ESB Asset Development UK Ltd

Millmoor Rig Wind Farm

Further Environmental Information - Chapter 4 Geology, Hydrogeology, Hydrology and Peat

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4. GEOLOGY, HYDROGEOLOGY, HYDROLOGY AND PEAT

Introduction

4.1. This Chapter of the Further Environmental Information (FEI) Report assesses the potential impacts on geology, hydrogeology, hydrology and peat from the FEI Layout. This Chapter should be read in conjunction with the original EIA Report **Chapter 10: Geology, Hydrogeology, Hydrology and Peat**.

4.2. This Chapter presents additional information and addresses the comments received from consultees and stakeholders following submission of the EIA Report. The results of the impact assessment have been reviewed (and updated if applicable) to take into account the changes which have been made to the EIA Layout. Changes to the predicted effects on receptors as a result of the FEI Layout have been assessed and updated where relevant.

Scope and Methodology

4.3. The existing baseline conditions and potential risks associated with the Proposed Development are unchanged. The mitigation, management and monitoring measures discussed in **Chapter 10** of the **EIA Report**, as well as the accompanying Technical Appendices, remain valid and should be applied to the findings of the FEI Report.

4.4. The assessment methodology used in the EIA Report is detailed in **Chapter 10** and is used for the assessment of effects in this Chapter.

Post-submission Consultation

4.5. The post-submission consultation responses received with relevance to geology, hydrogeology, hydrology and peat are detailed and considered in **Table 4.1**.

Table 4.1 Post submission consultation responses

Name of consultee	Key concerns	Response
SEPA 2nd February 2023	Areas of peat and 50 m watercourse buffers to be shown on map and annotated as no micrositing/development areas.	**New Figure 10.8** of the **FEI Report** provides an annotated map showing watercourse buffers and areas of peat marked as no micrositing areas.
	A map showing 50 m watercourse buffers and the 100 m buffer of the Tweed SAC is required to make clear that no infrastructure has been	**Updated Figure 10.4.1** of the **FEI Report** shows the watercourse and Tweed SAC buffers, and illustrates that, as far as possible, infrastructure has not been placed within these areas.

Name of consultee	Key concerns	Response
	placed within these areas.	During redesign of the EIA Layout the access track to turbine T13 was realigned, causing it to encroach slightly within a minor watercourse buffer. Alternative design options were considered but were found to be impractical due to other environmental and engineering constraints. To prevent contamination of the watercourse, at least two lines of silt fencing would be placed between the watercourse and the construction works for at least 20 m to either side of the watercourse. Daily water quality checks would be carried out and, if contamination is identified, all works should stop until the issue is resolved.
	The EIA highlights generic pollution mitigation but more specific site controls will be needed.	Site specific controls would be set out post-consent in the Construction Environmental Management Plan (CEMP) for the Proposed Development.
	A clearer statement on not discharging concrete batching water to any watercourse is required.	Protective bunding would be installed around the concrete batching area to ensure that contaminated runoff is contained. Dedicated drainage would be installed to ensure that water from the batching area can be suitably treated to reduce alkalinity and suspended sediment load prior to discharge to ground, if conditions are suitable, or removed from the site by tanker for treatment and disposal offsite. No concrete batching water would be discharged to any watercourse.
	If peripheral bunding to divert water away from working areas are bare soil this would pose a destabilisation and pollution risk.	Bunding that is to be present long-term would be seeded or covered with a geotextile to stabilise and prevent generation of silty runoff. This would be outlined in the CEMP post-consent.
	Confirm that water treatment areas have room to accommodate settlement ponds and silt busters.	The post-consent Surface Water Management Plan (SWMP) would set out detailed plans for water treatment areas and would ensure that adequate space is available for all levels of treatment including settlement ponds and Silt Busters.

Name of consultee	Key concerns	Response
	We refer the applicant to the up-to-date CAR Practical Guide (December 2022) for oil storage etc and separate drainage to these areas will need to be designed.	Noted. Detailed designs for drainage would be provided post-consent as part of the site SWMP.
	Opportunities to enhance watercourse crossings by removing closed culverts should be explored.	Noted. Several watercourse crossings on site are existing closed culverts which may require upgrading during construction of the Proposed Development. Upgrades would make use of bottomless culverts. This would be addressed at the detailed design stage post consent.
	Modification of the footprint/exact location of the construction compound would be preferable than the mitigation described in Technical Appendix 10.2 Outline PMP.	The construction compound is located within an area predominantly mapped as 'no peat'. There are three depth records greater than 0.5 m within the vicinity of the compound recorded. However, it is considered likely that the peat depth interpolation has overestimated the peat depths in this area, leading to peat depth contours (**New Figure 10.10** of the **FEI Report**) showing greater depths than is really the case. All peat in this area has been significantly disturbed due to forestry activities and is no longer a functioning peatland meaning that siting the construction compound at this location is not likely to have significant adverse impacts on peat. It is considered that use of mitigation described in **Technical Appendix 10.2** of **Chapter 10** of the **EIA Report** will be sufficient. Micrositing would be used at the detailed design stage to further reduce impacts to peat.
Ironside Farrar 29th March 2023	A slope model and peat probing survey plan should be included to allow review of slope character and to ensure sufficient density of peat probing has been conducted in line with relevant guidance.	A slope model and peat probing survey plan are provided in **New Figures 10.9** and **10.11** of the **FEI Report** respectively. The majority of the site is flat with most of the slope angles across the developable area being 8° or less.
	The method of peat depth interpolation used to create the peat depth	A gravity interpolation was used across the survey area with a 10 m cell size and a 200 m buffer around the margin.

