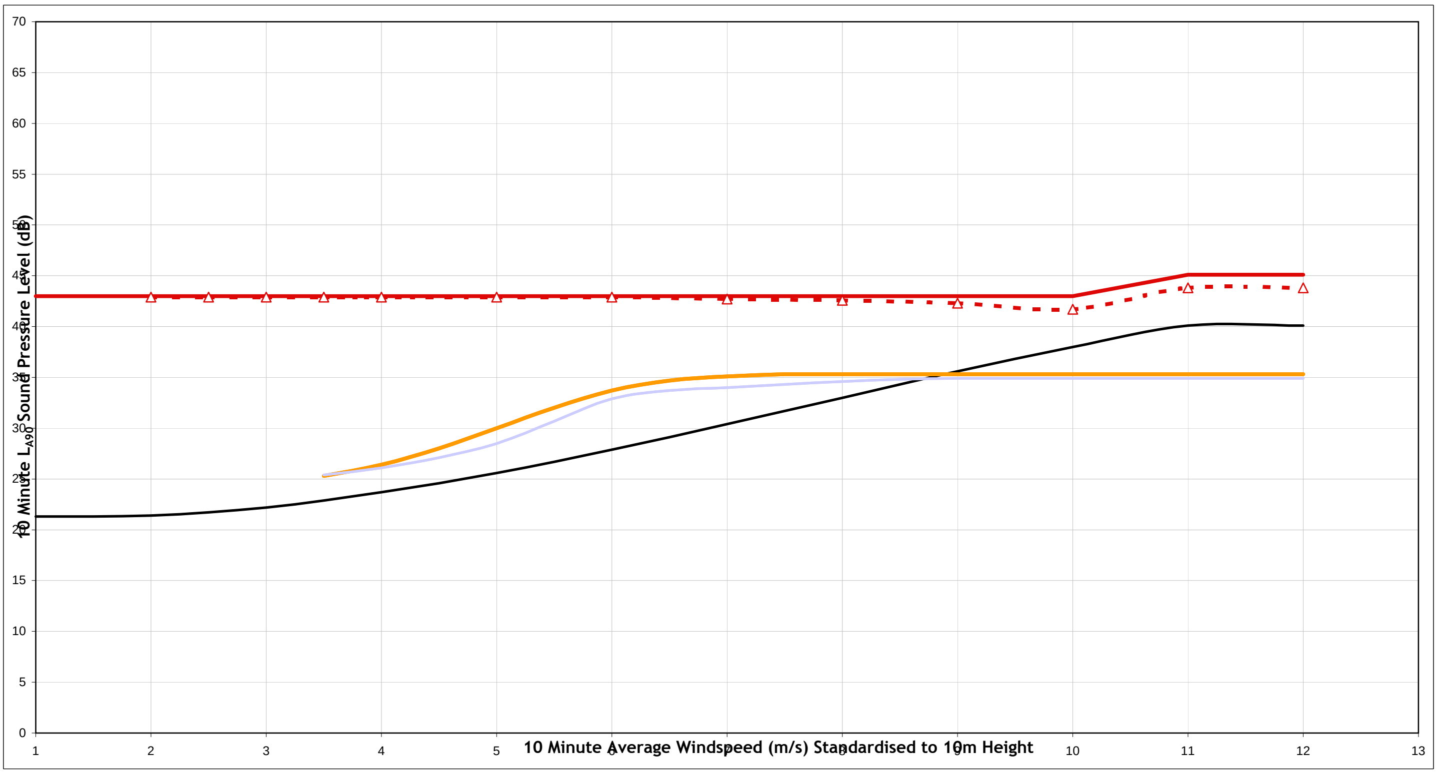
ETSU-R-97 QUIET DAYTIME - Kettlester (H8)



ETSU-R-97 NIGHT-TIME - Kettlester (H8)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Kettlester (H8)
Figure Number	A1.5h
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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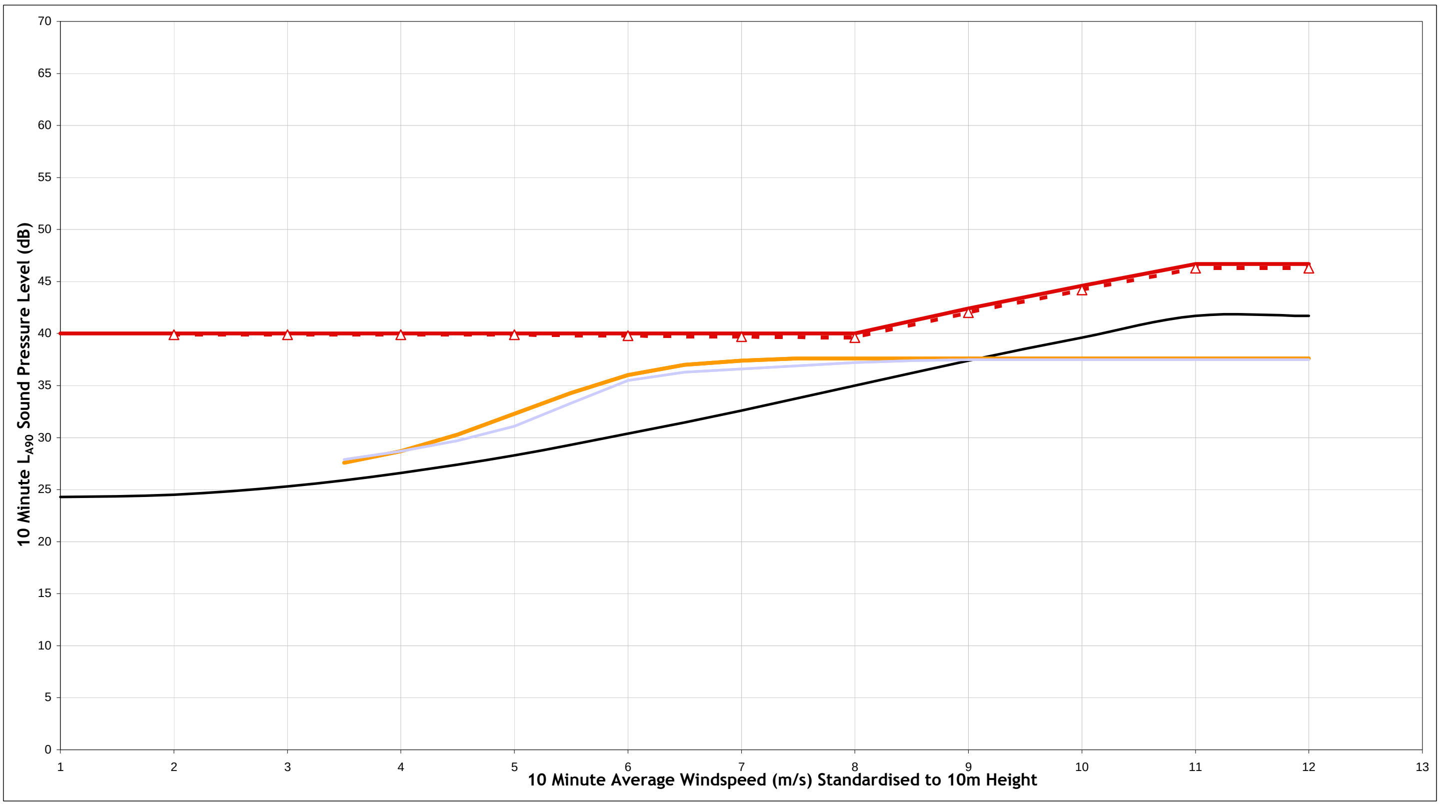
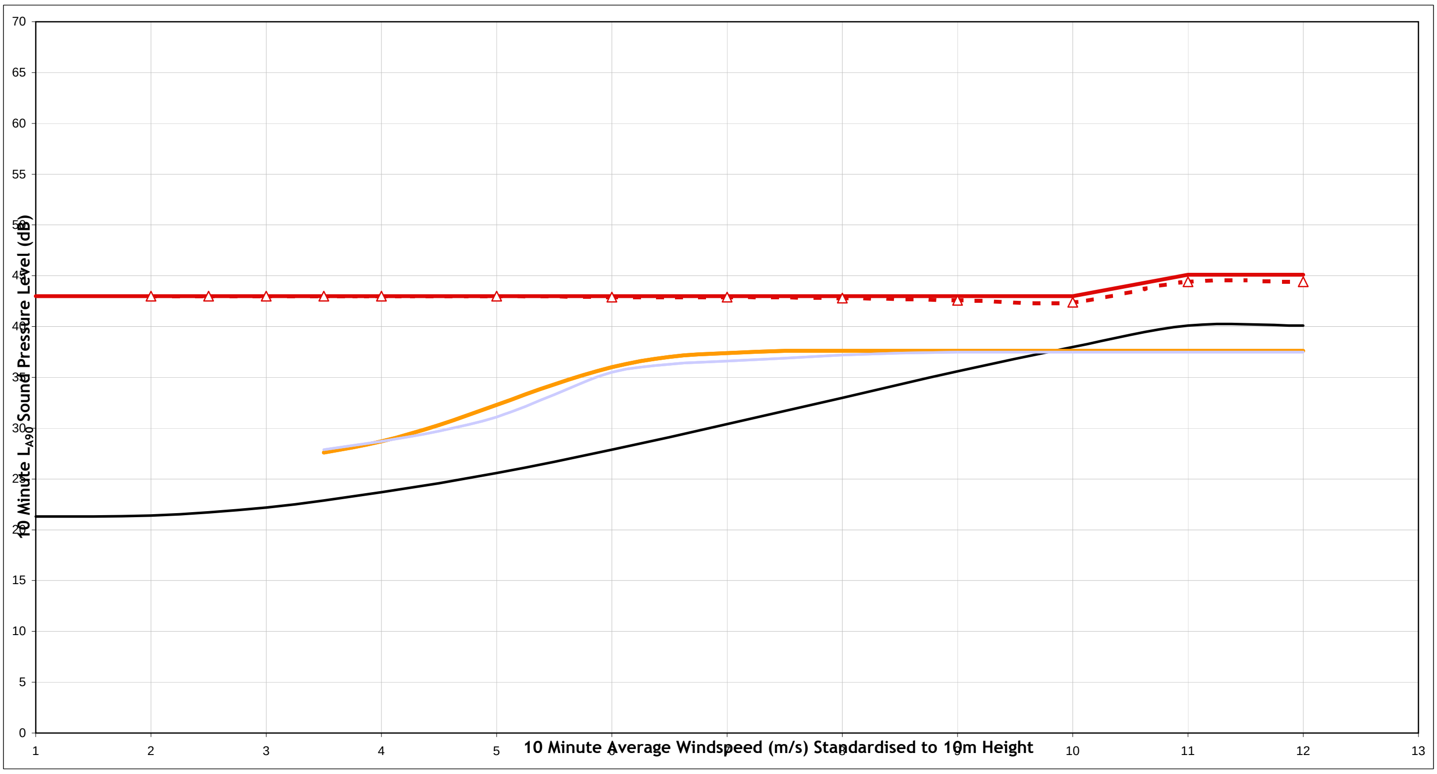
ETSU-R-97 QUIET DAYTIME - Islesview (H9)



