

8. Geology, Hydrology, Hydrogeology and Peat

8.1 Introduction

8.1.1 This chapter presents the findings of the assessment of the likely significant effects of the Proposed Development on geology, hydrology, hydrogeology, and peat.

8.1.2 The specific objectives of the chapter are to:

- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the geological, hydrological, hydrogeological and peat baseline established from desk studies, site-specific surveys and feedback obtained during technical engagement with stakeholders;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address the likely significant effects; and
- assess any residual effects following the implementation of any additional mitigation measures.

8.1.3 The assessment uses information and findings presented in **Chapter 6: Ecology** to inform the assessment of potential effects on possible areas of Groundwater Dependent Terrestrial Ecosystems (GWDTEs) which are presented in this chapter.

8.1.4 This chapter is supported by the following figures and technical appendices:

- Figures (presented in **Volume 3a** of the Environmental Impact Assessment report (EIAR)):
 - Figure 8.1.1: Hydrological Features;
 - Figure 8.2a – 8.2c: Watercourses and Flooding;
 - Figure 8.3: Soils;
 - Figure 8.4: Superficial Geology;
 - Figure 8.5: Peatland Classification;
 - Figure 8.6: Peat Depth Plan;
 - Figure 8.7: Peatland Condition;
 - Figure 8.8: Bedrock Geology;
 - Figure 8.9: Groundwater Vulnerability; and
 - Figure 8.10a – 8.10g: Potential Areas of GWDTE.
- Technical Appendices (included in **Volume 4**):
 - Technical Appendix 8.1: Peat Landslide and Hazard Risk Assessment (PLHRA);
 - Technical Appendix 8.2: Outline Peat Management Plan (PMP);
 - Technical Appendix 8.3: Peat Condition Assessment (PCA);
 - Technical Appendix 8.4: Schedule of Watercourse Crossings;
 - Technical Appendix 8.5: Private Water Supply Risk Assessment; and



○ Technical Appendix 8.6: Coal Mining Risk Assessment.

8.1.5 The assessment has been undertaken in accordance with relevant policy, legislation and guidance for onshore wind developments in Scotland. Of particular relevance to this assessment are the following:

- NatureScot, Advising on Peatland, Carbon-rich Soils and Priority Peatland Habitats in Development Management, 2023;
- NatureScot, Peatland Condition Assessment Guide, 2016;
- Scottish Environment Protection Agency (SEPA), Environmental Authorisation (Scotland) Regulations 2018 (EASR) Guidance: Engineering: Activity Guide: Crossings, WAT-G-024, 2025;
- SEPA, Guidance on Assessing the Impacts of Development on Groundwater Abstractions, 2024;
- SEPA, Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems, 2024;
- SEPA, Guidance for Pollution Prevention documents;
- SEPA, Planning Advice Note: Assessing the Impact of Developments on Peatland and Carbon Rich Soils, 2025;
- SEPA, Recommended Riparian Corridor Layer for use in Land Use Planning, 2024;
- SEPA, Standing Advice on Peaty Soils, 2025;
- Scottish Government, Proposed Electricity Generation Developments: Peat Landslide Hazard Best Practice Guide, 2017; and
- Scottish Government, Peatland survey guidance, 2017.

8.2 Consultation

8.2.1 Consultation undertaken prior to and during the EIA Scoping stage was described in the EIA Scoping Report. **Table 8-1** presents the consultee responses in the Scoping Opinion relevant to this chapter and a summary of how each response has been addressed. A summary of all consultation with consultees is included in Appendix C of the Pre-Application Consultation (PAC) Report submitted as part of the application for Section 36 consent.

Table 8-1: Summary of Consultation

Consultation Details	Consultee Comments	Applicant Response
SEPA email 20 March 2026 to clarify EIA approach.	Where it says; “We prefer all the technical information required for any SEPA authorisations to be submitted at the same time as the planning or similar application” that is referring to authorisations under the separate SEPA Permitting/EASR system. It is not a requirement that is likely to result in an objection from SEPA Planning if it is not submitted to SEPA Permitting at the same time. It is just a recommendation, partly to help the applicant avoid any delays.	Noted. SEPA Planning requirements and recommendations have been reviewed and included in this assessment where relevant.



Consultation Details	Consultee Comments	Applicant Response
	The information that SEPA Planning would require, along with recommendations, is all listed in our scoping response under PCS-20008014. There are links within that response to the various new EASR pages which we recommend the applicant looks at in terms of applying for authorisations. Please also note that SEPA Planning no longer normally provides detailed comments on CEMPs, although it is still a standard requirement to produce and implement one in consultation with the planning authority.	
SEPA email 26 March 2026 to discuss required scope if a new bridge crossing over the Glenmuir Water was included as part of the Proposed Development.	No response.	A new bridge crossing over the Glenmuir Water is no longer considered as part of the Proposed Development, as discussed in Chapter 3: Design Evolution and Alternatives .

8.3 Assessment Methodology and Significance Criteria

- 8.3.1 The potential impacts associated with the Proposed Development on geology, hydrology, hydrogeology and peat have been assessed by completing an initial desk study followed by an impact assessment. Characterisation of baseline conditions and the impact assessment have been informed by a programme of field surveys.
- 8.3.2 An appraisal of the potential significant effects on geology, hydrology, hydrogeology and peat for the assumed grid connection route and Abnormal Indivisible Load (AIL) route is included in **Section 8.5**; however, it is noted that these areas will be subject to future planning applications and are not included in the application for Section 36 consent. No fieldwork has been necessary to complete the appraisal for the assumed grid connection corridor or AIL route (see **Technical Appendix 1.1** for a description of the approach to assessment).

Study Area

- 8.3.3 The Study Area for this assessment is shown on **Figures 8.1 to 8.10**. The Study Area includes a 500 m buffer to the Site Boundary. This buffer has been chosen as based on professional judgement and experience, and industry best practice regarding the implementation of appropriate mitigation measures and represents a reasonable Zone of Influence (“Zoi”) for potential effects on peat, the hydrological and hydrogeological environment for onshore wind projects. Beyond this distance, any effect is considered to be so diminished as to be undetectable and therefore not significant.
- 8.3.4 The assessment for potential cumulative effects (see **Section 8.10**) uses the hydrological and hydrogeological catchments within the study area, with a maximum downstream distance of 5 km from the Site boundary. The cumulative assessment was limited to a 5 km study area, as potential effects are anticipated to diminish with distance from the Proposed Development and are expected to become



undetectable beyond this extent due to dilution, sediment settlement, attenuation and increasing hydrological disconnection.

Desk Study

- 8.3.5 An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information relating to geology, hydrology, hydrogeology and peat.
- 8.3.6 The following information sources have been reviewed to inform the desk study:
- Ordnance Survey (OS) 1:50,000, 1:25,000 and 1:10,000 scale mapping;
 - NatureScot SiteLink;
 - NatureScot's (formerly Scottish Natural Heritage) Carbon and Peatland 2016 map;
 - James Hutton Institute, National Soil Map of Scotland (1:250,000);
 - British Geological Survey (BGS) Onshore GeoIndex (1:50,000);
 - BGS Hydrogeological maps of Scotland (1,100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets);
 - Fisheries Management Scotland (FMS) District Salmon Fishery Board and River/Fisheries Trust information;
 - SEPA rainfall data, flood maps, reservoir flooding map and environmental data; and
 - National Rivers Flow Archive (NRFA) website.

Field Surveys

- 8.3.7 Detailed Site visits and walkover surveys within the Study Area were undertaken on the following dates:
- 2024 to complete initial (Phase I) peat and soil depth probing exercise;
 - February 2026 to complete site reconnaissance walkover and additional peat and soil (Phase I and II) depth probing;
 - April 2026 to complete additional peat and soil depth (Phase II) probing, a hydrological walkover, watercourse crossing survey, review areas of potential GWDTE, and complete a private water supply (PWS) survey.
- 8.3.8 The field surveys were undertaken in order to:
- verify the information collected during the desk and baseline study;
 - allow the assessment authors to obtain a first-hand appreciation of the Site;
 - undertake a visual assessment of the main surface water features within the Site and identify and verify private water supplies;
 - identify drainage patterns, areas vulnerable to erosion or sediment deposition, and any pollution risks;
 - visit any identified potential GWDTE areas (in consultation with the project ecologist);
 - visit any potential watercourse crossings and prepare a schedule of potential watercourse crossings;



- inspect rock exposures and establish by probing, an estimate of overburden thicknesses, peat depth and stability;
 - confirm underlying substrate, based on the type of refusal of a peat probe and by coring;
 - assess peatland condition within the Site; and
 - determine gradients, potential borrow pit locations, access routes, ground conditions, etc., and to assess the relative location of all the components of the Proposed Development.
- 8.3.9 The desk study and field surveys have been used to identify potential development constraints and have been used as part of the iterative design process. Further details on the design process and evolution of the Proposed Development are found in **Chapter 3**.
- 8.3.10 The data obtained as part of the desk study and collected as part of the field work has been processed and interpreted to complete the impact assessment and recommended mitigation measures where appropriate.

Assessment of Potential Effect Level and Significance

- 8.3.11 **Technical Appendix 1.1** provides an overview on the general approach to the Environmental Impact Assessment (EIA).
- 8.3.12 The significance of potential effects as a result of the Proposed Development has been assessed by considering two factors: the sensitivity of the receiving environment and the potential magnitude of impact, should that effect occur.
- 8.3.13 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of likely effects presented by the Proposed Development.
- 8.3.14 The assessment methodology has also been informed by experience of carrying out similar assessments for wind farms in comparable site settings, and other renewable energy developments, knowledge of the geology and water environment characteristics in Scotland and cognisance of good practice.
- 8.3.15 The criteria for determining the significance of effect are provided in **Table 8-2**, **Table 8-3** and **Table 8-4**.