Name of consultee	Key concerns	Response
	model should be provided.	
	Areas of peat identified within the site need to be reviewed and comments provided regarding whether or not their stability could be influenced by construction works. Run out from any potential peat slide should also be considered.	The Proposed Development has been split into sub-areas to allow more detailed consideration of peat slide risk as well as any run out from potential peat slide. These areas are discussed in detail in the **Response to Ironside Farrar** section below.

Field Surveys

4.6. Field surveys carried out to inform the EIA Report are detailed in the **EIA Report Chapter 10**.

4.7. Further field surveys were necessary to provide updated information for the FEI Layout. This included assessment of:

- peat depth and condition;
- an updated watercourse crossing along revised access tracks;
- gradients and prevailing ground conditions; and
- the locations of all components of the Proposed Development's revised infrastructure layout.

Peat

4.8. Phase 1 peat depth data from the former, withdrawn Highlee Hill Wind Farm application was obtained, which provided 1,142 peat depth measurements and indicated that the majority of the site was not underlain by peat. A further phase 2 peat depth and condition survey was undertaken in April 2022 for areas of proposed infrastructure, where 439 peat depth measurements were taken. Between the two surveys a total of 1,581 peat depth measurements were recorded for the Proposed Development and immediate surroundings.

4.9. Two additional peat depth surveys were undertaken in April and November 2024 to inform the FEI Layout and FEI Report where a further 358 individual peat depths were recorded. Additional peat probing was undertaken following the latest available guidance and publications from the Scottish Government (Scottish Government, 2023; Scottish Government, SNH, SEPA, 2017) at:

- 50 m intervals along the centreline of proposed new access tracks, and at 10 m perpendicular offsets to both sides from the centreline; and
- 10-20 m resolution grid sampling at turbines and other infrastructure which had changed location since the EIA Report was submitted.

4.10. Across all four surveys, a combined 1,939 individual probing locations were recorded. An updated figure showing peat depths across the Proposed Development is provided in **Updated Figure 10.3** of the **FEI Report**. The following provides a summary of the results from the combined peat surveys, including that data collected for the withdrawn Highlee Hill Wind Farm application:

- peat was present at approximately 14% of the probe locations, with approximately 2% of the probe locations being peat >1.0 m deep;
- the maximum peat depth recorded from all probes was 2.05 m;
- the average probe depth was approximately 0.26 m; and
- the average peat depth (probes >0.5 m) was approximately 0.73 m.

Peat Management Plan

4.11. The aim of the FEI Layout has been to avoid areas of peat where possible, and to minimise incursion into peat where it has not been possible to avoid all together.

4.12. Only 8% of infrastructure at the Proposed Development, including drainage, is underlain by peat. The majority of the infrastructure (92%) is not underlain by peat but rather peaty soil or topsoil no greater than 0.5 m deep.

4.13. The excavation volumes have been calculated using the same assumptions with regard to excavation widths and depths of access tracks and infrastructure as stated in **Technical Appendix 10.1: Peat Management Plan** of the **EIA Report**. Similarly, definitions of acrotelmic and catotelmic peat remain consistent.

4.14. The following tables set out the estimated volumes of peat that will need to be excavated in order to allow construction of the revised Proposed Development to proceed. Only those elements which have changed since the EIA Report was submitted have been included, referred to as 'revised infrastructure element'. The calculations provide totals for each element type and as an overall total. Each set of calculations provides subdivision into 'acrotelm' and 'catotelm'.

Peat Excavation Volumes

4.15. **Table 4.2** provides peat volumes that require excavation in order to allow construction of the revised Proposed Development.

Table 4.2 Peat excavation volumes for revised infrastructure elements

Infrastructure element	Acrotelm (m^3)	Catotelm (m^3)	Total (m^3)
Turbine T5 hardstanding	206	8	214
Turbine T9 hardstanding	876	447	1323
Turbine T10 hardstanding	0	0	0
Turbine T11 hardstanding	2,426	2,059	4,484
Turbine T13 hardstanding	553	55	608
Mobilisation Compound – northern boundary of access track	0	0	0
New track	4,115	1,152	5,267
Existing upgraded track	1,525	747	2,272

4.16. The FEI Layout is estimated to require around 23% more peat to be excavated than the original EIA Layout. Despite this, impacts to peat are still very minimal since the majority of the Proposed Development infrastructure will not require any peat to be excavated during construction. The total estimated peat excavation volumes are compared for each layout in **Table 4.3**.