ETSU-R-97 NIGHT-TIME - Islesview (H9)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Islesview (H9)
Figure Number	A1.5i
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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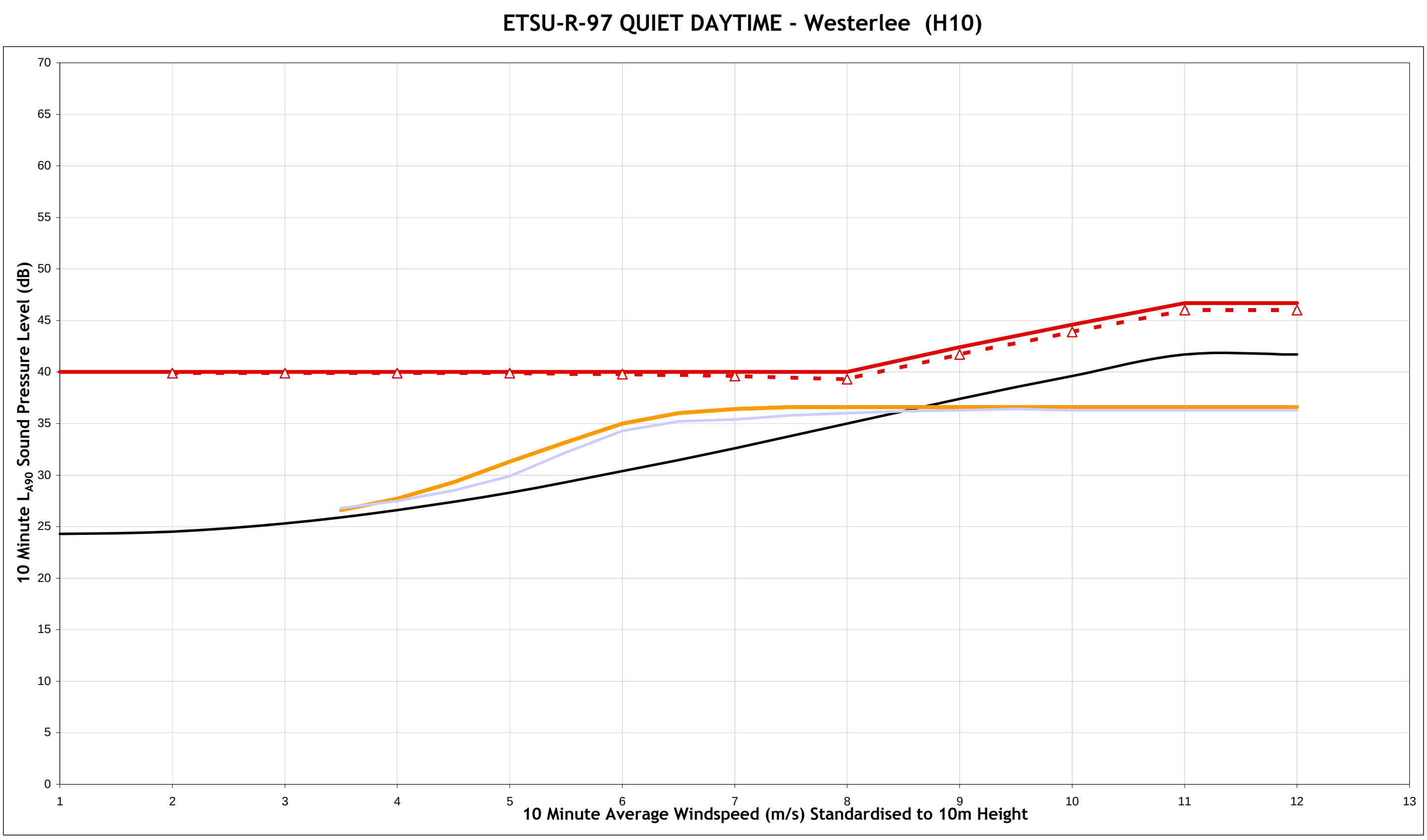