Sensitivity of Receptor

- 8.3.16 The sensitivity of the receiving environment (i.e. the baseline quality of the receiving environment) is defined as its ability to absorb an effect without a detectable change and can be considered through a combination of professional judgement and a set of pre-defined criteria which is set out in **Table 8-2**.
- 8.3.17 Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 8-2: Criteria for Assessing Sensitivity of Receptor

Sensitivity	Definition
High	• soil type and associated land use is highly sensitive (e.g. unmodified blanket bog or peatland, Class 1 or 2 priority peatland habitats or prime agricultural land); • extensive areas of deep peat (>1 m deep) are recorded;



Sensitivity	Definition
	- SEPA Water Framework Directive (WFD) water body classification of moderate to high; - high ecological importance or national or international value (e.g. Geological Conservation Review (GCR) site, Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) where designated features are dependent on geological, hydrology and/or hydrogeological environment; - extensive areas of flooding are recorded on SEPA's future flood maps and/or water body acts as an active floodplain or flood defence; - a Potential Vulnerable Area (PVA); - public and/or private water supply (including Drinking Water Protected Areas (DWPAs)); - groundwater vulnerability is classified as Class 4 to 5; - groundwater aquifer is considered highly productive aquifer; and - areas of potential GWDTE have been identified and considered to be predominately supported by groundwater.
Medium	- soil type and associated land use moderately sensitive (e.g. arable land which is not classified as prime, commercial forestry, modified peatland e.g. by drainage or forestry or Class 3 and 5 peatland habitats); - areas of peat <1 m deep are recorded; - SEPA WFD water body classification of poor to moderate; - isolated areas of flooding are recorded on SEPA's future flood maps which are shallow (<0.3 m deep) and / or confined to immediate waterbody corridors; - groundwater aquifer vulnerability of Class 2 to 3; - groundwater aquifer is considered a moderately productivity aquifer; and - areas of potential GWDTE have been identified and considered to be predominately supported by rainfall and / or surface water.
Low	- soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing of sheep and cattle or Class 4 and 0 peatland habitats); - no peat deposits are recorded; - SEPA WFD water body classification of poor to bad; - development is not shown to be at risk of flooding on SEPA's future flood maps; - groundwater vulnerability is classified as Class 0 to 1; - groundwater aquifer is not considered a significant aquifer or low to very low productivity; - surface water and groundwater not for water supplies (public or private); and - no areas of potential GWDTE have been identified.
Not sensitive	Receptor would not be affected by the Proposed Development e.g. lies within a different and unconnected geological, hydrological and/or hydrogeological catchment.

Magnitude of Impact

8.3.18 The potential magnitude of impact would depend upon whether the potential impact would cause a fundamental, material or detectable change. In addition, the timing,



scale, size and duration of the potential impact resulting from the Proposed Development are also determining factors.

- 8.3.19 The criteria that have been used to assess the magnitude of impact are defined in **Table 8-3**. The characteristics of the impacts are described as direct / indirect, temporary (reversible) or permanent (irreversible), together with timescales (short, medium and long term).

Table 8-3: Criteria for Assessing the Magnitude of Impact

Magnitude	Criteria	Definition
High	Results in a loss of an attribute	Long term or permanent changes to the baseline hydrology, hydrogeology and geology (including soils and peat) such as: • permanent degradation and total loss of soils or peatland habitat; • loss of important geological structure/features; • wholesale changes to watercourse channel, route, hydrology or hydrodynamics; • changes to the baseline environment resulting in an increase in surface water runoff with flood potential and also significant changes to erosion and sedimentation patterns; • major changes to the water chemistry; and • major changes to groundwater levels, flow regime and risk of groundwater flooding.
Medium	Results in impact on integrity of attribute or loss of part of an attribute	Material but non-fundamental and short to medium term changes to the baseline hydrology, hydrogeology and geology (including soils and peat) such as: • loss of extensive areas of soils or peat habitat, damage to important geological structures/features; • some fundamental changes to watercourses, hydrology or hydrodynamics; • changes to baseline environment resulting in an increase in surface water runoff within system capacity; • moderate changes to erosion and sedimentation patterns; • moderate changes to the water chemistry of surface runoff and groundwater; and • moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	Results in minor impact on an attribute	Detectable but non-material and transitory changes to the baseline hydrology, hydrogeology and geology (including soils and peat) such as: • minor or slight loss of soils or peatland or slight damage to geological structures/features; • minor or slight changes to the watercourse, hydrology or hydrodynamics; • changes to baseline environment resulting in slight increase in surface water runoff within the drainage system capacity; • minor changes to erosion and sedimentation patterns; • minor changes to the water chemistry of surface runoff and groundwater; and



Magnitude	Criteria	Definition
		minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use or integrity	No perceptible changes to the baseline hydrology, hydrogeology and geology (including soils and peat) such as: - no impact or alteration to existing important soils, peatland or geological environs; - no alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns; - no pollution or change in water chemistry to either groundwater or surface water; and - no alteration to groundwater recharge or flow mechanisms

Significance of Effect

- 8.3.20 The sensitivity of a receptor together with the magnitude of the impact determines the significance of the effect, which can be categorised into level of significance as identified in **Table 8-4** which provides a guide to assist in decision making. The likelihood of the significance of the effect is also considered at this qualitative assessment stage.
- 8.3.21 In some cases, the potential sensitivity of the receiving environment or the magnitude of potential impact cannot be quantified with certainty and, therefore, professional judgement remains the most robust method for identifying the predicted significance of a potential effect.
- 8.3.22 Effects of ‘major’ or ‘moderate’ significance are considered to be significant in terms of the EIA Regulations within this assessment.

Table 8-4: Significance of Effect Criteria

		Sensitivity of Receptor / Receiving Environment to Change			
		High	Medium	Low	Negligible
Magnitude of Impact	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Potential Cumulative Effects

- 8.3.23 The assessment also considers potential cumulative effects associated with other developments within 5 km of the Site and in the same surface water catchments as the Proposed Development. A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Site in combination with other developments within the cumulative Study Area which are likely to affect soils or geology, surface water and groundwater.

Committed Mitigation and Enhancement

- 8.3.24 Potential effects of the Proposed Development on geology, hydrology, hydrogeology and peat identified by the assessment have considered the design of the Proposed Development and the application of good practice guidance to be



implemented as standard during construction and operation, to prevent, reduce or offset effects where possible (embedded mitigation). As such, several good practice measures would form an integral part of the construction process, and these have been considered prior to assessing the likely effects of the Proposed Development (standard mitigation).

- 8.3.25 Good practice measures would be applied in relation to pollution risk, sediment management, peat management and management of flood risk and surface runoff rates and volumes. These would form part of the final Construction Environmental Management Plan (CEMP) which would be prepared during the detailed design stage of the project and secured by a planning condition prior to construction commencing. An outline CEMP is provided as **Technical Appendix 11.1**. An Operational Environmental Management Plan (OEMP) will also be prepared to maintain the relevant mitigation and management measures established during the construction phase into the operational phase of the Proposed Development.
- 8.3.26 The final CEMP would also include details and responsibilities for environmental management on-site and would outline the necessary surface water management, oil and chemical delivery and storage requirements, waste management, traffic and transport management and would specify response procedures to environmental incidents as well as monitoring requirements for wastewater, water supply and all appropriate method statements and risk assessments for the construction of the Proposed Development.

Assessment of Residual Effect Level and Significance

- 8.3.27 The assessment of residual effects follows the same process and criteria as the assessment of potential effects but takes account of the committed additional (secondary) mitigation and enhancement measures.

Limitations, Difficulties and Uncertainties

- 8.3.28 The assessment uses site investigation data, survey data and publicly available data sources, from but not limited to SEPA, BGS, NatureScot and East Ayrshire Council (EAC), as well as additional information supplied from stakeholders during the scoping and consultation stages.
- 8.3.29 No field work has been completed to inform the appraisal for the assumed grid connection corridor and AIL route, however these areas will be subject to future planning applications and which will benefit from field work to support these applications.
- 8.3.30 It is considered that the data and information used to complete this assessment is robust and that there are no significant data gaps or limitations.

8.4 Baseline Conditions

Climate and Topography

- 8.4.1 The site setting and local hydrology is presented as **Figure 8.1** and **8.2**.
- 8.4.2 Ground elevations at the Site range from approximately 192 m along the southern and northern boundary of the Site to approximately 285 m in the northeastern extent of the Site. The ground profile at the Site has been modified by historic mining and large amounts of colliery backfill are recorded across the Site.



- 8.4.3 SEPA has provided precipitation data for Dalblair rain gauge (station number 538510), which is located approximately 670 m southeast of the Site. In 2025, a precipitation total of 1,106.6 mm was recorded.