Table 4.3 Comparison of peat excavation volumes by layout option

Layout option	Acrotelm (m^3)	Catotelm (m^3)	Total (m^3)
FEI Layout	10,688	4,636	15,324
EIA Layout	9,392	3,045	12,437
Total change	1,296 (13.8%)	1,591 (52.3%)	2,887 (23.2%)

4.17. Avoiding incursion into areas of peat has been a key consideration during design of the FEI Layout however it has been necessary to balance this constraint with other considerations, for example cultural heritage and landscape impacts, and engineering practicalities. Increased biodiversity enhancement within the site will provide improved mitigation for impacts to peat when compared to those assessed within the EIA Report.

Peat Reuse Volumes

4.18. Calculations have been made to determine where excavated peat can usefully be reused within the Proposed Development, for the purposes of reinstatement and restoration. Estimated volumes for reuse are provided in **Table 4.4**, subdivided by the different reinstatement and restoration methods that are appropriate for the Proposed Development.

Table 4.4 Estimated soil and peat volumes for different reuse options for FEI Layout

Reuse option	Acrotelm (m^3)	Catotelm (m^3)	Total (m^3)
Dressing-off edges of turbine hardstandings & full reinstatement of temporary hardstanding areas	6,900	4,600	11,500
Dressing-off edges of additional construction compound	200	100	300
Proposed new access track verge reinstatement	11,300	0	11,300
Modified existing access track verge reinstatement	14,300	0	14,300
Totals	32,700	4,700	37,400

4.19. All figures in **Table 4.4** have been rounded down to the nearest 100 m^3 to make allowance for the uncertainties present within the figures.

4.20. It has been assumed that limited catotelmic peat would be reused for dressing-off edges and reinstatement of construction infrastructure. In areas with natural hollows, use of some catotelmic peat may be appropriate but it is likely in practice that most of this work would make use of acrotelmic peat.

4.21. It has been assumed that all track verge reinstatement would use entirely acrotelmic peat, although some catotelmic peat may be used in areas with natural hollows.

4.22. Reinstatement and dressing-off have assumed a maximum depth of 0.6 m and a maximum width of 2.5 m from the infrastructure or track margin, to be varied in practice as best suits the local ground conditions.

4.23. Despite the FEI Layout requiring the excavation of approximately 23% more peat than the EIA Layout, there are still ample opportunities for reuse of acrotelmic and catotelmic peat in dressing off the margins of permanent infrastructure (i.e. track verges, construction compound and turbine hardstandings) and full reinstatement of temporary infrastructure (i.e. turbine laydown areas).

Peat Reuse

4.24. All reuse and reinstatement works would be carried out under the direction of the Environmental Clerk of Works (ECoW). The ECoW would direct whether excavated peat should be stored or transported directly to a suitable reuse location. Immediate reuse is likely to be more practicable in the later stages of construction.

4.25. As there are more opportunities for reinstatement of acrotelmic peat than calculated excavation volumes, target reinstatement areas would be identified by the ECoW for areas where peat would be of greatest value. Reinstatement work in other parts of the site would make use of excavated soil materials in lieu of peat. All catotelmic peat in reuse areas would be capped with peat turves to encourage revegetation.

4.26. Methods for reuse are discussed in more detail in **Section 2** of **Technical Appendix 10.1**: Outline Peat Management Plan of the **EIA Report**.

Response to Ironside Farrar

4.27. In their Stage 1 Checking Report for the submitted EIA Report[1], Ironside Farrar said the following in relation to peat slide risk at the site:

4.28. Review and comment is required on the areas of peat that have been identified on the site (interpolated peat depth map) and if the stability of these areas could be influenced at all by construction activity. Review of the peat areas in relation to up slope and down slope of the infrastructure envelope and the related topography in terms of run out from any peat landslide source should be considered.

4.29. The Proposed Development has been split into sub-areas to allow for more detailed consideration. These are shown on **New Figure 10.10** of the **FEI Report**.

Small peat pockets – one or two peat measurements

4.30. A number of small pockets of peat have been identified across the Proposed Development area, mainly consisting of a single record >0.5 m but occasionally with two records >0.5 m within 50 m. These represent small, highly localised pockets of soil or peat. Their localised nature means that they are unlikely to pose a failure risk as a result of the very small area identified as peat and the absence of adjacent peat deposits.

[1] Ironside Farrar (2023). Peat Landslide Hazard Risk Assessment: Millmoor Rig Wind Farm Stage 1 Checking Report.