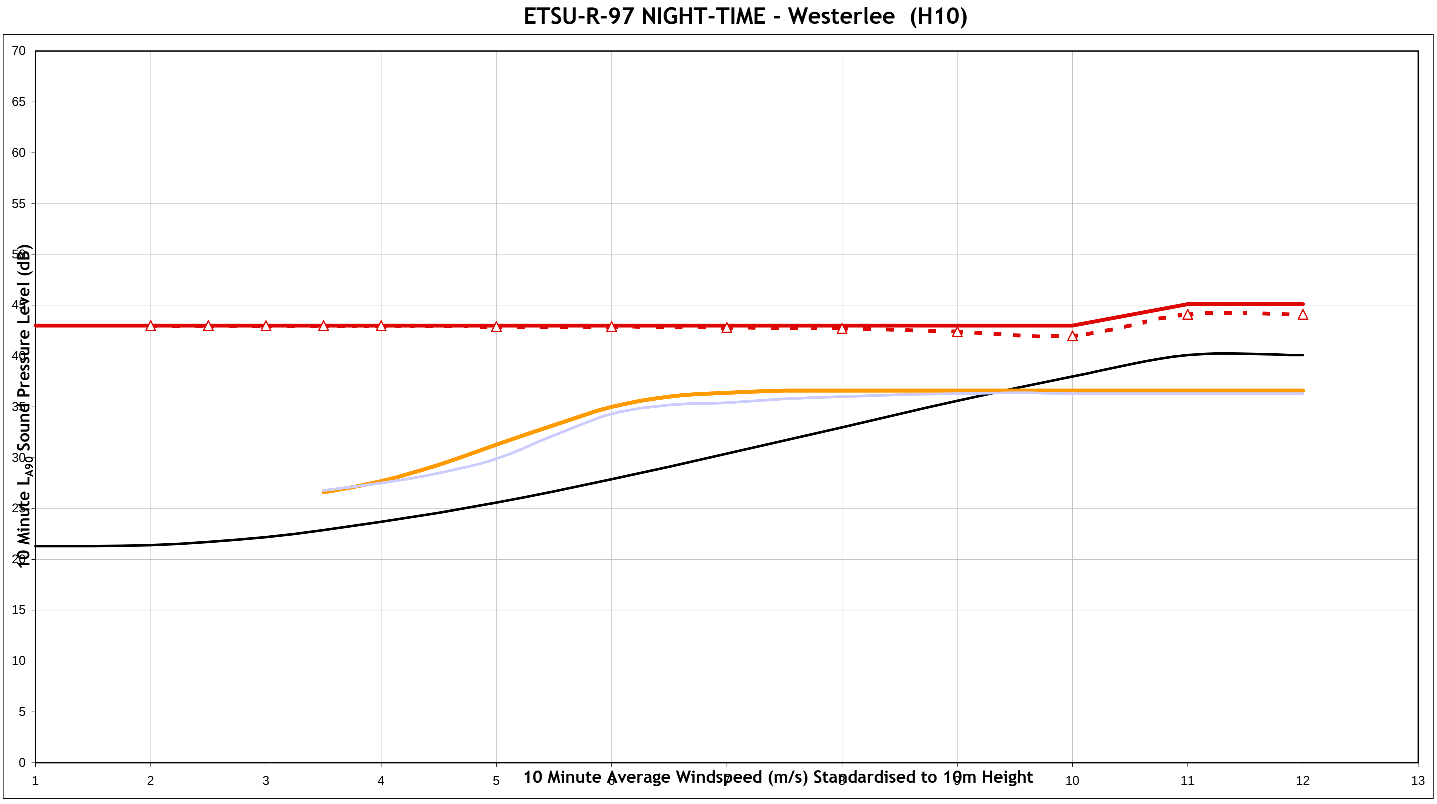

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Westerlee (H10)
Figure Number	A1.5j
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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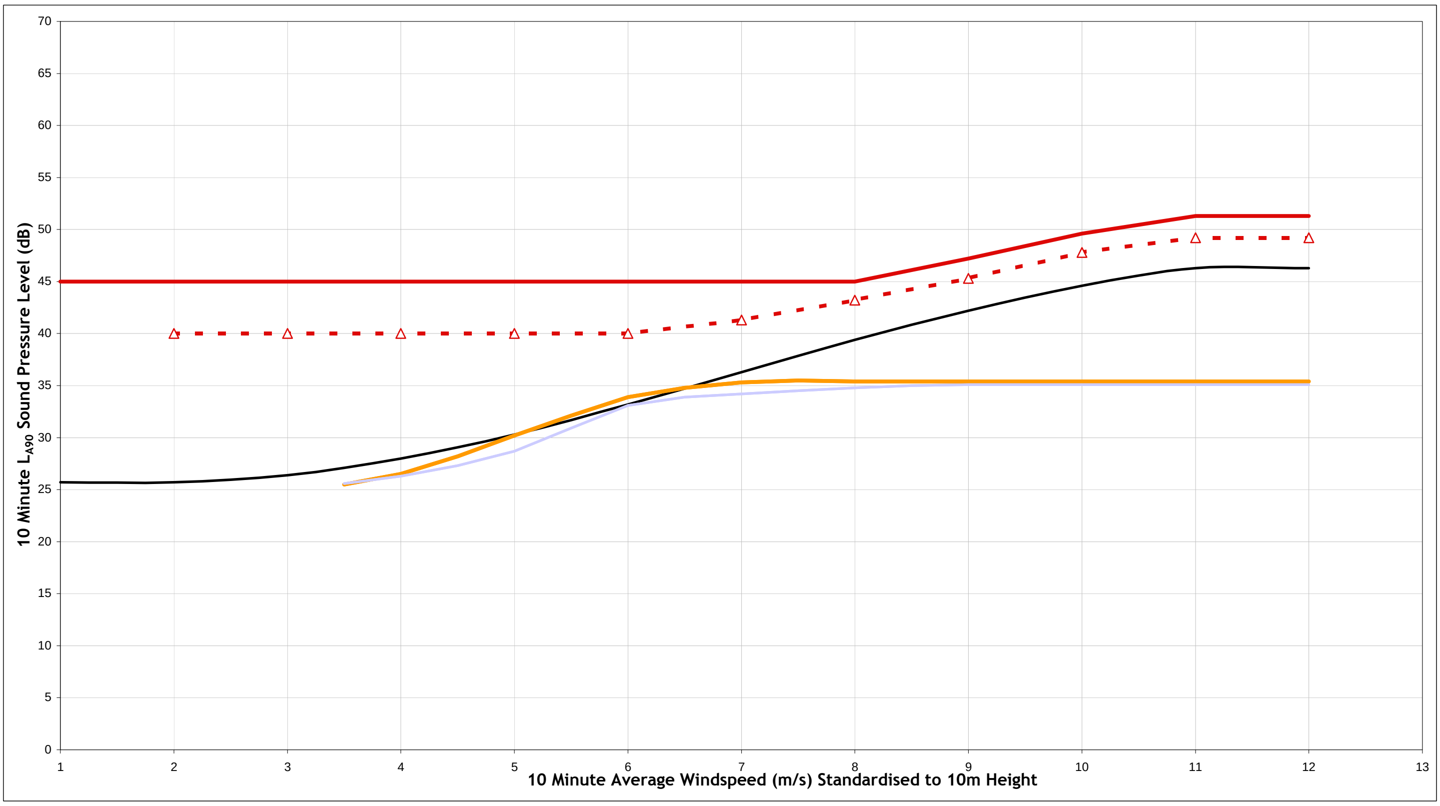
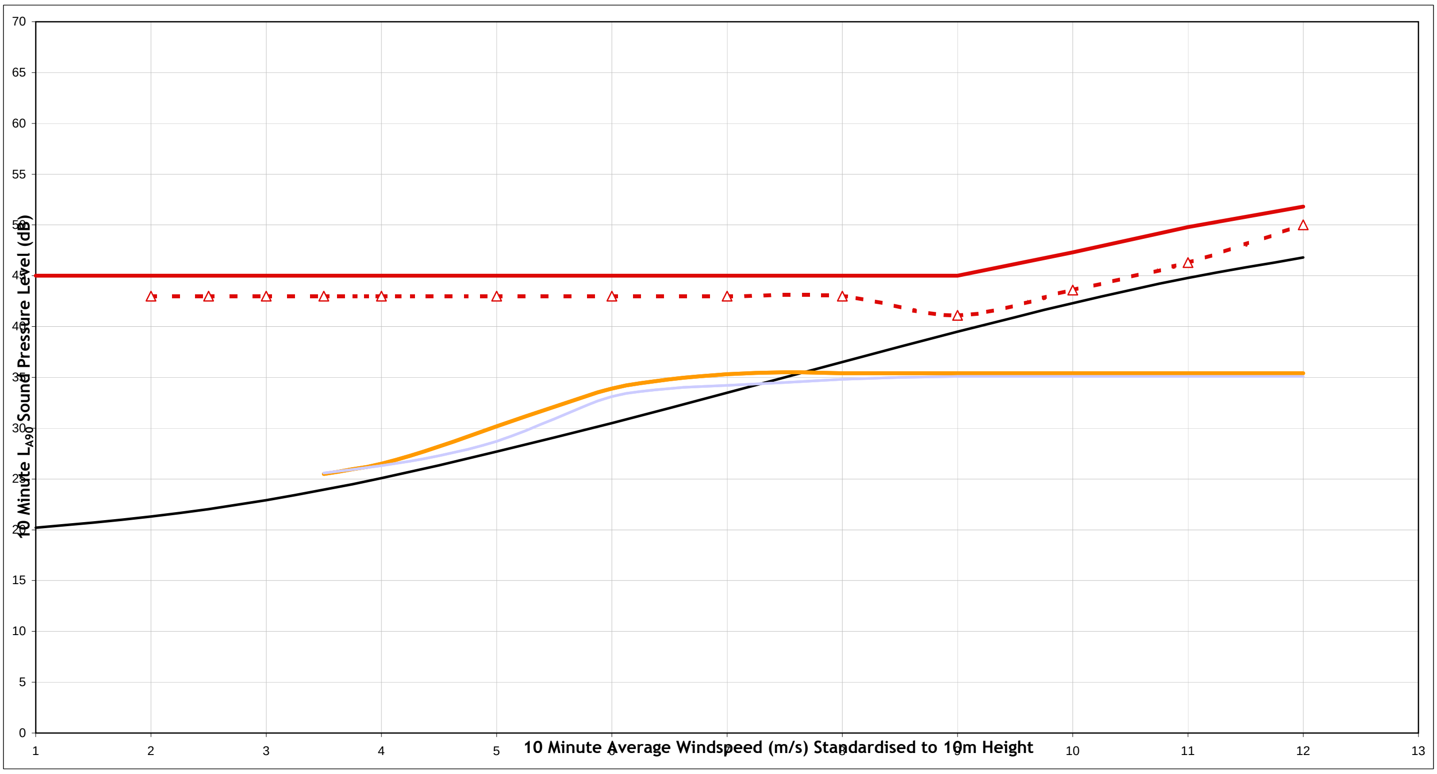
ETSU-R-97 QUIET DAYTIME - Kletterlea (H11)



ETSU-R-97 NIGHT-TIME - Kletterlea (H11)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Kletterlea (H11)
Figure Number	A1.5k
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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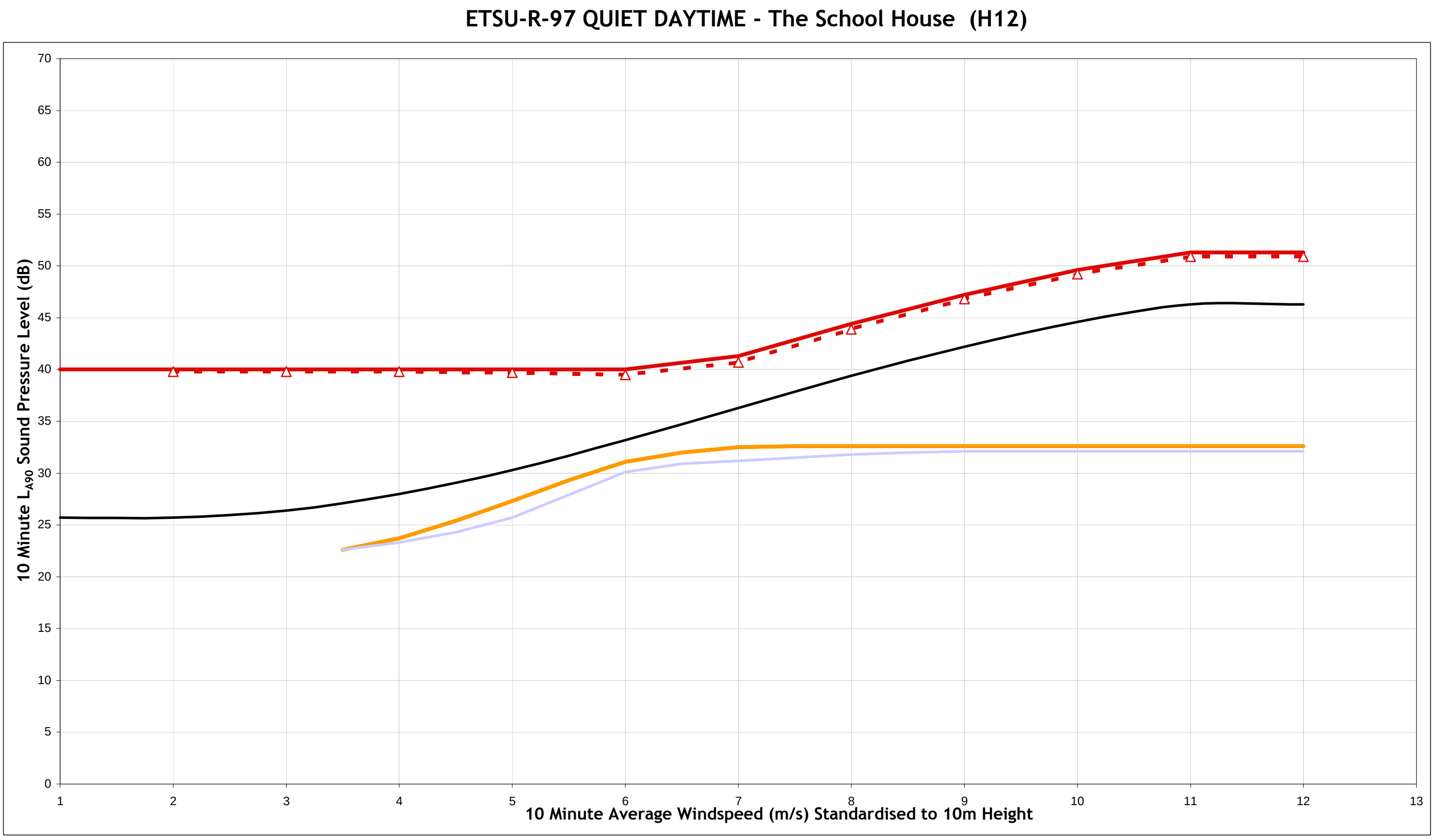