Designated Sites

- 8.4.4 Review of NatureScot SiteLink website indicates that the following designated sites are within the Study Area, as shown on **Figure 8.1**:
- Muirkirk Uplands Special Site of Scientific Interest (SSSI) which is located along the eastern boundary of the Site and 500 m north of the Site, on the opposite side of the Bellow Water to the Site. The SSSI has been designated for blanket bog and upland habitats, breeding and non-breeding bird assemblages and localised exposures of fossiliferous rock which are considered sensitive to changes to the surrounding geological or water environment;
 - Muirkirk and North Lowther Uplands Special Protection Area (SPA), located along the eastern boundary of the Site and 500 m north of the Site and has been designated for breeding and non-breeding bird assemblage; and
 - Airds Moss Special Area of Conservation (SAC) which is located approximately 500m north of the Site on the opposite side of the Bellow Water to the Site and has been designated for blanket bog habitats which are considered sensitive to changes to the surrounding geological or water environment.
- 8.4.5 The eastern boundary of the potential grid connection route intersects the Lagrae Burn SSSI and Geological Conservation Review (GCR) site whilst the proposed AIL route will intersect the Lugar Sill SSSI and GCR site. The Lagrae Burn and Lugar Sill SSSIs and GCRs have been designated for important assemblages of Upper Carboniferous sediments and internationally important igneous rock exposures respectively.

Geology and Soils

- 8.4.6 It is noted that the geological conditions within the Site have been previously disturbed by mining activities, the extent of which is shown on **Figures 8.3 to 8.5** and **Figure 8.8**. A Coal Mining Risk Assessment (CMRA) is presented within **Technical Appendix 8.6** which describes the past mining history within the Site.

Soils

- 8.4.7 An extract of the 1:250,000 Scotland's Soils mapping is shown in **Figure 8.3**, indicating the majority of the Site, where not disturbed by previous mining activities, is underlain by mineral gleys.
- 8.4.8 Parts of the western and eastern extent of the Site are shown to be underlain by peat soils whilst the north-western corner of the Site is underlain by peaty gleys.

Peat and Superficial Deposits

- 8.4.9 BGS superficial deposit mapping, see **Figure 8.4**, shows that the Site, where not disturbed by previous mining activities, is generally underlain by glacial till, with isolated deposits of peat particularly within the northern extent of the Site. Where previous surface mining has occurred, these deposits have been removed.
- 8.4.10 Alluvium and glaciofluvial deposits are recorded along the northern, northwestern and southern boundary of the Site associated with the Bellow Water and Glenmuir Water respectively. Smaller areas of alluvium are also noted within the northern extent of the Site along the banks of the Gass Water whilst other smaller



- watercourse channels within the Site are shown to be absent of any superficial deposits.
- 8.4.11 Areas of made ground are also noted within the northern extent of the Site associated with back fill from historic mining activities.
- 8.4.12 Peatland classification mapping published by NatureScot (see **Figure 8.5**) shows that majority of the Site is underlain by mineral soils (Class 0) which are not considered to represent peatland habitats. Areas of Class 5 peatland are noted within the northern extent of the Site whilst an area of Class 1 peatland is shown within the western extent of the Site.
- 8.4.13 Class 5 peatland habitats are not considered priority peatland habitats however soils may remain carbon-rich and areas of deep peat may be present where not disturbed by previous opencast mining. Class 1 peatland areas are considered areas of potentially nationally important carbon-rich soils, deep peat and priority peatland habitat, likely to be of high conservation value and restoration potential.
- 8.4.14 As part of the baseline assessment, comprehensive peat probing and condition surveys were undertaken in accordance with current guidance published by Scottish Government, SEPA and NatureScot. The results of the surveys are shown on **Figures 8.6** and **Figure 8.7** and have been used to inform a site-specific Peat Landslide Hazard Risk Assessment (PLHRA), outline Peat Management Plan (PMP) and peatland condition assessment (see **Technical Appendix 8.1**, **Technical Appendix 8.2** and **Technical Appendix 8.3**).
- 8.4.15 To summarise, site surveys have confirmed:
- The majority of the Site recorded a peat depth ≤ 0.5 m (approximately 78% of all peat probes recorded) with an average thickness of peat across the Proposed Development of 0.4 m;
 - Peat is generally absent across the Site, with some localised deposits recorded across the northern and central area of the Site. A maximum depth of 6.3 m was recorded within the centre of the Site; and
 - The condition of the peat (where present) at the Site has been classified as artificially drained or modified.
- 8.4.16 Further details of the peat depth and condition surveys are discussed in **Technical Appendices 8.1**, **8.2** and **8.3**.

Bedrock Geology

- 8.4.17 An extract of the BGS regional bedrock geological and linear features mapping is presented as **Figure 8.8**. This shows that the Site, prior to mining, was underlain by numerous sedimentary bedrock units comprising sandstones, limestones and sedimentary rock cycles with coal and interbedded lavas. Igneous intrusion rocks comprising microgabbros also recorded within the western extent of the Site. Numerous inferred faults and coal seams are recorded across the Site.
- 8.4.18 It is noted that the bedrock and superficial geology have been disturbed by historic deep and surface coal mining.
- 8.4.19 The assumed grid connection and AIL route are located in a similar geological setting to the Site.



Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

- 8.4.20 Extracts of the BGS 1:625,000 scale Hydrogeology of Scotland map and 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets are presented in **Figure 8.9**.
- 8.4.21 The majority of the bedrock underneath the Site has been classified by BGS as a moderately productivity aquifer which has been classified as a multi-layered aquifer with low yields except where disturbed by mining which affords secondary permeability and greater groundwater storage.
- 8.4.22 The Aquifer Productivity and Groundwater Vulnerability datasets classify the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. The data presented in **Figure 8.9** does not take account of the former coal mining activities.
- 8.4.23 The peat and glacial till superficial deposits are not classified as a significant aquifer.
- 8.4.24 The alluvial and river terrace deposits are classified moderate to high productivity aquifers which are characterised by intergranular groundwater movement. The sand and gravel horizons within these deposits can store groundwater and permit groundwater movement, however, their limited extent can hinder their ability to provide reliable groundwater yields. Local differences in thickness, material type and sorting can also cause a considerable range in hydraulic conductivity. Given the proximity of these deposits with nearby watercourses, including the Gass Water and Glenmuir Water, the groundwater within these deposits is likely to be shallow and in hydraulic continuity with these watercourses.
- 8.4.25 The majority of the sedimentary bedrock deposits within the Site are confirmed to be a moderate productivity aquifer with intergranular and fracture flow. The Passage Formation rocks along the north-western boundary of the Site are considered a high productivity aquifer with significant intergranular flow whilst the igneous intrusion rocks within the south-western extent of the Site have been classified as a very low productivity aquifer.
- 8.4.26 Where previous surface mining areas have been backfilled with overburden and interburden from between the exploited coal seams, groundwater is likely to be present and in hydraulic continuity with the surrounding bedrock.
- 8.4.27 The potential groundwater vulnerability in the uppermost aquifer within the Site is illustrated to vary. Lower areas of groundwater vulnerability (Class 1 to 3) are noted within the northern extent of the Site whilst the remainder of the Site is classified as Class 4a to 4b. Very small areas of Class 5 are noted within the northern extent of the Site where little or no superficial deposits are recorded, and thus where there is little attenuation of potential pollutants prior to entry to shallow groundwater.
- 8.4.28 It is recognised that the Aquifer Productivity and Groundwater Vulnerability mapping is unlikely to account for localised areas of surface coal mining and disturbed ground within the Site.

Groundwater Levels and Flow

- 8.4.29 In response to a data request, SEPA has confirmed that they do not hold any specific groundwater level data within the Study Area.



- 8.4.30 Natural groundwater recharge within the locally is limited by the following factors:
- steeper topographic gradients which will result in rainfall forming surface water runoff; and
 - presence of peat and glacial till deposits inhibiting infiltration owing to their generally low bulk permeability.
- 8.4.31 This is evidenced by the relatively high density of surface water streams shown on mapping and witnessed during site surveys.
- 8.4.32 In the absence of published information or data held by SEPA, it is anticipated that groundwater will be present as perched groundwater within the more permeable horizons of the glacial till, within the alluvium and river terrace deposits and sedimentary bedrock deposits.
- 8.4.33 Regionally groundwater is likely to follow topographic gradients (i.e. be approximated to the surface water catchment), however, locally, groundwater may be altered by previous mining activities especially where mining voids (e.g. adits) or backfilled surface mining are present.
- 8.4.34 It is understood there is no active control (e.g. pumping) of groundwater occurring at Site and all groundwater management measures and monitoring ceased when coal working stopped.

Groundwater Quality

- 8.4.35 All of Scotland's groundwater bodies have been designated as DWPA's under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2013 and require protection for their current use or future potential use as drinking water resources.
- 8.4.36 The current status of groundwater bodies in Scotland has been classified by SEPA in accordance with the requirements of the WFD. SEPA has identified that the Site is located within the Cumnock groundwater body (SEPA ID: 150646).
- 8.4.37 The groundwater body was classified in 2024 (the latest reporting cycle) as having Poor overall status, owing to the long-term implications of poor water quality and chemical presence within the aquifer. No specific pressures have been identified.
- 8.4.38 The recorded poor water quality is likely to reflect the presence of many decades of coal working regionally (e.g. a geogenic source impairing regional water quality).