4.31. A number of these records are located immediately adjacent to existing forestry tracks. No indications of instability were observed at any of these locations despite the presence of infrastructure and recent heavy plant movement related to active felling within the area.

Area 1: Peat bodies near Turbines T1, T2 & T4

4.32. Four larger areas of peat are present in this part of the site – one east of Turbine T1, one south of Turbine T1, one between Turbines T1 and T2, and one between Turbines T2 and T4 (Figure 10.10).

4.33. In all cases, the majority of the peat records are <1.0 m, with only two records exceeding 1.0 m in depth. No construction activity is proposed within any of these four areas, although bedrock excavation by blasting is proposed for Borrow Pit 1 in this area. Proposed construction work would involve track widening, some sections of new track and the construction of turbine foundations and hardstanding areas.

4.34. Much of the area between Turbines T1 and T2 has been recently clear-felled. Although there has been significant ground disturbance as a result of the felling activity, no signs of instability were observed at any location (**Photograph 4.1**).

4.35. Similarly, the area around Turbine T1, including the areas of peat to the east and south, have been clear-felled and replanted with young trees. Again, no signs of instability were observed at any location despite the significant ground disturbance involved in felling and planting activity (**Photograph 4.2**).

4.36. A smaller area of peat intersects the hardstanding for Turbine T1. This area includes a depth record of 0.83 m, although adjacent records are 0.6 m or less. The relatively localised nature of this peat area indicates that it would be unlikely to fail. This location is within young forestry, with extensive ditching for drainage and significant recent activity relating to clear-felling and replanting work. As a result, the area is considered to be at very low risk of instability.

Photograph 4.1: View NE over Area 1 from NGR NT 6338 0590, showing clear-fell and new tree planting, highly disturbed ground with some peat soil and mineral soil.

Photograph 4.2: View S in Area 1 from NGR NT 6394 0538, showing young tree growth and a drainage ditch.

Area 2: Peat bodies near the construction compound and substation option

4.37. Two areas of peat are present in this part of the site – one between the construction compound and the substation, and one to the north of the construction compound (**New Figure 10.10** of the **FEI Report**).

4.38. All peat records in this area are <1.0 m, with the deepest being 0.99 m. Construction works include sections of new track, widening of existing track and establishment of the construction compound and substation platforms.

4.39. The entirety of this area has been recently clear-felled and replanted, with the land to the west of the Fell Burn (including construction compound area) planted more recently than the land to the east (including substation area). Although there has been significant ground disturbance as a result of the felling and replanting activity, no signs of instability were observed at any location (**Photograph 4.3**).

4.40. Parts of the construction compound are located within areas of peat. Slope angles in this area are up to 4° and the peat records are relatively localised. As this area has undergone significant activity relating to felling and planting, with no signs of instability, it is considered to be at very low risk of instability.

4.41. In addition, the location of the construction compound would be subject to confirmatory peat survey to determine if the interpolated peat depths are correct. Following this additional data gathering exercise, the footprint would be revised to minimise incursion into areas of peat. If possible, taking into account engineering and other environmental constraints, the compound footprint would be amended to avoid all areas of peat. It is the Applicant's stated preference to avoid peat as a first level of control.

Photograph 4.3: View SE over Area 2 and the main substation from NGR NT 6388 0705, showing new tree growth.

Area 3: Peat bodies near Turbines T7 & T8 and along the Jed Water

4.42. Five areas of peat are present in this part of the site – one between Turbines T7 and T8, one north-west of Turbine T7, and three along the Jed Water valley. One of these three areas forms the largest extent of peat within the Proposed Development area (**Figure 10.10**).

4.43. This area includes the deepest peat record from the site, at 2.05 m. All the depth records >1.0 m are located within the Jed Water valley, close to the watercourse. While there are areas with relatively steep slopes, the more substantial thicknesses of peat are present within the flatter floor area of the valley. No construction work is proposed within any of the five peat bodies in Area 3 and most of the required construction relates to track widening. Short sections of new track would be required to give access to Turbines T4, T7 and T8 and the turbine foundations and hardstanding would all require construction activity. In addition, bedrock excavation by blasting is proposed for Borrow Pit 2 near this area.

4.44. The majority of this area has been recently clear-felled and replanted, except for the forestry block immediately east of the Jed Water up to the access track further to the east and part of the area between Turbines T7 and T8. Although there has been significant ground disturbance as a result of the felling and replanting activity, no signs of instability were observed at any location (**Photograph 4.4**).

Photograph 4.4: View E over Area 3 and the Jed Water valley from NGR NT 6267 0733, showing clear-fell and early new tree growth.

Area 4: Peat bodies near Turbines T5, T6, T12 & T13

4.45. Five areas of peat are present in this part of the site – one between Turbines T6 and T12, one south-east of Turbine T6, one east of Turbine T5, one at the southern end of the

hardstanding for Turbine T13 and one south of this on the access track to Turbine T13. (**New Figure 10.10** of the **FEI Report**).