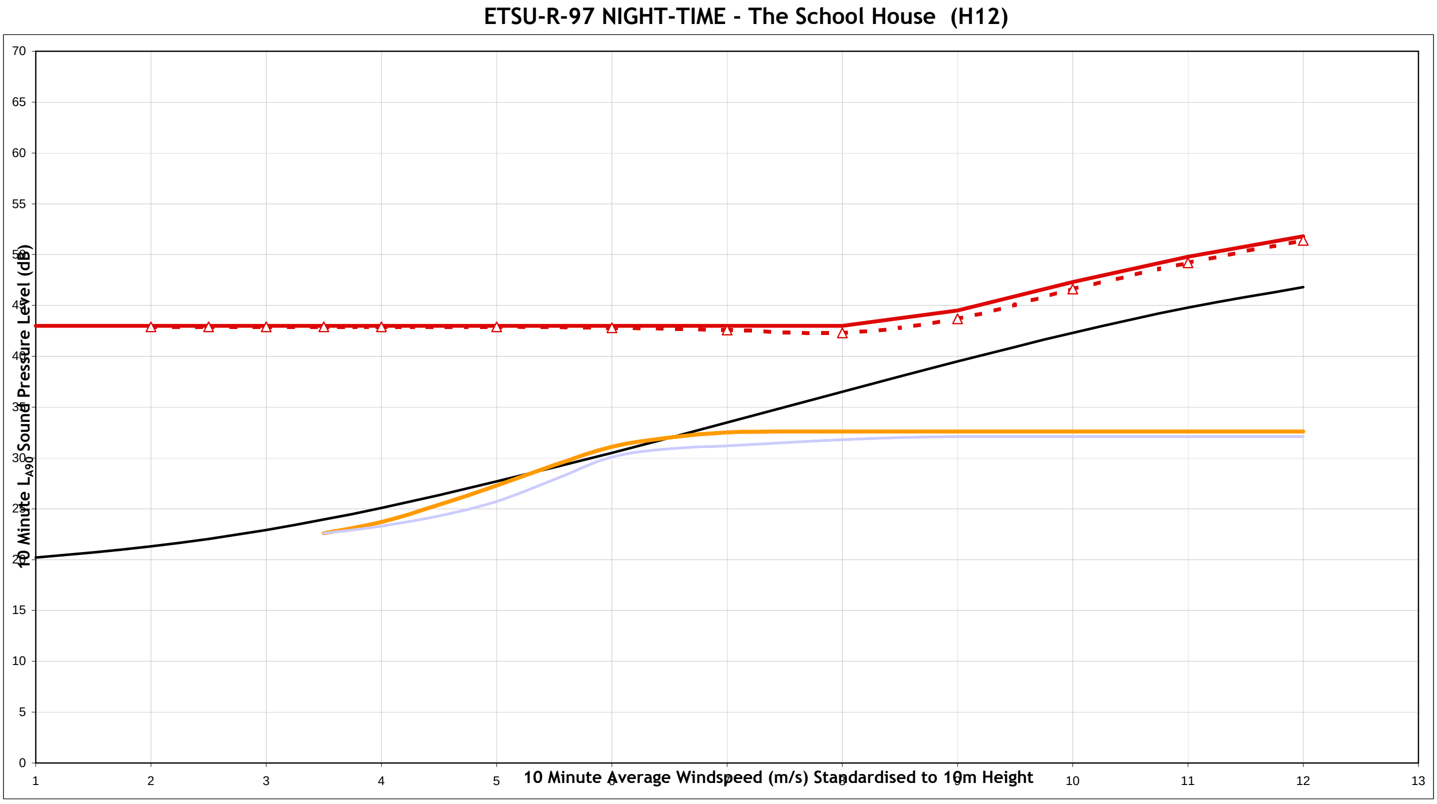

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits The School House (H12)
Figure Number	A1.5l
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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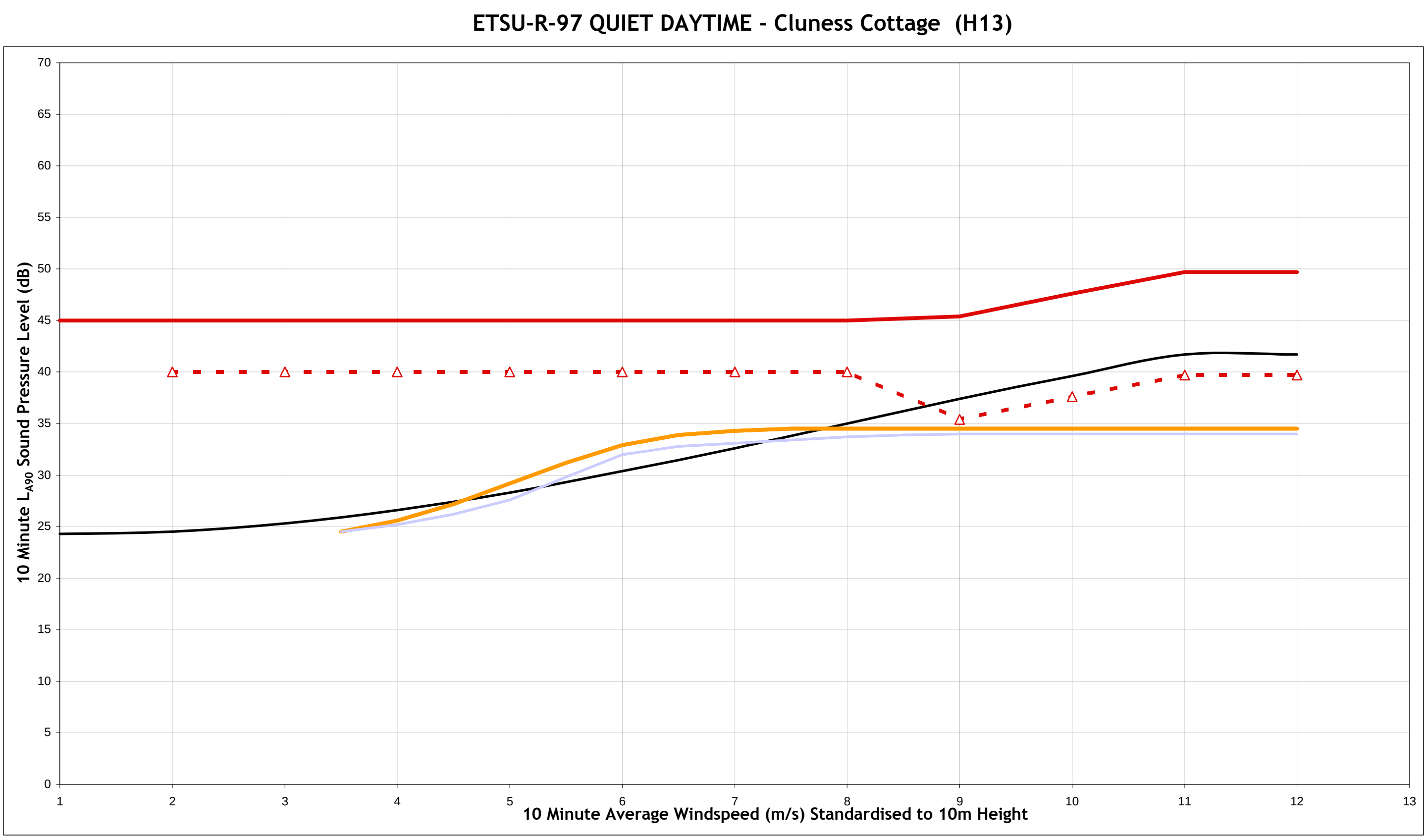