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

- 8.4.39 A National Vegetation Classification (NVC) habitat mapping exercise was conducted as part of the ecology baseline assessment, and this has been used to identify potential areas of GWDTE within the Site. The methodology and results of the NVC habitat mapping exercise are discussed in detail within **Chapter 6**. With reference to SEPA guidance, areas of potential GWDTE are shown on **Figure 8.10**. An assessment of potential areas of GWDTE, and in particular consideration whether the habitats are sustained by groundwater or surface water is presented in **Table 8-5**.
- 8.4.40 The assessment of geology and hydrogeology beneath and adjacent to the areas of potential GWDTE is made with reference to published mapping. It is recognised over large areas of the Site the superficial and upper bedrock horizons have been removed and disturbed by previous surface coal mining. Whilst the coal at site will have been removed the overburden and interburden (rocks between the coal seams) have been backcast into the open coal mining void and used to restore the



site. This material comprises broken and a heterogenic deposit of clay, sandstone, mudstone, siltstone and limestone that permits groundwater movement and storage. Typically, it has a higher bulk permeability than the surrounding *in situ* (unworked) bedrock and therefore does not hinder local or regional groundwater movement nor cause an upwelling of groundwater which might support a GWDTE habitat.

Table 8-5: GWDTE Risk Assessment

NVC Community	Location and Distribution of Potential GWDTE within the Site and Likely Groundwater Dependency
M4	There is one area of M4 noted within the western extent of the Site. No development is proposed within 250 m of this habitat and therefore, in accordance with SEPA guidance, no further assessment is required.
M6	Areas of M6 are generally recorded in linear features across the Site with larger isolated areas within the northern extent of the Site. The smaller linear features are shown to coincide with existing mapped watercourses, drainage features and existing surface water flow paths as mapped by the SEPA flood mapping. The larger areas of M6 habitats are generally underlain by low permeability glacial till and peat deposits. One habitat is shown to be partially underlain by glaciofluvial deposits whilst another habitat is shown to be partially underlain by sedimentary bedrock units. No groundwater emergence was recorded in these areas during the hydrological walkover survey and the habitat is at an elevation of >200mAOD (e.g. above the elevation of the likely regional groundwater table and elevation of larger watercourses that bound the site). It is therefore considered that the M6 habitats within the Site are predominately sustained by surface water and waterlogging of soils adjacent to watercourses and above the low permeability soils rather than emergent groundwater. No further assessment is required.
M15	M15 habitats were recorded in the northern extent of the Site. These deposits are shown to be underlain by low permeability peat and glacial till deposits. No groundwater emergence was recorded during the hydrological walkover in these areas. It is therefore considered that the M15 habitats within the Site are predominately sustained by surface water flow and waterlogging of soils above the low permeability deposits rather than emergent groundwater. No further assessment is required.
M23a	Areas of M23 habitat are recorded in isolated areas across the Site. The majority of the habitats are shown to be underlain by low permeability glacial till and peat deposits. Where the deposits are not underlain by low permeability deposits they are shown to be along existing watercourse corridors or around existing water features within the Site. Therefore, it is considered that the M23 habitats within the Site are predominately sustained by surface water runoff and waterlogging of soils rather than emergent groundwater. No further assessment is required.
M27	There are three isolated areas of M27 noted within 250 m of the Proposed Development, within the northern extent of the Site. The habitats are noted within existing surface water flow paths as shown by SEPA flood mapping near existing mapped watercourses. It is therefore considered that these habitats are also sustained by surface water flow rather than emergent groundwater. In addition, no groundwater emergence was recorded in these areas during the hydrological walkover. No further assessment is proposed.
MG9	Areas of MG9 are recorded across the Site. These habitats are shown to be underlain by low permeability glacial till and peat deposits. The habitats are also noted along existing watercourse corridors. This distribution is not consistent with emergent groundwater such as springs or seepage lines.



NVC Community	Location and Distribution of Potential GWDTE within the Site and Likely Groundwater Dependency
	Therefore, it is considered that the MG9 habitats within the Site are predominately sustained by surface water runoff and waterlogging of soils rather than emergent groundwater. No further assessment is required.
MG10	MG10 habitats are present across the Site. They are generally shown to be underlain by low permeability glacial till deposits, but are also present in areas of peat, glaciofluvial deposits and alluvial deposits. Alluvium and river terrace deposits may contain groundwater, but this is likely to be in hydraulic continuity with nearby watercourses and not emerge as springs or at ground. The habitats are noted along existing watercourse corridors in some areas, particularly in the northern extent of the Site. This distribution is not consistent with emergent groundwater such as springs or seepage lines. Therefore, it is considered that the MG9 habitats within the Site are predominately sustained by surface water runoff, incident rainfall, and waterlogging of soils rather than emergent groundwater. No further assessment is required.
W4	Isolated areas of W4 are recorded across the Site. Within 250 m of the Proposed Development, the habitat is shown to be underlain by low permeability peat, glacial till and alluvium deposits. In general, limited groundwater is anticipated within these deposits due to their general low bulk permeability, except for alluvium deposits. No emergent groundwater was recorded within this area during the hydrological walkover survey. It is therefore considered that the W4 habitats within the Site are predominately sustained by surface water runoff and waterlogging of soils rather than emergent groundwater. No further assessment is required.
W7	W7 habitats are recorded in the northern and southern extents of the Site. Within 250 m of the Proposed Development the habitats are shown to be underlain by alluvial and glaciofluvial deposits where groundwater may be present. This groundwater is likely to be in hydraulic continuity with the nearby watercourses. The habitats are also noted along existing watercourse corridors and surface water flow paths shown on the SEPA flood maps. This distribution is not consistent with emergent groundwater such as springs or seepage lines. Therefore, it is considered that the W7 habitats within the Site are predominately sustained by surface water runoff and waterlogging of soils rather than emergent groundwater. No further assessment is required.

8.4.41 Review of **Table 8-5** shows that the majority of areas of potential GWDTE were or are underlain by low permeability peat and glacial superficial deposits or are located within existing watercourse corridors and surface water flow paths. This distribution is not typical of that which is sustained by emerging groundwater but rather it is likely to be supported by rainfall, shallow surface water ponding and water logging of soils adjacent to watercourses or above the low permeability deposits. In addition, no groundwater emergence was recorded during the hydrological walkover survey.

8.4.42 It is concluded that the potential GWDTE habitats are not sustained by groundwater. However, safeguards to maintain these habitats, and sustain the surface water flows and preserve water quality to these habitats, will be implemented during construction and operation of the Proposed Development.

Hydrology

Local Hydrology

8.4.43 The hydrology within the Study Area is shown on **Figures 8.1** and **8.2**.



- 8.4.44 The entire Study Area is located within the Lugar Water catchment which is part of the wider River Ayr catchment. The Site is drained by the following sub catchments of the Lugar Water:
- The northern extent of the Site is located within the Bellow Water / Gass Water sub catchment. The Gass Water flows north-west through the northern extent of the Site before discharging into the Bellow Water approximately 570m northwest of the Site. The Bellow Water flows southwestward before discharging into the Lugar Water approximately 1.3 km west of the Site. Approximately 38 % of the Site is located within this sub catchment including turbines T1 to T5 and T7 and two proposed compound areas.
 - The remainder of the Site is located within the Glenmuir Water sub catchment which includes turbines T6, T8 and T9 to T14 and the proposed substation and BESS compound areas. The Glenmuir Water flows generally northwestward along the southern boundary of the Site before discharging into the Lugar Water approximately 1.3 km west of the Site.
- 8.4.45 Several tributaries of the Gass Water and Glenmuir Water rise within the Site however the local hydrology has been modified from previous mining activities (which is further discussed in **Section 8.5** and **Technical Appendix 8.4**). Several settlement ponds, associated with previous coal processing operations at Site, are located in the north of the Site. Water is also present within the mining voids at both Dalfad and Duncanziemere Coal Mines.
- 8.4.46 The southern extent of the proposed AIL route is within another sub catchment of the Lugar Water (Glaisnock Water sub catchment) whilst the southern extent of the assumed grid connection is located within the River Nith catchment.
- 8.4.47 None of the surface water catchments which drain the Study Area, assumed grid connection corridor or proposed AIL route have been designated as a DWPA. In addition, a review of the Scottish Water asset plans confirms that there are no assets within the Site.

Surface Water Flow and Quality

- 8.4.48 The Gass Water and Lugar Water are monitored at gauging stations (Gass Water at Welltress [reference 83012] and Lugar Water at Langholm [reference 83004]) within the northwestern extent of the Site and approximately 10 km west (downstream) of the Site respectively. Mean surface water flows are recorded to be 0.426 m³/s and 5.661 m³/s respectively.
- 8.4.49 SEPA classify larger watercourses within the Study Area as part of its responsibility under the WFD. The quality of watercourses relevant to the Site are presented in **Table 8-6**. Smaller watercourses within the Study Area are not monitored and classified by SEPA.

Table 8-6: SEPA WFD Classifications (2024)

Waterbody (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical	Hydro-morphology	Pressures
Bellow Water / Gass Water (ID: 10433)	High	High	High	High	None
Lugar / Glenmuir Water (ID: 10430)	Good	Good	High	Good	None



Fisheries

- 8.4.50 Fisheries within the area are managed by the Ayrshire Rivers Trust (ART) in partnership with the River Ayr District Salmon Fishery Board. Further details on fisheries are discussed in in **Chapter 6**.