4.46. Eight peat records >1.0 m are present, between 1.12 m and 1.42 m. Two of these are associated with the Jed Water valley, close to the watercourse. Much of the proposed construction works in Area 4 would relate to track widening. Short sections of new track would be required to give access to Turbines T6 and T12 and the turbine foundations and hardstanding would all require construction activity. However, these works would not require construction within areas of peat.

4.47. The deepest peat (1.42 m) is located along the new access track to Turbine T13, and construction works within peat would also be required for the foundation and hardstanding of Turbine T13. It is likely that the peat depth of 1.42 m is an overestimation of the true peat depth in this part of the site. It was noted during surveys that the probe at this point was coated in clay when removed from the ground and adjacent peat depths were between 0 and 0.34 m, suggesting that a pocket of clayey soil had been encountered rather than peat.

4.48. The majority of this area has been recently clear-felled with some areas of replanting, except for the forestry block between Turbine T5 and the site boundary to the east. Although there has been significant ground disturbance as a result of the felling and replanting activity, no signs of instability were observed at any location (**Photograph 4.5, Photograph 4.6, Photograph 4.7**).

Photograph 4.5: View NE over Area 4 from NGR NT 6171 0538, showing debris from clear-fell activity and new tree growth.

Photograph 4.6: View NE over Area 4 towards the Jed Water from NGR NT 6223 0583, showing debris from clear-fell and unfelled stands of mature trees.

Photograph 4.7: View S over Area 4 from Turbine 13, NGR NT 6163 0619, showing an area of felled forestry with mature conifers in the background.

Area 5: Peat bodies at Turbines T9 and T11

4.49. Two main areas of peat are present in this part of the site – one at Turbine T11 and one in the north-west at Turbine T9. Small pockets of peat are also present in the north, along the access track between Turbines T8 and T9 (**New Figure 10.10** of the **FEI Report**).

4.50. Nine peat records >1.0 m are present, between 1.01 m and 1.30 m. Of these, one is located on the proposed new access track to Turbine T11 and three are located within the hardstanding footprint for Turbine T11. The others are adjacent to Turbines T9 and T11 but are not within the hardstanding footprints.

4.51. The area has been planted and felled in the past, although not recently. Felling and planting activities have caused significant ground disturbance but despite this, no signs of instability were noted during site visits (**Photograph 4.8**).

Photograph 4.8: View over Area 5 from Turbine T11 showing dense stands of junior conifers and evidence of disturbed ground from felling and planting activities.

Area 6: Peat bodies within the access area

4.52. There are two main areas of peat along the access track into the turbine area. One is in the north at the crossing of Carter Burn and the other in the south at the crossing of Black Burn.

4.53. The peat deposits in the south consists of small, localised pockets with peat depths between 0.52 m and 0.87 m.

4.54. In the north there is one larger peat body at the crossing of the Carter Burn with several smaller pockets scattered along or adjacent to the access track. Peat depths range from 0.51 m to 1.1 m. For the most part, peat depths greater than 0.6 m are found adjacent to but outwith the footprint of the access track.

4.55. The northern section of the access track runs through agricultural fields as well as commercial forestry consisting of a mixture of mature stands and junior conifers. As has been observed across the rest of the site, forestry activities have greatly disturbed the ground but have caused no observable signs of instability in the area.

Peat core samples

4.56. Core sample C1 was collected from a location northeast of Turbine T7. This sample indicated that peaty soil was present at this location, to a depth of 0.40 m, grading into clay below (**Photograph 4.9**).

4.57. Core sample C2 was collected from a location south of the construction compound and south-east of Turbine T3. This sample indicated that peaty soil was present at this location, to a depth of 0.25 m, with brown soil below (**Photograph 4.10**).

4.58. Core sample C3 was collected from a location east of Turbine T1. This sample indicated that there was no peat present at this location, the sample was entirely diamicton till (**Photograph 4.11**).

4.59. The northwestern part of the Proposed Development is largely without peat, except as isolated small pockets.

Photograph 4.9: Core sample from location C1, NGR NT 6243 0711, showing peaty soil with clay at base. Scale is marked in 10 cm bands.

Photograph 4.10: Core sample from location C2, NGR NT 6376 0654, showing thin peaty soil with brown soil below. Scale is marked in 10 cm bands.

Photograph 4.11: Core sample from location C3, NGR NT 6378 0560, showing absence of peat/peaty soil at this location. Scale is marked in 10 cm bands.

Summary – RSK Response to Ironside Farrar

4.60. A review of the setting, distribution and nature of peat and peaty deposits has been undertaken for the Proposed Development. Peat is patchy and discontinuous, with most areas forming small and isolated pockets. Where larger areas are present, these are mostly located away from proposed infrastructure.