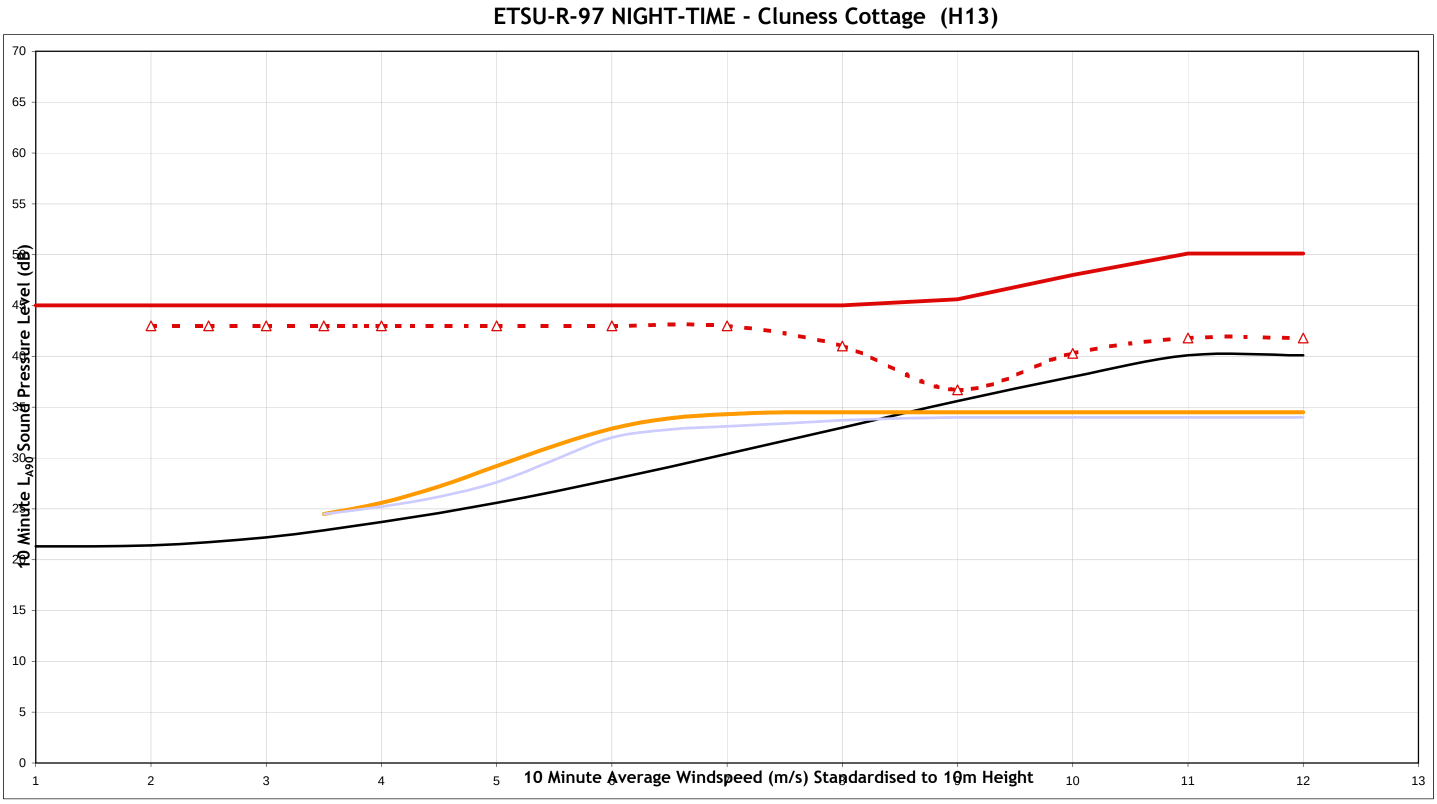

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Cluness Cottage (H13)
Figure Number	A1.5m
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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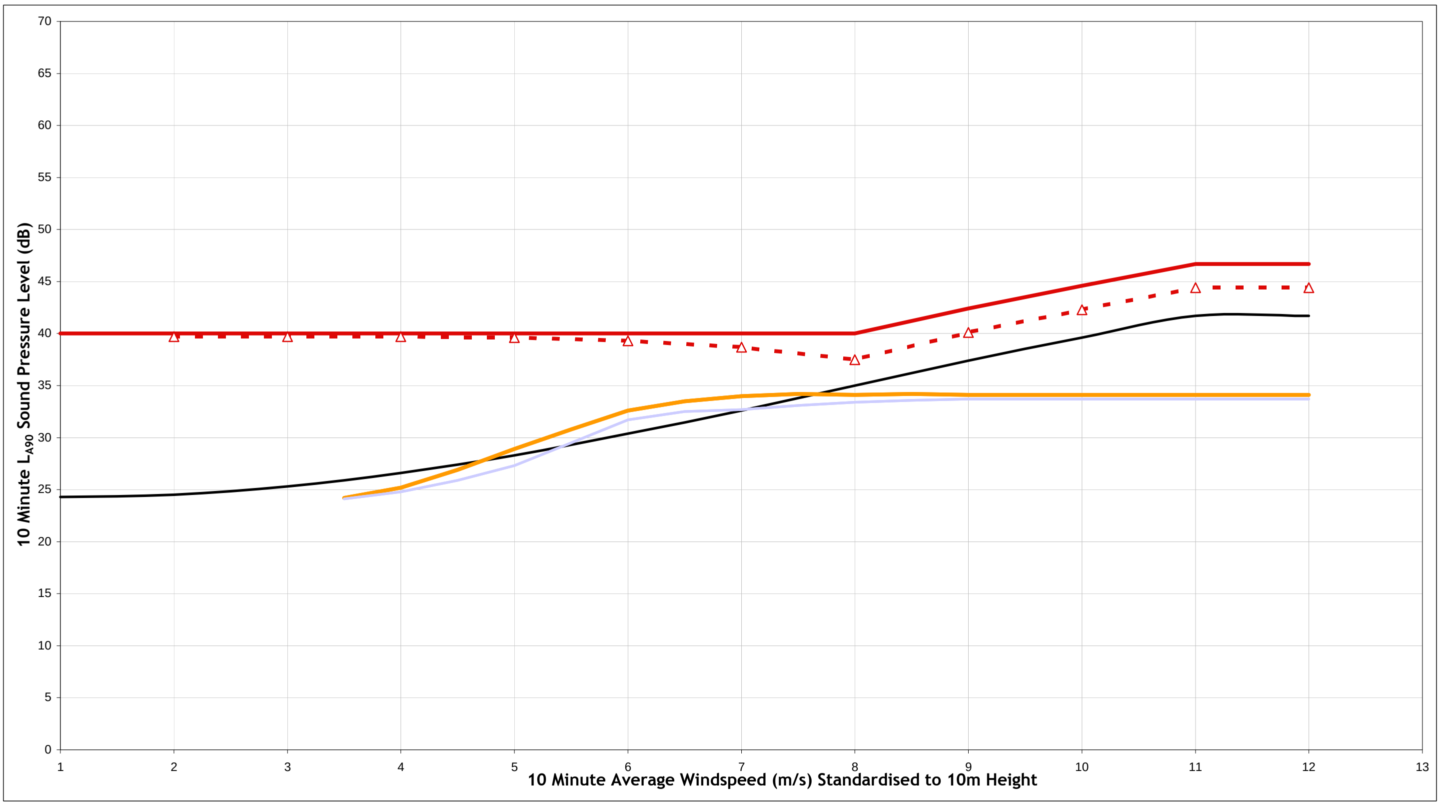
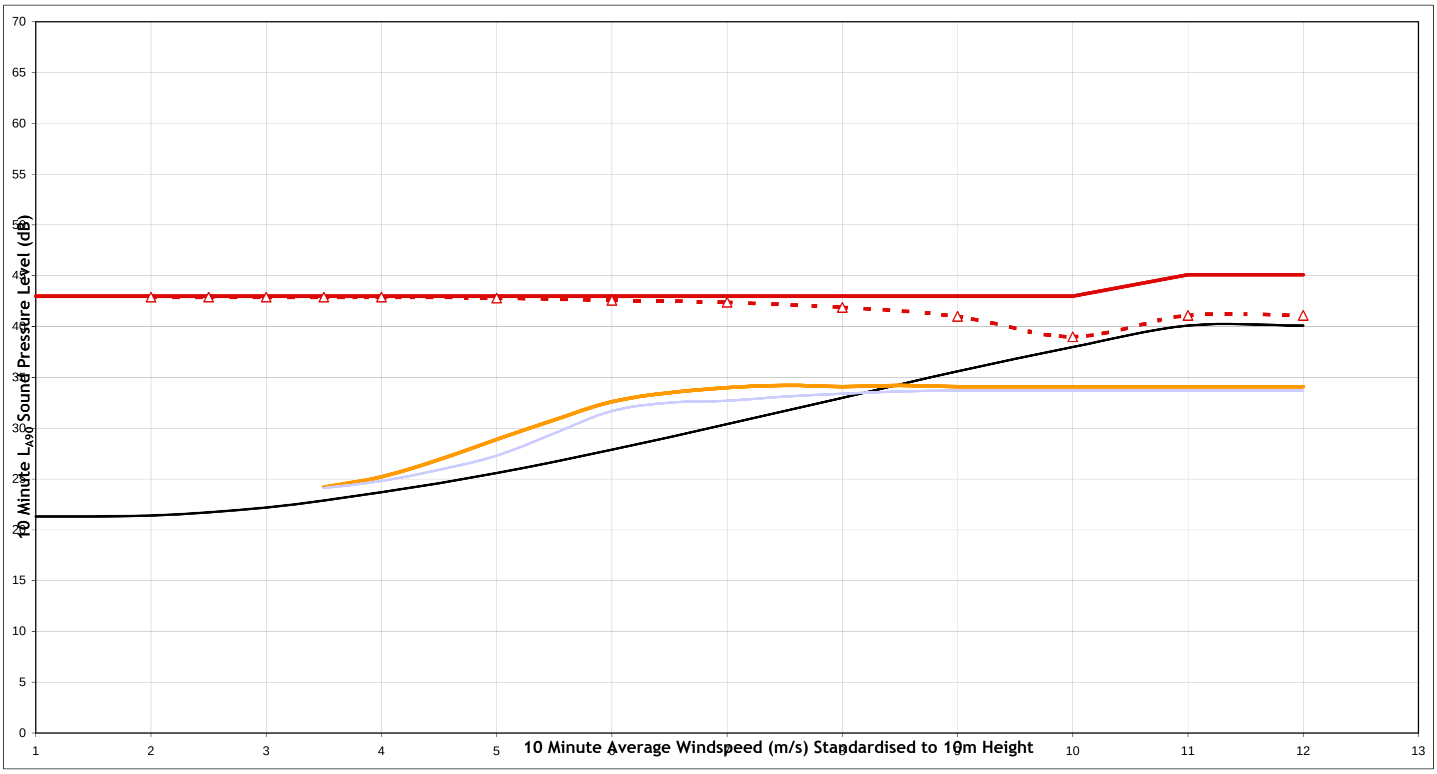
ETSU-R-97 QUIET DAYTIME - Staneygarth (H14)



ETSU-R-97 NIGHT-TIME - Staneygarth (H14)



Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Staneygarth (H14)
Figure Number	A1.5n
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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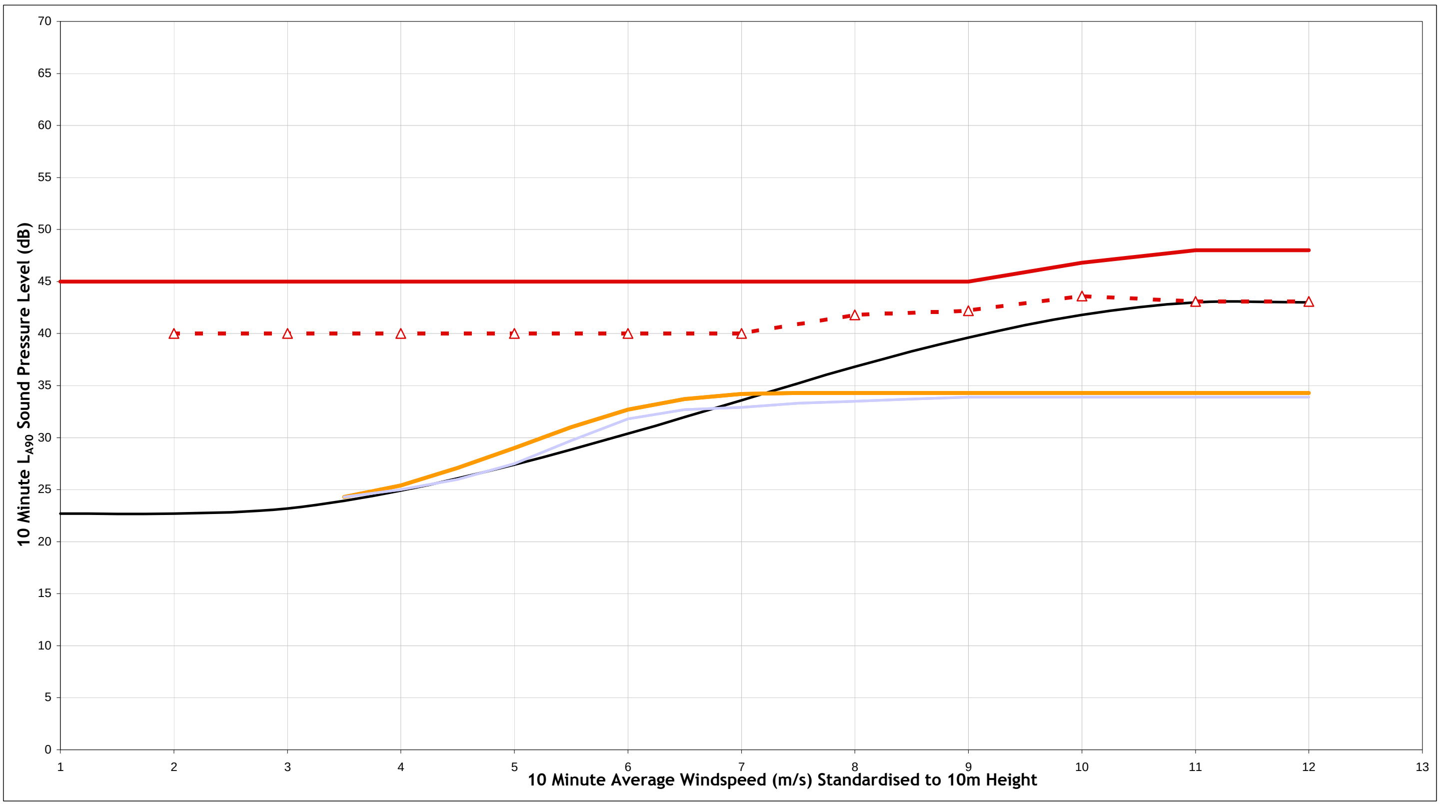

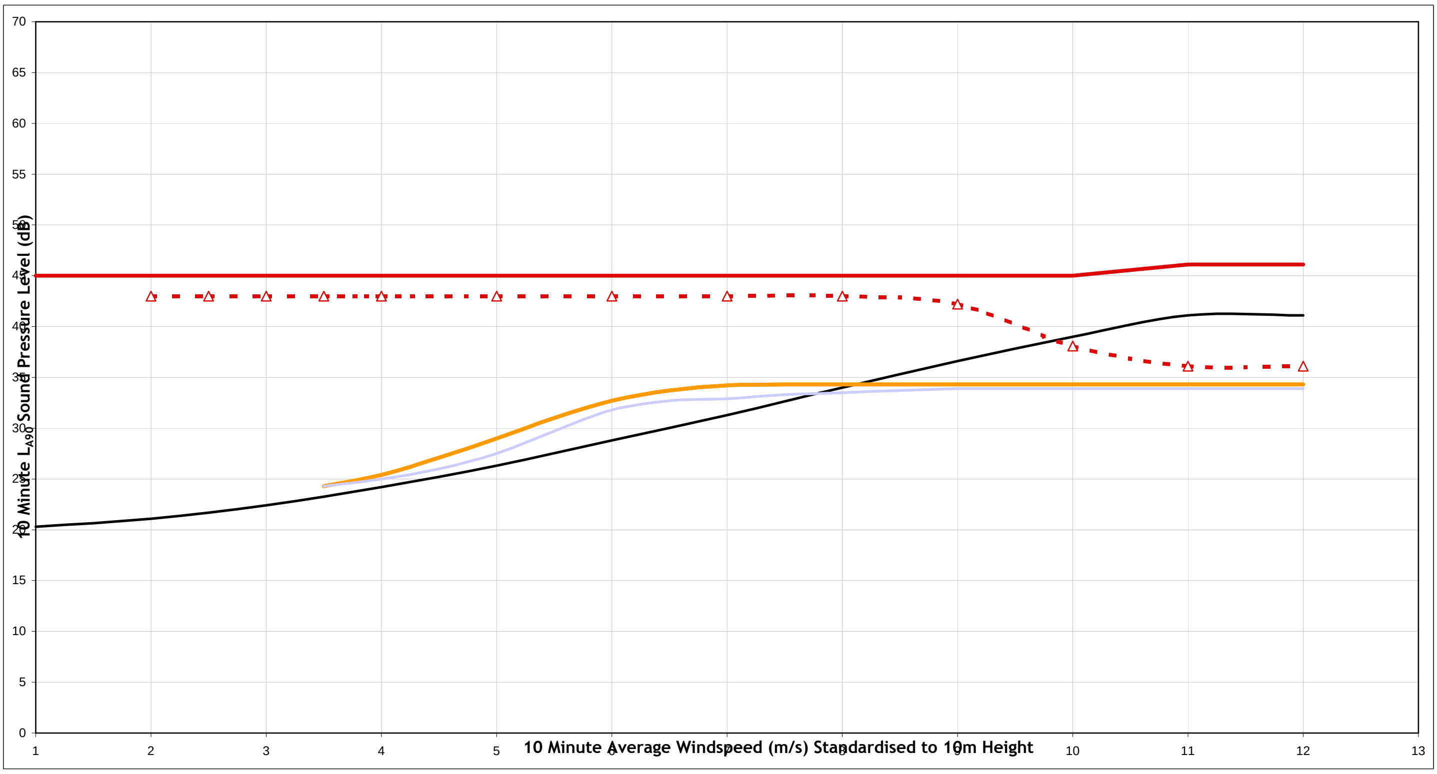

Legend:

- Background Noise Trend
- Total ETSU Noise Limits
- Beaw Field Site Specific Limit
- Beaw Field Only - Senvion 3.4M
- Beaw Field Only - Nordex N100

Project	Beaw Field Wind Farm
Client	Peel Wind Farms (Yell) Ltd
Title	Noise Assessment against Specific Limits Giggleswick (H15)
Figure Number	A1.5o
Scale	NTS
Drawn	JB
Checked	GC
Date	18/05/2016
Document Reference	10081-007

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Appendix 5.2

Alternative Noise Limits (Clueness Turbine Removed)

Annex 2 - Alternative Suggested Noise Limits if the small Turbine at Clueness Cottage is removed prior to the operation of the Proposed Development

Table 1 - Between 07:00 and 23:00 - Noise level dB $L_{A90,\ 10\text{-minute}}$

Location (easting, northing grid coordinates)	Standardised wind speed at 10 metres height (m/s) within the site averaged over 10-minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
	L_{A90} Decibel Levels											
Lower Hollingarth (452188, 1183917)	40	40	40	40	40	40	40	40	42	43	43	43
Whirliegarth (452739, 1183016)	40	40	40	40	40	40	40	40	40	43	43	43
Easterlee (451773, 1180569)	40	40	40	40	40	40	40	40	42	44	46	46
Gentletown (452415, 1180263)	40	40	40	40	40	40	40	42	44	47	48	48
Littlester (451022, 1180133)	40	40	40	40	40	40	41	44	47	49	51	51
Hamnavoe (449726, 1180866)	40	40	40	40	40	40	40	40	42	43	43	43
Helnaquhida (452013, 1180138)	40	40	40	40	40	40	40	40	42	44	46	46
Kettlester (451861, 1180049)	40	40	40	40	40	40	40	40	42	44	46	46
Islesview (451819, 1180372)	40	40	40	40	40	40	40	40	42	44	46	46
Westerlee (451775, 1180241)	40	40	40	40	40	40	40	39	42	44	46	46
Kletterlea (451404, 1180170)	40	40	40	40	40	40	41	43	45	48	49	49
The School House (451203, 1179999)	40	40	40	40	40	40	41	44	47	49	51	51
Cluness Cottage (451955, 1179932)	40	40	40	40	40	40	40	40	42	44	46	46
Staneygarth (451936, 1179890)	40	40	40	40	40	40	40	40	42	44	46	46
Giggleswick (452261, 1179938)	40	40	40	40	40	40	40	42	43	44	44	44

Table 2 - Between 23:00 and 07:00 - Noise level dB $L_{A90, 10\text{-minute}}$

Location (easting, northing grid coordinates)	Standardised wind speed at 10 metres height (m/s) within the site averaged over 10-minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
	L_{A90} Decibel Levels											
Lower Hollingarth (452188, 1183917)	43	43	43	43	43	43	43	43	43	43	43	44
Whirliegarth (452739, 1183016)	43	43	43	43	43	43	43	43	43	43	44	44
Easterlee (451773, 1180569)	43	43	43	43	43	43	43	43	43	43	45	45
Gentletown (452415, 1180263)	43	43	43	43	43	43	43	43	43	44	46	46
Littlester (451022, 1180133)	43	43	43	43	43	43	43	42	44	47	49	51
Hamnavoe (449726, 1180866)	43	43	43	43	43	43	43	43	43	43	43	44
Helnaquhida (452013, 1180138)	43	43	43	43	43	43	43	43	43	42	44	44
Kettlester (451861, 1180049)	43	43	43	43	43	43	43	43	43	43	45	45
Islesview (451819, 1180372)	43	43	43	43	43	43	43	43	43	43	45	45
Westerlee (451775, 1180241)	43	43	43	43	43	43	43	43	43	42	44	44
Kletterlea (451404, 1180170)	43	43	43	43	43	43	43	43	44	44	46	50
The School House (451203, 1179999)	43	43	43	43	43	43	43	42	44	47	49	51
Cluness Cottage (451955, 1179932)	43	43	43	43	43	43	43	43	43	42	45	45
Staneygarth (451936, 1179890)	43	43	43	43	43	43	43	43	43	43	45	45
Giggleswick (452261, 1179938)	43	43	43	43	43	43	43	43	43	40	37	37