Flood Risk

- 8.4.51 SEPA has developed national flood maps that present modelled flood extents for river, coastal, groundwater and surface water flooding. The river, coastal, surface water and groundwater maps were developed using a consistent methodology to produce outputs for the whole of Scotland, supplemented with more detailed, local assessments where available and suitable for use.
- 8.4.52 Flood extents are presented in three likelihoods:
- high likelihood: a flood event is likely to occur in the defined area on average more than once in every ten years (1:10), or a 10 % chance of happening in any one year;
 - medium likelihood: a flood event is likely to occur in the defined area on average more than once in every two hundred years (1:200), or a 0.5 % chance of happening in any one year; and
 - low likelihood: a flood event is likely to occur in the defined area on average more than once in every thousand years (1:1,000), or a 0.1 % chance of happening in any one year.
- 8.4.53 SEPA has also produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act 2011.
- 8.4.54 SEPA also publish potential future flood extents (to the year 2080 for fluvial and 2070 for pluvial flooding) which account for the potential uplifts in rainfall depths and intensities as a consequence of climate change. An extract of this mapping is shown on **Figure 8.2** and is considered in the summary of potential sources of flooding presented in **Table 8-7**.

Table 8-7: Flood Risk Screening

Potential Flood Risk Source	Potential Flood Risk to the Proposed Development	Justification
Coastal or Tidal Flooding	No	The Site is at situated at an elevation of at least 200 m AOD and is remote from the coast. SEPA coastal flood mapping confirms the Site is not at risk from coastal or tidal flooding now or in the future.
River or Fluvial Flooding	No	Areas of fluvial flooding are shown along the banks of the Gass Water and Glenmuir Water within the Site however flood extents are not shown to extend beyond the immediate watercourse corridors. No element of the Proposed Development, except for an existing watercourse crossing (WCX02 as shown on Figure 8.2 and discussed in Technical Appendix 8.4), is shown to be at risk from fluvial flooding now or in the future. It is noted that Cumnock (downstream of the Site) has been designated as a potentially vulnerable area (PVA) from fluvial flooding from the Lugar Water.



Potential Flood Risk Source	Potential Flood Risk to the Proposed Development	Justification
Surface Water and Small Watercourse Flooding	Yes	SEPA surface water and small watercourses (<10 km ² catchments) flood mapping confirms that there are floodplains associated with the smaller watercourses and settlement ponds within the Site. There are also surface water flow paths within the Site. Flood extents generally coincide with existing watercourse corridors or comprise of shallow (<0.3 m deep) surface water flow paths towards the existing watercourses. Smaller isolated deeper areas of flood risk are noted across the Site associated with topographic lows within the Site and from previous mining activities. Except for very small areas of the proposed access tracks no development is proposed within areas of surface water flooding deeper than >0.3 m deep.
Groundwater Flooding	No	SEPA flood mapping does not indicate any areas of potential groundwater flood risk within the Site.
Flooding due to Dam or Reservoir Failure	No	SEPA reservoir inundation flood mapping confirms that the Site is not at risk from any breach scenarios from dam or reservoir failure.
Flood Defence Breach	No	SEPA mapping indicates that there are no flood defence schemes within the Study Area.
Flooding from Artificial Drainage Systems	No	The Site comprises historic mining site as such, no large-scale artificial drainage systems are present within the Site. Any drainage comprises of open channels and settlement ponds which have been assessed as part of surface water or fluvial flood risks.

Private Water Supplies

- 8.4.55 Consultation with EAC has been undertaken to gather details on registered private water supplies (PWS) within the Study Area. Additional properties, and potential water users, were also identified following a programme of site-specific field investigation that involved visiting the properties within the Study Area.
- 8.4.56 The risk the Proposed Development poses to PWS has been considered as part of this assessment and is presented in **Technical Appendix 8.5**. The assessment has been undertaken in accordance with SEPA's guidance for assessing the impact on developments on groundwater abstractions.
- 8.4.57 In summary the assessment confirms that neither the yield nor quality of water at the PWS supplies within the Study Area are considered to be at risk from the Proposed Development.
- 8.4.58 EAC database confirmed that there are an additional five PWS located within 250 m of the assumed grid route corridor. No additional PWS shown on the EAC database are noted within 250 m of the proposed AIL route. Subject to further assessment at the time the planning applications are made for these elements and the adoption of industry good practice guidance no effects on potential PWS sources are anticipated.



Authorised Sites

- 8.4.59 Review of SEPA's environmental database indicates that there are 18 Controlled Activity Regulations (CAR) or Environmental Authorisations (Scotland) Regulations (EASR) records within the Study Area (see **Figure 8.1**), the details of which include:
- six discharges for private sewage systems and one discharge for sheep dip onto land;
 - seven engineering authorisations for bridges, watercourse or culvert realignment or removal and bank reinforcements;
 - three discharges for other effluent mine water from previous mining activities; and
 - one water abstraction monitoring point for previous Powharnal / Dalfad Open Cast Coal Site which is it understood is no longer used.
- 8.4.60 No additional licenced abstractions are recorded within 250 m of the assumed grid route corridor or AIL route.

Summary of Sensitive Receptors

- 8.4.61 **Table 8-8** outlines the receptors identified as part of the baseline studies, and their sensitivity based upon previously detailed criteria contained in **Table 8-2**. These receptors form the basis of the assessment, and as per the methodology, are used in conjunction with a magnitude of effect to determine significance.

Table 8-8: Summary of Sensitive Receptors

Receptor	Sensitivity	Reason for Sensitivity
Geological and water-dependent statutory designated sites	High	Statutory designated sites are recorded within the Study Area with designated features which are sensitive to changes in water environment.
Peat and carbon-rich soils	High	Area of Class 1 peatland has been recorded within the Site and site-specific peat depth probing has confirmed areas of deep peat (>1 m deep) within the Site.
Superficial and bedrock geology	Not sensitive	The superficial and bedrock geology is common regionally and has no specific rarity value. No designated geological sites are recorded within the study area.
Groundwater	High	Groundwater quality beneath the Site has been classified as Poor however areas of the Site have been classified with Class 5 groundwater vulnerability.
GWDTE	Medium	Areas of potential GWDTE have been identified within the Site by NVC mapping, however, it has been confirmed that these are likely to be sustained by surface water rather than groundwater.
Surface water	High	Watercourses within the study area downstream of the Proposed Development which have been classified by SEPA as Good or High overall status.
DWPA	Not sensitive	None of the water catchments which drain the Site have been designated as a DWPA.
Scottish Water Assets	Not sensitive	Review of Scottish Water asset maps confirms that there are no assets within the Site.



Receptor	Sensitivity	Reason for Sensitivity
Flood risk receptors downstream of the Proposed Development	High	Isolated areas of flooding are recorded on SEPA's future flood maps which are shallow (< 0.3 m deep) and / or confined to immediate waterbody corridors, however Cumnock (downstream of the Proposed Development) has been designated as a PVA.
PWS	Not sensitive	It has been confirmed (see Technical Appendix 8.5) that none of the PWS sources within the Study Area are considered to be at risk from the Proposed Development.
Licenced Abstractions	Not sensitive	No active licensed abstractions have been recorded within the Study Area.

Future Baseline in Absence of Proposed Development

- 8.4.62 Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher average temperatures. This means that there is likely to be greater pressures on water supplies and lower water levels in summer months in the future. Additionally, summer storms are predicted to be of greater intensity.
- 8.4.63 Peak fluvial and surface water (pluvial) flows associated with extreme storm events may also increase in volume and velocity. Whilst not relevant to this Site, further sea rise is also anticipated.
- 8.4.64 These potential changes are considered in the assessment of effects. Whilst there is uncertainty surrounding the future baseline environment, assuming the current land use remains unchanged, there are no other anticipated changes on the soils, geology, hydrological or hydrogeological environment throughout the anticipated lifetime of development other than climate change.

8.5 Embedded and Standard Mitigation

Embedded Mitigation

- 8.5.1 Embedded mitigation measures are those measures that are inherent to the Proposed Development. This includes mitigation by design (also known as primary mitigation), implemented through design iteration works as described in **Chapter 3: Design Evolution and Alternatives**.
- 8.5.2 The Proposed Development has been designed, as far as possible, to avoid and minimise impacts and effects to geology, peat, hydrology and hydrogeology through the process of design development, and by embedding mitigation measures into the design. This has included using existing access tracks, avoiding areas of peat and carbon-rich soils, areas of potential flooding, PWS sources and groundwater dependent GWDTEs where practically possible, minimising development in riparian corridors and maintaining a buffer to watercourses where practically possible.

Peat Identification and Avoidance

- 8.5.3 The potential presence of peat within the Site formed a key consideration in the layout of the Proposed Development. Informed by detailed peat depth surveys undertaken across the Site, the majority of the Proposed Development avoids peat entirely, with limited encroachment on peat areas. No areas of near natural peat are present (see **Figures 8.5 and 8.6** and **Technical Appendices 8.1 to 8.3**).



- 8.5.4 In accordance with the mitigation hierarchy set out in Policy 5 of the National Planning Framework 4 (NPF4) and detailed in SEPA's and NatureScot's guidance, the Proposed Development has generally been limited to areas of peat <0.5 m deep, where peat is absent or where it has been degraded / previously modified.
- 8.5.5 Existing tracks have been used where possible to reduce the amount of peat excavations required.