4.61. All parts of the site are under conifer forestry or have been recently clear-felled, with some cleared areas also replanted with young conifer trees. The planting and harvesting works involve very significant disturbance to the ground. No evidence of instability was observed at any location within the site. Combined with the careful design process, which has avoided any proposed works in areas of peat where possible, it is concluded that the risk of peat landslide in the area is very low.

Groundwater-Dependent Terrestrial Ecosystems (GWDTE) Assessment

4.62. Potential GWDTE within the Site are shown in the **Updated Figure 10.3.1** of the **FEI Report**. The assessment undertaken in **Chapter 10** and **Technical Appendix 10.3: GWDTE Assessment** of the **EIA Report** remains relevant, and all mitigation outlined in both documents remains valid for the FEI Layout. The key changes in relation to GWDTE are as follows:

- A section of the access track into the site has been rerouted westwards at Carter Burn. This would pass through areas of H12, U20 and M23. H12 and U20 that have a low potential for groundwater dependency and M23 which is potentially moderately groundwater-dependent. In this area impacts to potential GWDTE would be increased compared to those associated with the EIA Layout.
- In the EIA Layout the hardstanding of turbine T5 was situated fully within an area of MG9, a potentially moderately groundwater-dependent habitat. In the FEI Layout T5 hardstanding has moved south-east and is now only partially situated within the MG9 corridor in this area. This would cause impacts to be reduced.
- Turbine T13 has been moved approximately 55 m northwards, which places the turbine and associated hardstanding outwith an area of MG9 habitat, as well as reducing the length of track requiring to be excavated through this area. This would act to reduce impacts to MG9 habitats in this area.
- Turbine T11 has moved approximately 173 m to the south-east and the associated hardstanding is now partially situated within an area of MG9 habitat. This would increase impacts on MG9 habitats in this area.

4.63. The above changes to the layout in relation to potentially GWDTE are not substantive and do not change the overall assessment of GWDTE provided in **Chapter 10** or **Technical Appendix 10.3**. The increased impact to MG9 habitat due to the relocation of T11 is balanced by the reduction in impacts due to the realignment of T5 and T13. With appropriate mitigation in place, as set out in **Chapter 10** and **Technical Appendix 10.3** the impacts to GWDTE from the FEI Layout are considered to be **not significant.**

Watercourse Crossings

4.64. The assessment undertaken in **Technical Appendix 10.4: Drainage Impact and Watercourse Crossing Assessment** remains unchanged except for amendments to

one watercourse crossing. In the FEI Layout, watercourse crossing WC01 has been moved approximately 180 m north-west and downstream of the original location from the EIA. The original location would have required upgrading an existing bridge structure. Crossing the Carter Burn at this location would require construction of a new bridge or large bottomless culvert. Details of the new crossing are provided in **Table 4.5** below.

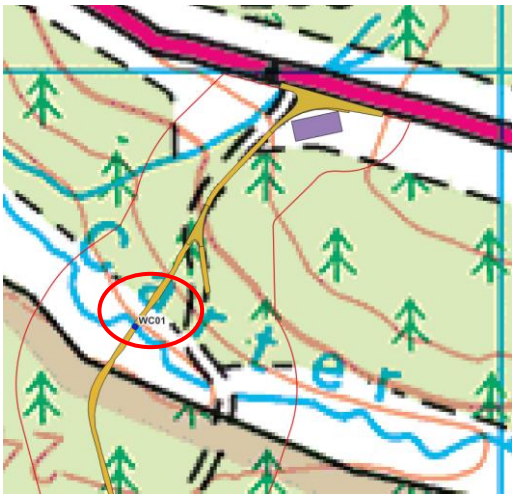
4.65. The crossing of the Black Burn (watercourse crossing WC02) would essentially remain the same as described in **Technical Appendix 10.4** of the **EIA Report** but has moved approximately 30 m upstream of the original location.

4.66. All other watercourse crossings would remain the same as for the EIA Layout. An updated figure showing watercourse crossings for the Proposed Development is provided in **Updated Figure 10.4.1** of the **FEI Report**.