Appendix 5.3

Suggested Noise Conditions

SUGGESTED NOISE CONDITIONS AS INCLUDED WITHIN APPENDIX 22.1 OF THE ES

Noise

30 The rating level of noise immissions from the combined effects of the wind turbines hereby permitted (including the application of any tonal penalty), when determined in accordance with the attached Guidance Notes, shall not exceed the values for the relevant integer wind speed set out in or derived from Tables 1 and 2 attached to these conditions and:

A) Prior to the Commissioning of the Development, the wind farm operator shall submit to the Local Authority for written approval a list of proposed independent consultants who may undertake compliance measurements in accordance with this condition. Amendments to the list of approved consultants shall be made only with the prior written approval of the Local Planning Authority.

B) Within 21 days from receipt of a written request of the Local Planning Authority, following a complaint to it alleging noise disturbance at a dwelling, the wind farm operator shall, at its expense, employ an independent consultant approved by the Local Planning Authority to assess the level of noise immissions from the wind farm at the complainant's property (or a suitable alternative location agreed in writing with the Local Planning Authority) in accordance with the procedures described in the attached Guidance Notes. The written request from the Local Planning Authority shall set out at least the date, time and location that the complaint relates to. Within 14 days of receipt of the written request of the Local Planning Authority made under this paragraph (B), the wind farm operator shall provide the information relevant to the complaint logged in accordance with paragraph (H) to the Local Planning Authority in the format set out in Guidance Note 1(e).

C) Where there is more than one property at a location specified in Tables 1 and 2 attached to this condition, the noise limits set for that location shall apply to all dwellings at that location. Where a dwelling to which a complaint is related is not identified by name or location in the Tables attached to these conditions, the wind farm operator shall submit to the Local Planning Authority for written approval proposed noise limits selected from those listed in the Tables to be adopted at the complainant's dwelling for compliance checking purposes. The proposed noise limits are to be those limits selected from the Tables specified for a listed location which the independent consultant considers as being likely to experience the most similar background noise environment to that experienced at the complainant's dwelling. The submission of the proposed noise limits to the Local Planning Authority shall include a written justification of the choice of the representative background noise environment provided by the independent consultant. The rating level of noise immissions resulting from the combined effects of the wind turbines when determined in accordance with the attached Guidance Notes shall not exceed the noise limits approved in writing by the Local Authority for the complainant's dwelling.

D) Prior to the commencement of any measurements by the independent consultant to be undertaken in accordance with these conditions, the wind farm operator shall submit to the Local Planning Authority for written approval the proposed measurement location identified in accordance with the Guidance Notes where measurements for compliance checking purposes shall be undertaken. Where the proposed measurement location is close to the wind turbines, rather than at the complainants property (to improve the signal to noise ratio), then the operators submission shall include a method to calculate the noise level from the wind turbines at the complainants property based on the noise levels measured at the agreed location (the alternative method). Details of the alternative method together with any associated guidance notes deemed necessary, shall be submitted to and agreed in writing by the Local Authority prior to the commencement of any measurements. Measurements to assess compliance with the noise limits set out in the Tables attached to these conditions or approved by the Local Planning Authority pursuant to paragraph (C) of this condition shall be undertaken at the measurement location approved in writing by the Local Authority.

E) Prior to the submission of the independent consultant's assessment of the rating level of noise immissions pursuant to paragraph (F) of this condition, the wind farm operator shall submit to the Local Planning Authority for written approval a proposed assessment protocol setting out the following:

   i) the range of meteorological and operational conditions (the range of wind speeds, wind directions, power generation and times of day) to determine the assessment of rating level of noise immissions.

   ii) a reasoned assessment as to whether the noise giving rise to the complaint contains or is likely to contain a tonal component.

The proposed range of conditions shall be those which prevailed during times when the complainant alleges there was disturbance due to noise, having regard to the information provided in the written request of the Local Planning Authority under paragraph (B), and such others as the independent consultant considers necessary to fully assess the noise at the complainant's property. The assessment of the rating level of noise immissions shall be undertaken in accordance with the assessment protocol approved in writing by the Local Planning Authority and the attached Guidance Notes.

F) The wind farm operator shall provide to the Local Planning Authority the independent consultant's assessment of the rating level of noise immissions undertaken in accordance with the Guidance Notes within 2 months of the date of the written request of the Local Planning Authority made under paragraph (B) of this condition unless the time limit is extended in writing by the Local Planning Authority. The assessment shall include all data collected for the purposes of undertaking the compliance measurements, such data to be provided in the format set out in Guidance Note 1(e) of the Guidance Notes. The instrumentation used to undertake the measurements shall be calibrated in accordance with Guidance Note 1(a) and certificates of calibration shall be submitted to the Local Planning Authority with the independent consultant's assessment of the rating level of noise immissions.

G) Where a further assessment of the rating level of noise immissions from the wind farm is required pursuant to Guidance Note 4(c) of the attached Guidance Notes, the wind farm operator shall submit a copy of the further assessment within 21 days of submission of the independent consultant's assessment pursuant to paragraph (F) above unless the time limit for the submission of the further assessment has been extended in writing by the Local Planning Authority.

H) The wind farm operator shall continuously log power production, wind speed and wind direction, all in accordance with Guidance Note 1(d) of the attached Guidance Notes. The data from each wind turbine shall be retained for a period of not less than 24 months. The wind farm operator shall provide this information in the format set out in Guidance Note 1(e) of the attached Guidance Notes to the Local Planning Authority on its request within 14 days of receipt in writing of such a request.

Note: For the purposes of this condition, a "dwelling" is a building within Use Classes 7, 8 and 9 of the Town and Country Planning (Use Classes) (Scotland)

Order 1997 which lawfully exists or had planning permission at the date of this permission.

Table 1 - Between 07:00 and 23:00 - Noise level dB $L_{A90,\ 10\text{-minute}}$

Location (easting, northing grid coordinates)	Standardised wind speed at 10 metres height (m/s) within the site averaged over 10-minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
	L_{A90} Decibel Levels											
Lower Hollingarth (452188, 1183917)	40	40	40	40	40	40	40	40	42	43	43	43
Whirliegarth (452739, 1183016)	40	40	40	40	40	40	40	40	40	43	43	43
Easterlee (451773, 1180569)	40	40	40	40	40	40	40	40	42	44	46	46
Gentletown (452415, 1180263)	40	40	40	40	40	40	40	42	44	47	48	48
Littlester (451022, 1180133)	40	40	40	40	40	40	41	44	47	49	51	51
Hamnavoe (449726, 1180866)	40	40	40	40	40	40	40	40	42	43	43	43
Helnaquhida (452013, 1180138)	40	40	40	40	40	40	40	39	42	44	46	46
Kettlester (451861, 1180049)	40	40	40	40	40	40	40	39	42	44	46	46
Islesview (451819, 1180372)	40	40	40	40	40	40	40	40	42	44	46	46
Westerlee (451775, 1180241)	40	40	40	40	40	40	40	39	42	44	46	46
Kletterlea (451404, 1180170)	40	40	40	40	40	40	41	43	45	48	49	49
The School House (451203, 1179999)	40	40	40	40	40	40	41	44	47	49	51	51
Cluness Cottage (451955, 1179932)	40	40	40	40	40	40	40	40	35	38	39	39
Staneygarth (451936, 1179890)	40	40	40	40	40	39	39	38	40	43	45	45
Giggleswick (452261, 1179938)	40	40	40	40	40	40	40	42	43	44	44	44

Table 2 - Between 23:00 and 07:00 - Noise level dB $L_{A90,\ 10\text{-minute}}$

Location (easting, northing grid coordinates)	Standardised wind speed at 10 metres height (m/s) within the site averaged over 10-minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
	L_{A90} Decibel Levels											
Lower Hollingarth (452188, 1183917)	43	43	43	43	43	43	43	43	43	43	43	44
Whirliegarth (452739, 1183016)	43	43	43	43	43	43	43	43	43	43	44	44
Easterlee (451773, 1180569)	43	43	43	43	43	43	43	43	43	43	45	45

Gentletown (452415, 1180263)	43	43	43	43	43	43	43	43	43	44	46	46
Littlester (451022, 1180133)	43	43	43	43	43	43	43	42	44	47	49	51
Hamnavoe (449726, 1180866)	43	43	43	43	43	43	43	43	43	43	43	44
Helnaquhida (452013, 1180138)	43	43	43	43	43	43	43	43	42	42	44	44
Kettlester (451861, 1180049)	43	43	43	43	43	43	43	43	42	42	44	44
Islesview (451819, 1180372)	43	43	43	43	43	43	43	43	43	42	45	45
Westerlee (451775, 1180241)	43	43	43	43	43	43	43	43	43	42	44	44
Kletterlea (451404, 1180170)	43	43	43	43	43	43	43	43	41	44	46	50
The School House (451203, 1179999)	43	43	43	43	43	43	43	42	44	47	49	51
Cluness Cottage (451955, 1179932)	43	43	43	43	43	43	43	41	37	40	42	42
Staneygarth (451936, 1179890)	43	43	43	43	43	43	42	42	41	39	41	41
Giggleswick (452261, 1179938)	43	43	43	43	43	43	43	43	43	40	36	36

Note to Tables 1 & 2: The geographical coordinates references set out in these tables are provided for the purpose of identifying the general location of dwellings to which a given set of noise limits applies. The standardised wind speed at 10 metres height within the site refers to wind speed at 10 metres height derived from those measured at hub height, calculated in accordance with the method given in the Guidance Notes.