Watercourse Buffers

- 8.5.6 In accordance with wind farm construction best practice guidance and SEPA consultation advice, a 50 m buffer has been applied to all watercourses (as shown on OS 1:10,000 mapping). A 10 to 15 m buffer has also been applied to watercourses identified within the Site in accordance with SEPA's riparian corridor guidance. A commitment has been made to maintain the watercourse buffers in the proposed micro-siting allowance.
- 8.5.7 The design has sought to minimise the number of locations where infrastructure does encroach within the watercourse buffers. As shown on **Figure 8.2**, the majority of the Proposed Development is proposed outside of these buffers except for the following areas:
- proposed and existing watercourse crossings;
 - approximately 370 m of existing access track which is scheduled to be upgraded as part of the Proposed Development within the northern extent of the Site;
 - approximately 200 m of proposed new access tracks near turbine T11; and
 - turbine T4 and associated hardstanding areas and approximately 770 m of proposed new access tracks near the turbine.
- 8.5.8 The area around turbine T4 was reviewed as part of the hydrological walkover and it was witnessed that the hydrology in this area has been altered by previous mining activities. It has been confirmed (see **Technical Appendix 8.4**) that the mapped watercourses in this area are not present and therefore no development is proposed within 50 m of any watercourses in this area.
- 8.5.9 No excavations >1 m deep will be required to upgrade the existing access tracks or establish the proposed new access tracks located within the 50 m water buffer and therefore in accordance with SEPA consultation advice the SEPA riparian corridor has been applied instead of the standard 50 m watercourse buffer. No development except for the proposed watercourse crossings, approximately 80 m of existing access track and approximately 40 m of proposed new access tracks south of T11, are noted within the SEPA riparian corridor buffer. This is discussed further in **Section 8.7**.

Watercourse Crossings

- 8.5.10 The Proposed Development has sought to utilise existing tracks where possible. Three new watercourse crossings are required to establish the Proposed Development, and upgrades to three existing watercourse crossings may be required subject to detailed structural assessment which will be completed prior to construction.
- 8.5.11 The locations of the proposed and existing watercourse crossings are shown on **Figure 8.2** and a schedule of the crossing points, which includes photographs and dimensions of each crossing can be found in **Technical Appendix 8.4**.



Private Water Supplies

- 8.5.12 The risk the Proposed Development poses to PWS sources within the Study Area is presented in **Technical Appendix 8.5**. It has been confirmed that none of the known PWS sources within the Study Area are at risk from the Proposed Development. The Applicant is committed to ensuring that any assumptions used to complete the PWS risk assessment are confirmed prior to the commencement of works and if required the PWS risk assessment updated, as discussed in **Technical Appendix 8.5**.
- 8.5.13 No development is proposed within 250 m of the PWS sources and the Applicant is committed to maintaining this buffer in the proposed micro-siting allowance.

Standard Mitigation

- 8.5.14 Standard mitigation (also known as tertiary mitigation) includes all mitigation usually assumed to be in place during construction and operation and is generally regarded as industry standard or best practice. Committed standard mitigation measures are set out in **Chapter 2**, with the following being specifically applicable to geology, hydrology, hydrogeology, and peat.

General Measures

- 8.5.15 As a principle, preventing the release of any pollution/sediment is preferable to dealing with the consequences of any release. There are several general measures which cover all effects assessed within this chapter and the details are given below.
- 8.5.16 Prior to construction, site-specific drainage plans would be produced. These would consider any existing local drainage which may not be mapped and incorporate any site-specific mitigation measures identified during the assessment.
- 8.5.17 Measures would be included in the final CEMP for dealing with potential pollution, sedimentation and flood risk incidents and would be developed prior to construction. This would be adhered to should any incident occur, reducing the effect as far as practicable.
- 8.5.18 The final CEMP would contain details on the location of spill kits, would identify 'hotspots' where pollution may be more likely to originate from; provide details to site personnel on how to identify the source of any spill and state procedures to be adopted in the case of a spill event. A suitably qualified and experienced specialist spill response contractor would be identified to deal with any major environmental incidents. This could be the Principal Contractor if this suitable qualification and experience can be demonstrated prior to contract award.
- 8.5.19 The final CEMP would be secured by a planning condition prior to construction commencing. Mitigation measures outlined in the final CEMP would also form measures to be adopted as part of a longer-term OEMP, as required.
- 8.5.20 A wet weather protocol would be developed. This would detail the procedures to be adopted by all staff during periods of heavy rainfall. Toolbox talks would be given to engineering, construction and supervising personnel.
- 8.5.21 Roles would be assigned to site staff, and the inspection and maintenance regimes of sediment and runoff control measures would be adopted during these periods. In extreme cases, this protocol will dictate that work on Site may have to be temporarily suspended until weather or ground conditions allow.



Environmental Manager / Ecological Clerk of Works (ECoW)

- 8.5.22 To ensure all reasonable precautions are taken to avoid negative effects on soil, peat and the water environment, a suitably qualified Environmental Manager or ECoW¹ would be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on ecological and hydrological matters.
- 8.5.23 The Environmental Manager / ECoW would be required to be present on-site during the construction phase and will carry out monitoring of works and briefings with regards to any ecological and hydrological sensitivities on the Site to the relevant staff of the Principal Contractor and subcontractors.
- 8.5.24 With respect to the water environment, the Environmental Manager / ECoW would also have responsibility for ensuring that surface water flow paths and the quality of water supporting water dependent habitats are sustained and protected during all phases of construction of the Proposed Development.

Safeguarding of Peat and Carbon-Rich Soils

- 8.5.25 The peat depth probing data has confirmed that the Proposed Development has largely avoided areas of peat (>0.5 m).
- 8.5.26 The peat depth probing data has been used to determine the volume of soil and peat which will be disturbed by the Proposed Development. This data has been used to prepare a site-specific PMP (**Technical Appendix 8.2**) which details the volume of acrotelmic and catotelmic peat which will be disturbed and how this will be safeguarded. Mitigation and good practice construction methodologies are also detailed in **Technical Appendix 8.2**.
- 8.5.27 No surplus peat will be generated, and the volumes of peat / carbon rich soils generated from the proposed excavations would be used to reinstate track verges, temporary hardstanding areas and as part of habitat and peat restoration plans.
- 8.5.28 **Technical Appendix 8.1** also confirms that there are limited areas of peat instability risk across the Proposed Development and that with the employment of common mitigation measures all the areas of peat instability can be mitigated.
- 8.5.29 Detailed design and construction practices will need to consider the particular ground conditions and the specific works at each location throughout the construction period. An experienced and qualified engineering geologist or geotechnical engineer will be appointed as a supervisor, to provide advice during the setting out, micrositng and construction phases of the Proposed Development. Where micrositng allowances exist, any movements of infrastructure would ensure the avoidance of peat if encountered, supported by intrusive ground investigations which will be undertaken post consent, prior to construction.

Water Quality Monitoring

- 8.5.30 Water quality monitoring before, during construction and post construction will be undertaken at the main watercourses which drain the Site to ensure that none of the watercourses are carrying pollutants or suspended solids. Monitoring would be carried out at a specified frequency (depending upon the construction phase).
- 8.5.31 Monitoring would continue throughout the construction phase and immediately post construction. Monitoring would be used to allow a rapid response to any pollution

¹ Refer to Technical Appendix 1.1. for a description of the roles and responsibilities relating to the implementation of environmental management measures during construction.



incident as well as assess the impact of good practice or if remedial measures to improve water quality were implemented.

- 8.5.32 Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. The performance of the good practice measures would be kept under constant review by the water monitoring schedule, based on a comparison of data taken during construction with a baseline data set, sampled prior to the construction period.
- 8.5.33 Water quality monitoring plans would be developed during prior to construction, and it is expected the monitoring programme would be secured by a pre-development planning condition to be agreed with EAC.

Works within Watercourse Buffers

- 8.5.34 No excavations >1 m deep will be required to upgrade the access tracks located within the 50 m buffer and therefore in accordance with SEPA consultation advice the SEPA's riparian corridor buffers can be adopted instead of the standard 50 m watercourse buffer. No development except for the proposed watercourse crossings, approximately 80 m of existing access track and approximately 40 m of proposed new access tracks south of T11, are noted within the SEPA riparian corridor buffer.
- 8.5.35 At these locations, additional safeguards would be deployed and included in the final CEMP, and subject to agreement with EAC. These would include, but are not limited to the following:
- increased induction and training for staff highlighting sensitivities;
 - a wet weather working protocol and provision to cease works during prolonged rainfall or periods of high runoff (pluvial or fluvial);
 - reduction in extent of working area to minimise the potential to disturb ground;
 - additional passive water quality control measures, such as temporary water diversion ditches, silt fences, and silt traps to control and treat runoff from working areas;
 - daily inspection of works and watercourses and full time supervision of construction and restoration and works;
 - deployment of real-time water quality monitoring telemetry with predetermined water quality trigger levels based on baseline water quality data (e.g. for pH, dissolved oxygen and electrical conductivity); and
 - documentation that clearly identifies responsibilities, actions and contact details should a pollution event be recorded.

Pollution Risk

- 8.5.36 Good practice measures in relation to pollution prevention would include the following:
- refuelling would take place at least 50 m from watercourses and where possible it would not occur when there is risk that oil from a spill could directly enter the water environment;
 - foul water generated on-site would be managed in accordance with best practice and be drained to a sealed tank and routinely removed from site;



- a vehicle management plan and speed limit would be strictly enforced on-site to minimise the potential for accidents to occur;
- drip trays would be placed under stationary vehicles which could potentially leak fuel/oils;
- areas which would be designated for washout of vehicles are a minimum distance of 50 m from a watercourse;
- washout water would also be stored in the washout area before being treated and disposed of;
- no direct or indirect discharges to watercourses without prior treatment in buffer zones or adjacent to proposed infrastructure;
- water would be prevented, as far as possible, from entering excavations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with the EASR, to minimise the potential for accidental spillage. This would be included in the final CEMP and OEMP; and
- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP and OEMP.