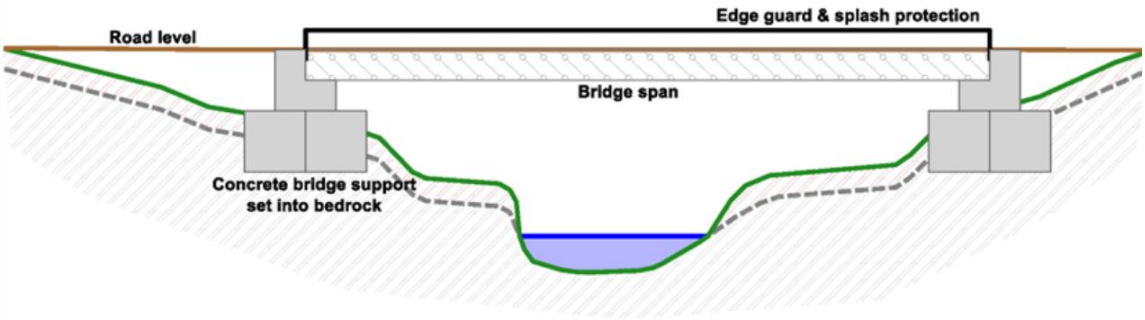
Water Quality Monitoring

4.67. As described in the EIA Report, water quality monitoring would begin prior to any construction works, to allow for pre-construction baseline water quality to be determined. For the most part, the location of the water quality monitoring points remain unchanged in the FEI Layout with the exception of the monitoring point on the Carter Burn which has been relocated to NT 6542 0763, downstream of the relocated watercourse crossing in this area. The recommended frequency and duration of monitoring would remain the same as specified in the **Chapter 10** of the **EIA Report**. The revised water quality monitoring locations are shown in the **Updated Figure 10.7** of the **FEI Report**.

Table 4.5 Watercourse crossing details for the amended WC01

Watercourse crossing WC01	
Grid reference: NT 6545 0760	
View upstream at Carter Burn showing a well-defined channel, approximately 2.5 m wide with a water depth of 0.3 m. Banks are vegetated with bracken and grass. Trees and shrubs are visible further upstream. Channel substrate contains gravel, sand and some cobbles.	

Watercourse crossing WC01	
View downstream at Carter Burn also showing a well-defined channel with vegetated banks. Bracken is most prevalent on the southern bank.	



Bridge or large bottomless culvert – indicative cross-section (not to scale)

Effects During Construction and Operation

4.68. Within **Chapter 10** of the EIA Report the impact of construction and operational phase works at the Proposed Development on the following elements were assessed:

- physical changes to overland drainage and surface water flows;
- water contamination from particulates and suspended solids;
- water contamination from fuels, oils or foul drainage;
- changes in or contamination of water supply to vulnerable receptors including designated sites, GWDTE and Private Water Supply (PWS);
- increased flood risk;
- physical removal of bedrock;
- modification to groundwater flow paths;
- soil erosion and compaction; and
- peat instability.

4.69. The changes to the EIA Layout highlighted in this FEI Report have impacted various factors pertaining to geology, hydrogeology, hydrology and peat. These have been discussed in **paragraphs 4.8** to **4.67** of this Chapter.

4.70. In summary, the FEI Layout would require increased excavation of peat, leading to increased impacts to peat compared with those recorded for the EIA Layout. Overall impacts to GWDTE have been neither reduced nor increased. Two watercourse crossings have been moved to accommodate realignment of access tracks. One of these, the crossing at Carter Burn, would require construction of a new bridge or large bottomless culvert rather than the upgrade to an existing bridge proposed under the EIA Layout. One water quality monitoring location has been moved to accommodate the relocation of an area of access track and associated watercourse crossing.

4.71. Additional site visits and data collection, including additional peat data, has served to confirm the opinion that peat slide risk is negligible at the site and that a full peat slide risk assessment is not required for the Proposed Development. None of the above points have changed the overall impact assessment documented in **Chapter 10** of the **EIA Report** which still stands for the FEI Layout. Therefore, this **FEI Report** finds that **no significant effects** on geology, hydrogeology, hydrology and peat would arise as a result of the Proposed Development.

4.72. **Table 4.6** summarises the effects on geology, hydrogeology, hydrology and peat and highlights where there are differences due to the changes between the EIA Layout and the FEI Layout.

Cumulative impacts

4.73. **Chapter 10**, **Section 10.7** of the EIA Report stated that there would be potential for cumulative impacts on the River Tweed catchment and the River Tweed SAC, should the construction phase of Pines Burn Wind Farm overlap with that of the Proposed Development. However, with appropriate mitigation in place, as set out in the EIA Report, the cumulative impacts were not considered to be significant.

4.74. It should be noted that Pine Burns Wind Farm is now operational. Potentially significant impacts are mostly associated with the construction phase of development and as a result there would be negligible potential for any cumulative impacts with the Proposed Development.

4.75. Since the submission of the **EIA Report**, Liddesdale Wind Farm, which is located immediately south of the Proposed Development, has submitted a Scoping report. Given that it is in the early stage of the planning application process, it is unlikely that its construction phase would overlap with that of the Proposed Development. However, if the construction phases were to overlap this would create the possibility of cumulative impacts particularly on the Jed Water and Catlee Burn catchments which are present within both development boundaries. Provided mitigation measures and best practice construction are adhered to at both sites during construction, the cumulative impacts are considered to be negligible.

Conclusion

4.76. In conclusion , this chapter of the **FEI Report** has detailed the following changes with respect to geology, hydrogeology, hydrology and peat.