The noise emission limits set out in Tables 1 & 2 are increased to 45 dB(A) L_{A90}, or the relevant ETSU-R-97 derived "quiet daytime hours" or the "night hours" noise limit based on the measured background noise levels plus 5dB(A), whichever is the greater, at any noise sensitive premises having a financial involvement with the wind farm. The wind farm operator must provide written confirmation of the location of any such premises to the Planning Authority prior to commencement of development.

Guidance Notes for Noise Condition

These notes are to be read with and form part of the noise condition. They further explain the condition and specify the methods to be employed in the assessment of complaints about noise immissions from the wind farm. The rating level at each integer wind speed is the arithmetic sum of the wind farm noise level as determined from the best-fit curve described in Note 2 of these Guidance Notes and any tonal penalty applied in accordance with Note 3 with any necessary correction for residual background noise levels in accordance with Note 4. Reference to ETSU-R-97 refers to the publication entitled "The Assessment and Rating of Noise from Wind Farms" (1997) published by the Energy Technology Support unit (ETSU) for the Department of Trade and Industry (DTI).

Note 1

(a) Values of the $L_{A90,10\text{-minute}}$ noise statistic should be measured at the complainant's property (or an approved alternative representative location as detailed in Note 1(b)), using a sound level meter of EN 60651/BS EN 60804 Type 1, or BS EN 61672 Class 1 quality (or the equivalent UK adopted standard in force at the time of the measurements) set to measure using the fast time weighted response as specified in BS EN 60651/BS EN 60804 or BS EN 61672-1 (or the equivalent UK adopted standard in force at the time of the measurements). This should be calibrated before and after each set of measurements, using a calibrator meeting BS EN 60945:2003 "Electroacoustics – sound calibrators" Class 1 with PTB Type Approval (or the equivalent UK adopted standard in force at the time of the measurements) and the results shall be recorded. Measurements shall be undertaken in such a manner to enable a tonal penalty to be calculated and applied in accordance with Guidance Note 3.

(b) The microphone shall be mounted at 1.2 - 1.5 metres above ground level, fitted with a two-layer windshield or suitable equivalent approved in writing by the Local Authority, and placed outside the complainant's dwelling. Measurements should be made in "free field" conditions. To achieve this, the microphone shall be placed at least 3.5 metres away from the building facade or any reflecting surface except the ground at the approved measurement location. In the event that the consent of the complainant for access to his or her property to undertake compliance measurements is withheld, the wind farm operator shall submit for the written approval of the Local Authority details of the proposed alternative representative measurement location prior to the commencement of measurements and the measurements shall be undertaken at the approved alternative representative measurement location.

(c) The $L_{A90,10\text{-minute}}$ measurements should be synchronised with measurements of the 10-minute arithmetic mean wind speed and wind direction data and with operational data logged in accordance with Guidance Note 1(d) and rain data logged in accordance with Note 1(f).

(d) To enable compliance with the conditions to be evaluated, the wind farm operator shall continuously log arithmetic mean wind speed in metres per second and wind direction in degrees from north at hub height for each turbine and arithmetic mean power generated by each turbine, all in successive 10-minute periods. Unless an alternative procedure is previously agreed in writing with the Planning Authority, this hub height wind speed, averaged across all operating wind turbines, shall be used as the basis for the analysis. Each 10 minute arithmetic average mean wind speed data as measured at turbine hub height shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres. It is this standardised 10 metre height wind speed data which is correlated with the noise measurements determined as valid in accordance with Note 2(b), such correlation to be undertaken in the manner described in Note 2(c). All 10-minute periods shall commence on the hour and in 10-minute increments thereafter synchronised with Greenwich Mean Time and adjusted to British Summer Time where necessary.

(e) Data provided to the Local Authority in accordance with paragraphs (E) (F) (G) and (H) of the noise condition shall be provided in comma separated values in electronic format with the exception of data collected to asses tonal noise (if required) which shall be provided in a format to be agreed in writing with the Local Authority.

(f) A data logging rain gauge shall be installed in the course of the independent consultant undertaking an assessment of the level of noise immissions. The gauge shall record over successive 10-minute periods synchronised with the periods of data recorded in accordance with Note 1(d). The wind farm operator shall submit details of the proposed location of the data logging rain gauge to the Local Authority prior to the commencement of measurements.

Note 2

(a) The noise measurements should be made so as to provide not less than 20 valid data points as defined in Note 2 paragraph (b).

(b) Valid data points are those measured during the conditions set out in the assessment protocol approved by the Local Authority under paragraph (E) of the noise condition but excluding any periods of rainfall measured in accordance with Note 1(f).

(c) Values of the $L_{A90,10\text{-}minute}$ noise measurements and corresponding values of the 10-minute standardised ten metre height wind speed for those data points considered valid in accordance with Note 2(b) shall be plotted on an XY chart with noise level on the Y-axis and wind speed on the X-axis. A least squares, "best fit" curve of an order deemed appropriate by the independent consultant (but which may not be higher than a fourth order) shall be fitted to the data points to define the wind farm noise level at each integer speed.

Note 3

(a) Where, in accordance with the approved assessment protocol under paragraph (E) of the noise condition, noise immissions at the location or locations where compliance measurements are being undertaken contain or are likely to contain a tonal component, a tonal penalty shall be calculated and applied using the following rating procedure.

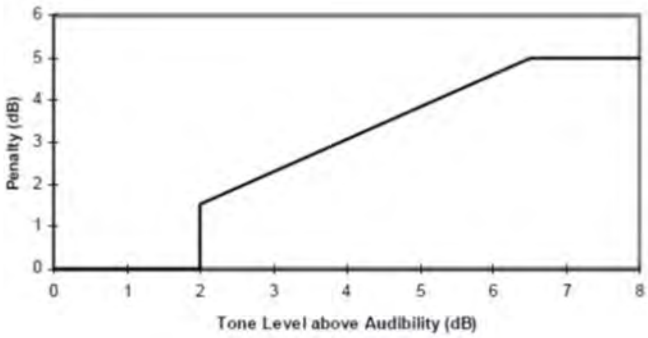
(b) For each 10-minute interval for which $L_{A90,10\text{-}minute}$ data have been determined as valid in accordance with Note 2, a tonal assessment shall be performed on noise immissions during 2-minutes of each 10-minute period. The 2-minute periods should be spaced at 10-minute intervals provided that uninterrupted uncorrupted data are available ("the standard procedure"). Where uncorrupted data are not available, the first available uninterrupted clean 2-minute period out of the affected overall 10-minute period shall be selected. Any such deviations from the standard procedure shall be reported.

(c) For each of the 2-minute samples the tone level above audibility shall be calculated by comparison with the audibility criterion given in Section 2.1 on pages 104 -109 of ETSU-R-97.

(d) The tone level above audibility shall be plotted against wind speed for each of the 2-minute samples. Samples for which the tones were below the audibility criterion or no tone was identified, a value of zero audibility shall be substituted.

(e) A least squares "best fit" linear regression shall then be performed to establish the average tone level above audibility for each integer wind speed derived from the value of the "best fit" line fitted to values within ± 0.5m/s of each integer wind speed. If there is no apparent trend with wind speed then a simple arithmetic mean shall be used. This process shall be repeated for each integer wind speed for which there is an assessment of overall levels in Note 2.

(f) The tonal penalty is derived from the margin above audibility of the tone according to the figure below derived from the average tone level above audibility for each integer wind speed.



Note 4

(a) If a tonal penalty is to be applied in accordance with Note 3 the rating level of the turbine noise at each wind speed is the arithmetic sum of the measured noise level as determined from the best fit curve described in Note 2 and the penalty for tonal noise as derived in accordance with Note 3 at each integer wind speed within the range set out in the approved assessment protocol under paragraph (E) of the noise condition.

(b) If no tonal penalty is to be applied then the rating level of the turbine noise at each wind speed is equal to the measured noise level as determined from the best fit curve described in Note 2.

(c) If the rating level at any integer wind speed lies at or below the values set out in the Tables attached to the conditions or at or below the noise limits approved by the Local Authority for a complainant's dwelling in accordance with paragraph (C) of the noise condition then no further action is necessary. In the event that the rating level is above the limit(s) set out in the Tables attached to the noise conditions or the noise limits for a complainant's dwelling approved in accordance with paragraph (C) of the noise condition, the independent consultant shall undertake a further assessment of the rating level to correct for background noise so that the rating level relates to wind turbine noise immission only.

(d) The wind farm operator shall ensure that all the wind turbines in the development are turned off for such period as the independent consultant requires to undertake the further assessment. The further assessment shall be undertaken in accordance with the following steps:

i. Repeating the steps in Note 2, with the wind farm switched off, and determining the background noise (L_3) at each integer wind speed within the range set out in the approved noise assessment protocol under paragraph (E) of this condition.

ii. The wind farm noise (L_1) at this speed shall then be calculated as follows where L_2 is the measured level with turbines running but without the addition of any tonal penalty:

$$L_1 = 10\log\left[10^{L_2/10} - 10^{L_3/10}\right]$$

i. The rating level shall be re-calculated by adding the tonal penalty (if any is applied in accordance with Note 3) to the derived wind farm noise L_1 at that integer wind speed.

ii. If the rating level after adjustment for background noise contribution and adjustment for tonal penalty (if required in accordance with note (iii) above) at any integer wind speed lies at or below the values set out in the Tables attached to the conditions or at or below the noise limits approved by the Local Authority for a complainant's dwelling in accordance with paragraph (C) of the noise condition then no further action is necessary. If the rating level at any integer wind speed exceeds the values set out in the Tables attached to the conditions or the noise limits approved by the Local Authority for a complainant's dwelling in accordance with paragraph (C) of the noise condition then the development fails to comply with the conditions.