8.5.37 Site investigation (e.g. trial pitting and/or boreholes) will be undertaken prior to any construction works where excavation will be required to construct the Proposed Development. The site investigation would inform detailed design and construction methods of the Proposed Development to ensure pollution risk is further considered and minimised prior to construction.

Erosion & Sedimentation

8.5.38 Good practice measures for the management of erosion and sedimentation would include the following:

- all stockpiled materials would be located out with a 50 m buffer from watercourses, including on up gradient sides of tracks and battered to limit instability and erosion;
- where possible, stockpiled material would either be seeded or appropriately covered, minimising the area of exposed bare ground;
- monitoring of stockpiles/excavation areas during extreme rainfall events;
- water would be prevented as far as possible, from entering excavations through the use of appropriate cut-off drainage;
- where this is not possible, water that enters excavations would pass through a number of settlement lagoons and silt/sediment traps to remove silt prior to indirect discharge into the surrounding drainage system. Detailed assessment of ground conditions would be required to identify locations where settlement lagoons would be feasible;
- clean and dirty water on-site would be separated and dirty water would be filtered before entering the water environment;
- if the material is stockpiled on a slope, silt fences would be located at the toe of the slope to reduce sediment transport;



- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum and appropriate drainage would be in place to prevent surface water entering deep excavations;
- a design of drainage systems and associated measures to minimise sedimentation into natural watercourses would be developed - this may include silt traps, check dams and/or diffuse drainage;
- silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- construction personnel, the Principal Contractor and the Environmental Manager / ECoW would carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

Sustainable Drainage Systems

- 8.5.39 SuDS will be incorporated as part of the Proposed Development and included as part of a detailed drainage design which will be developed further as part of the final CEMP and would be agreed with EAC and SEPA prior to construction.
- 8.5.40 SuDS techniques aim to mimic pre-development surface water runoff conditions and balance or throttle flows to the rate of surface water runoff that might have been experienced at the Site prior to development. Good practice in relation to the management of surface water runoff rates and volumes and potential for localised surface water flood risk would include the following:
- drainage systems would be designed to ensure that any sediment, pollutants or foreign materials which may cause blockages are removed before water is discharged into a watercourse;
 - on-site drainage would be subject to routine checks to ensure that there is no build-up of sediment or foreign materials which may reduce the efficiency of the original drainage design causing localised flooding;
 - drainage systems deployed would attenuate runoff rates and reduce runoff volumes to mitigate potential increase in downstream flood risk;
 - where necessary, check dams would be used to reduce the flow velocity and attenuate the rate of runoff shed from site; and
 - as per good practice for pollution and sediment management, prior to construction, site-specific drainage plans would be developed and construction personnel made familiar with the implementation of these.

Water Abstractions and Dewatering

- 8.5.41 If water abstraction, for example to provide a source of water for dust suppression during construction, is required, a potential source will be identified at the detailed design stage of the project and following site investigation. An application for a EASR authorisation would then be made to SEPA and managed through the regulation of the EASR. Should a suitable source not be identified, a water bowser would be used.
- 8.5.42 Good practice that would be followed in addition to the EASR regulations includes:
- planning of water use so as to minimise abstraction volumes;



- reuse of water where possible;
 - recording of abstraction volumes; and
 - control of abstraction rates to prevent significant water depletion in a source.
- 8.5.43 Any temporary dewatering required to facilitate construction will also be undertaken in accordance with the appropriate EASR general binding rule(s) (GBR).

Watercourse Crossings

- 8.5.44 Review of 1:10,000 scale watercourse mapping and the hydrological survey confirms that three new crossings and upgrades to three existing watercourse crossings may be required (subject to detailed structural assessment) as shown on **Figure 8.2** and detailed further in **Technical Appendix 8.4**.
- 8.5.45 Any new and upgraded crossings will be designed to pass the 1 in 200-year flood event, including an allowance for climate change, and the design and construction details will be agreed with SEPA and EAC as part of the final CEMP.
- 8.5.46 During the operation of the Proposed Development, a longer term OEMP will be implemented which will include routine inspection and clearing of the watercourse crossings throughout the operational phase of the Proposed Development.

Concrete Batching and Pouring

- 8.5.47 As part of Site investigation works, which will be undertaken as part of the detailed design stage, the ground conditions would be assessed to inform the concrete design which will be used to facilitate the Proposed Development in accordance with best practice. The turbine foundation design will ensure that the concrete specification used is appropriate for the environment to minimise degradation and leaching into the surrounding soil and water environment. If necessary, the excavations would incorporate an adequate barrier to prevent the movement of any on-site pollutants to the underlying soils, groundwater and surface water environment.
- 8.5.48 These methods will be specified in the final CEMP, and the proposed concrete design will be agreed with SEPA prior to construction.

Proposed Grid Corridor and AIL Route

- 8.5.49 Works for the assumed grid connection and AIL route will be undertaken in accordance industry standard good practice similar to those outlined above.
- 8.5.50 The AIL route utilises the existing road network and established watercourse crossings. Consequently, only very minor construction works are required, reducing the potential for disturbance to watercourses, limiting the risk of sediment release and pollution, and avoiding the need for new in-channel works or water crossing infrastructure.
- 8.5.51 It is expected that any structures associated with the grid connection will be designed to ensure that impacts on the GCR sites and peat are mitigated, in accordance with the requirements of NPF4, and are placed at a sufficient distance from any watercourses, areas of flooding and PWS sources in accordance with SEPA and EAC guidance.



8.6 Scope of Assessment

- 8.6.1 **Table 8-9** provides a summary of which receptors and impacts have been scoped in or out of the assessment during the construction and operation phases of the Proposed Development.
- 8.6.2 As set out in **Technical Appendix 1.1**, effects associated with the construction phase can be considered to be representative of reasonable worst-case decommissioning effects, therefore no separate assessment of the decommissioning phase is presented in this chapter.

Table 8-9: Summary of Assessment Scope

Receptor/Impact	Scoped In?		Comments
	Construction	Operation	
Potential impact on Muirkirk Uplands SSSI	Yes	Yes	Parts of the SSSI are located downstream of the Proposed Development, especially turbines T1 and T2 (see Figure 8.1). The SSSI has been designated for blanket bog and upland habitats which are considered sensitive to changes in the water environment which without appropriate controls could be impacted by the Proposed Development. As confirmed by NatureScot in their scoping response, the qualifying geology feature of the SSSI can be scoped out of the assessment as it will not be affected by the Proposed Development.
Potential impact on Muirkirk and North Lowther Uplands SPA	No	No	The SPA is designated for features which are not sensitive to changes in the geological or water environment. Potential effects are considered in Chapter 6 .
Potential impact on Airds Moss SAC	No	No	Although the SAC is designated for features which are sensitive to changes in the water environment, the SAC is located within a different surface water catchment to the Proposed Development. The water which sustains the SAC will therefore not be impacted by the Proposed Development
Potential effects on superficial deposits and bedrock geology	No	No	The superficial and bedrock geology is common regionally and there are no protected geological features within the Site. Whilst there will be effects arising from track construction, and for turbines and crane hardstandings, these are limited in area and do not extend beyond the immediate footprint of the Proposed Development. Furthermore, the nature of the activities during construction and operation of the Proposed Development would not alter regional superficial or bedrock geology.
Degradation and disturbance of peat and carbon-rich soils.	Yes	No	Peat and peaty soils have been recorded within the Site which could be degraded during construction of the Proposed Development.



Receptor/Impact	Scoped In?		Comments
	Construction	Operation	
			No excavation, movement or storage of peat or carbon-rich soils is anticipated during the operational life of the Proposed Development and therefore, no impacts are anticipated.
Potential impacts on GWDTEs.	No	No	The baseline assessment confirms that all potential areas of GWDTE are considered to be sustained by rainfall and surface water rather than emergent groundwater. Subject to adoption of good practice measures, including an appropriate drainage plan to maintain surface water flow paths, no effects on the water which sustains potential areas of GWDTE within the Site are anticipated.
Generation of pollution impairing water quality of surface water catchments and groundwater bodies.	Yes	No	No development except for the proposed watercourse crossings, approximately 80 m of existing access track and approximately 40 m of proposed new access tracks south of T11, are noted within the SEPA riparian corridor buffer. Given the proximity of the watercourses to the proposed works, potential adverse effects as a result on pollution and erosion effects have been scoped in for these areas during construction. During operation the possibility of a pollution event is much diminished and has been scoped out. Subject to adoption of embedded mitigation (50m watercourse buffer and SEPA's riparian corridor buffers in accordance with SEPA consultation advice) and adherence to good practice industry standards no effects for the remainder of the Proposed Development are anticipated. Good practice will be adopted through a CEMP and OEMP which will be agreed with EAC prior to construction commencing.
Erosion and sedimentation.	Yes	No	
Generation of pollution from previous historic mining activity.	No	No	Committed embedded mitigation includes the provision of an ECoW to supervise works and the efficacy of control measures to be recorded by a water monitoring programme. There is no evidence of current ground conditions impairing groundwater or surface water. This good practice will be secured through a CEMP and OEMP which will be agreed with EAC prior to construction commencing.
Potential effects on catchment wide surface water and groundwater levels and flow.	No	No	Mitigation measures including a detailed drainage design will be adopted to maintain existing surface water flow paths and levels. Any temporary abstractions or dewatering required to construct the Proposed



Receptor/Impact	Scoped In?		Comments
	Construction	Operation	
			Development will be undertaken and regulated in accordance with EASR which will be agreed with SEPA prior to construction.
Potential impacts on DWPA's.	No	No	The baseline assessment and Scottish Water scoping response has confirmed that the Site does not lie in a DWPA.
Increased flood risk due to development.	No	No	Subject to adoption of a detailed drainage design, which incorporates the use of SuDS and an appropriate management of the drainage system no increase in flooding is expected as a result of the Proposed Development.
Potential effects on PWSs.	No	N/A	In accordance with SEPA's guidance, no PWS sources which have been assessed are considered to be at risk from the Proposed Development (see Technical Appendix 8.4). Subject to adoption of embedded mitigation (250 m buffer to PWS sources) and adherence to good practice no effects are anticipated. A commitment has been made to ensure that any assumptions used in the PWS risk assessment are confirmed prior to the commencement of works and if required the PWS risk assessment updated.
Potential impacts on licenced abstractions.	No	No	The baseline assessment has confirmed that no active authorised abstractions are recorded within the Study Area and therefore no potential effects are anticipated.
Potential effects on geology and water environment as a result of the proposed grid connection and AIL route	No	No	Subject to adoption of good practice industry standards no effects on geology, hydrology, hydrogeology and peat are expected as a result of the proposed grid connection and AIL route.