4.77. The FEI Layout has increased the amount of peat requiring to be excavated by approximately 23%. However, excavation volumes are still considered to be small because the majority of the site is not underlain by peat. Additionally, there are ample opportunities for reuse of excavated peat within the site, meaning overall impacts to peat are not considered to be significant.

4.78. All concerns raised by Ironside Farrar regarding peat slide risk at the site have been addressed. The presence of peat across the site is minimal and generally not associated with infrastructure. Slope angles across the site are generally low and no signs of instability were noted during site surveys. As a result, peat slide risk is considered to be negligible and not significant.

4.79. Impacts to GWDTE have been increased in some areas and decreased in others with overall impacts broadly remaining the same as those associated with the EIA Layout.

4.80. Watercourse crossing WC01 has moved downstream and will require construction of a new bridge or large bottomless culvert rather than upgrading an existing bridge as was proposed at its previous location. Watercourse crossing WC02 has been moved upstream but would otherwise remain the same.

4.81. Cumulative impacts from Pine Burns Wind Farm have been found to be reduced, while there is now the potential for the construction phase of Liddesdale Wind Farm to overlap with that of the Proposed Development, and cause cumulative impacts. Overall, impacts from cumulative effects are considered to be not significant.

4.82. A summary of residual effects is provided in **Table 4.6** below and includes information on any changes noted between the **EIA** and **FEI Reports**.

Table 4.6 Summary of residual effects during construction, operation and decommissioning

Effect	Phase	Receptor	Assessment consequence	Effect significance	Change from EIA Report to FEI
Physical changes to overland drainage and surface water flows	Construction	Surface watercourses within the site	Minor, long-term and adverse	Not significant	No. Watercourse crossing WC01 has changed location and would now involve construction of a new bridge or large bottomless culvert rather than upgrading an existing bridge structure. The location of WC02 has also been slightly adjusted but the crossing would essentially remain the same. Neither amendment would change the overall consequence and effect significance.
	Operation		Negligible		No
	Decommissioning		Minor, long-term and adverse		No
Water contamination from particulates and suspended solids	Construction	Surface watercourses within the site	Minor, temporary and adverse	Not significant	Yes. The access track to turbine T13 is located within approximately 16 m of a minor watercourse. To prevent contamination of the watercourse at least two lines of silt fencing would be placed between the watercourse and the construction works for at least 20 m to either side of the watercourse. Daily water quality checks would be carried out and, if contamination is identified, all works should stop until the issue is resolved.
	Operation				
	Decommissioning				
Water contamination from fuels, oils or foul drainage	Construction	Surface watercourses within the site	Minor, temporary and adverse	Not significant	Yes. For all works on the access track to turbine T13 at least two lines of silt fencing would be placed between the watercourse at this location and the construction works for at least 20 m to either side of the watercourse to protect it from fuel or oil spills related to the construction works. Daily water quality checks would be carried out and, if contamination is identified, all works should stop until the issue is resolved.
	Operation		Negligible		
	Decommissioning		Negligible		
Changes in or contamination of water	Construction	Designated sites		Not significant	No

Effect	Phase	Receptor	Assessment consequence	Effect significance	Change from EIA Report to FEI
supply to vulnerable receptors		GWDTE	Minor, temporary and adverse		No. The FEI Layout would increase impacts to GWDTE in some areas and decrease them in others resulting in no overall change to the consequence or effect significance set out in the EIA Report.
		PWS			No
	Operation	Designated sites	Negligible	Not significant	No
		GWDTE			
		PWS			
	Decommissioning	Designated sites	Minor, temporary and adverse	Not significant	No
		GWDTE			
		PWS			
Increased flood risk	Construction	Infrastructure and property downstream of the Proposed Development	Negligible	Not significant	No
	Operation				
	Decommissioning				
Physical removal of bedrock	Construction	Bedrock	Negligible	Not significant	No
	Operation		No change		
	Decommissioning		No change		
Modification to groundwater flow paths	Construction	Groundwater	Minor, long term and adverse	Not significant	No
	Operation		Negligible		
	Decommissioning		Minor, long term and beneficial		

Effect	Phase	Receptor	Assessment consequence	Effect significance	Change from EIA Report to FEI
Soil erosion and compaction	Construction	Soils and peat within the site	Minor, temporary and adverse	Not significant	No. The amount of peat requiring excavation has been increased by the FEI Layout; however, the overall consequence and effect significance have not changed for this receptor.
	Operation		Negligible		No
	Decommissioning		Minor, long term and beneficial		No
Peat instability	Construction	N/A	Negligible	Not significant	No. Additional site visits and peat surveys, as well as slope and topographical mapping, have all confirmed that peat slide risk at the site is negligible and that a peat slide risk assessment is not required for the Proposed Development.
	Operation		Not assessed		
	Decommissioning		Not assessed		