8.7 Assessment of Potentially Significant Effects

Construction

Potential Impacts on Muirkirk Uplands SSSI

- 8.7.1 Muirkirk Uplands SSSI is downstream of turbines T1 and T2 and therefore is hydrologically connected to the Proposed Development. The SSSI has been designated for upland habitats and blanket bog qualifying features which are sensitive to potential changes in water quality and quantity which, without appropriate controls, could be impacted by the Proposed Development.
- 8.7.2 The proposed turbines T1 and T2 are located approximately 70 m and 100 m west of the boundary of the SSSI respectively and the SSSI is noted at an elevation approximately 10 m lower than the proposed turbines. Peat is absent at both turbine



locations with T1 also located on mining-disturbed ground. Consequently, there is unlikely to be any hydrological connectivity between the underlying soils at the turbines and the adjacent peatland. It is therefore considered that any temporary dewatering required to establish the turbine foundations will be localised and have no impact on the SSSI.

- 8.7.3 In accordance with good practice, drainage measures will be deployed during construction of the turbines to ensure that existing surface water and shallow groundwater flow paths are maintained. Measures such as capture drains or cross drains would be used capture the 'clean' water upgradient of the turbine before discharging this water immediately downgradient of the turbine at an appropriate rate thereby maintaining existing surface water flow paths toward the SSSI. Additional drainage systems will be deployed as required to ensure runoff from the construction areas are contained and treated before discharge.
- 8.7.4 Good practice measures and location specific drainage plan will be outlined in the final CEMP which will also include the deployment of an appropriately qualified Environmental Manager / ECoW who will be responsible to ensure that any mitigation measures deployed are working as intended. These measures will be used to maintain existing hydraulic connectivity to the SSSI and minimise potential drainage and dewatering effects on the upland habitat and blanket bog qualifying features.
- 8.7.5 Water-dependent designated sites are considered to be high sensitivity receptors. With the implementation of recommended good practice measures which will be outlined in the final CEMP, the magnitude of impact is assessed as negligible. The resultant significance of effect is assessed as **negligible** and **not significant**.

Peat and Carbon-rich Soils

- 8.7.6 Without appropriate mitigation and sensitive handling of peat and carbon-rich soils, there is potential for the Proposed Development to degrade the peat habitats and carbon-rich soils and impact the carbon store and hydrological function of the peatlands. Degradation may occur through inappropriate handling of peat deposits during construction, local lowering of the water table to facilitate excavations associated with construction works and the concentration of surface water flow as a result of construction of the Proposed Development so that peat becomes eroded. Construction in unstable areas could also potentially increase ground instability resulting in peat slides.
- 8.7.7 It has been shown (see **Technical Appendix 8.1 to 8.3**) that the Proposed Development will largely avoid peat (>0.5 m) and the disturbance of peat and carbon-rich soils as a result of construction of the Proposed Development can be minimised. A peat management plan (PMP) will form part of the final CEMP which would ensure that the disturbance of carbon-rich soils and shallow peat deposits can be minimised, and these deposits can be safeguarded. In addition, location-specific drainage plans and good practice measures will form part of the final CEMP and will be used to maintain existing hydraulic connectivity to the peat deposits and minimise potential drainage and dewatering effects.
- 8.7.8 Peat and carbon-rich soils are considered to be high sensitivity receptors. With the implementation of recommended best practice measures to be outlined in the final CEMP, the magnitude of impact on deposits of carbon-rich soil and peat is assessed as negligible and thus the significance of effect is **negligible** and **not significant**.



Pollution and Increased Sedimentation for Works within the Watercourse Buffer

- 8.7.9 The baseline assessment has confirmed that approximately 80 m of existing access track within the northern extent of the Site and approximately 40 m of proposed new access tracks south of T11 are noted within the SEPA riparian corridor buffer. These sections of existing and proposed new tracks near T11 can be seen on **Figure 1.3**. Given the proximity of the watercourses without appropriate controls there is an increased risk of pollution and sedimentation within the watercourses adjacent to these access tracks during construction of these access tracks.
- 8.7.10 The watercourse near the existing access track comprises of a small drainage ditch whilst the proposed new access track towards turbine T11 is located near a small tributary of the Glenmuir Burn. Where the proposed new track encroaches into the watercourse buffer it uses an existing farm access track. Review of the SEPA small watercourses and surface water flood mapping indicates that the proposed new access track would also not encroach into the functional floodplain of the tributary during the future scenario, which includes an allowance for climate change.
- 8.7.11 Micrositing allowances will be adopted in these areas so that where possible any excavations required to construct or upgrade the access tracks will be undertaken on the side of the track which is furthest away from the watercourse. Mitigation measures such as silt fences would be deployed and additional location specific mitigation measures would be adopted in these areas to ensure that the water quality of the watercourses is maintained during construction of the access tracks. These measures will be outlined in the final CEMP and would include measures such as ensuring that no refuelling, storage of pollutants or stockpiling of materials is undertaken in the areas which are noted within the watercourse buffers in accordance with good practice measures.
- 8.7.12 It is proposed that the watercourses in these areas are included in the proposed water quality and level monitoring programme. As stated in **Section 8.5** additional monitoring (including the use of real-time water quality telemetry with trigger levels) has been committed to confirm that the Proposed Development does not have a significant effect on the watercourses. Furthermore, an Environmental Manager / ECoW will supervise the limited extent of works proposed in the watercourse buffers and will have the authority to stop works if required.
- 8.7.13 Surface water is considered a high sensitivity receptor. With the good practice construction techniques to protect the quality and quantity of surface water, in combination with the proposed monitoring programme, and supervision by an ECoW, the potential impact is assessed as negligible, and the resultant significance of effect is assessed as **negligible** and **not significant**.

Operation

Potential Impacts on Muirkirk Uplands SSSI Blanket Bog

- 8.7.14 During the operational phase of the Proposed Development, no permanent groundwater control will be required and therefore existing water flow paths will be maintained. Drainage measures adopted during construction will remain in place during the operation of the Proposed Development, as required, which will be outlined in the final CEMP and adopted through a longer-term OEMP.
- 8.7.15 The Muirkirk Uplands SSSI is considered a high sensitivity receptor. Subject to adoption of good practice measures, incorporated through an OEMP, the magnitude



of impact is considered negligible. The significance of effect is therefore **negligible** and **not significant**.

8.8 Additional Mitigation and Enhancement

- 8.8.1 **Table 8-10** sets out additional mitigation measures (also known as secondary mitigation, comprising measures beyond embedded/standard mitigation) and enhancement measures to which the Applicant has committed. These measures are designed to reduce identified adverse effects and/or to enhance beneficial effects.

Table 8-10: Additional (Secondary) Mitigation and Enhancement

Reference	Mitigation/ Enhancement Measure	Description
WQM001	Confirmatory Water Quality Monitoring	A programme of water monitoring is proposed prior to any construction activity, during construction and immediately post construction of the Proposed Development. The monitoring programme would be agreed with EAC and is expected to include monitoring of the watercourses which drain from the Site to ensure there are no effects to the water environment. This will also include watercourses where the Proposed Development encroaches into the watercourse buffers and where additional mitigation measures have been committed.

8.9 Residual Effects

- 8.9.1 No significant residual effects on geology, hydrology, hydrogeology, or peat receptors are predicted during the construction or operation phases of the Proposed Development.

8.10 Cumulative Assessment

- 8.10.1 The assessment also considers potential cumulative effects associated with other developments within 5 km of the Site and in the same surface water catchments as the Proposed Development. A cumulative effect is considered to be the effect on a geological, peat, hydrological or hydrogeological receptors arising from the Site in combination with any other developments which are likely to affect soils, geology, surface water and or groundwater.
- 8.10.2 The following wind farm developments are located within 5 km and in the same surface water catchment as the Proposed Development:
- The Drum (planning) which is located within the Gass Water / Bellow Water and Glenmuir Water sub catchments upstream of the Proposed Development;
 - Glen Water (planning) which is partially located within the Glenmuir Water sub catchment; and
 - Lethans (consented) which is located within the Glenmuir Water sub catchment upstream of the Proposed Development.
- 8.10.3 It is anticipated that each potential cumulative scheme (should they gain consent) will be constructed and maintained in accordance with good practice, industry standards and relevant legislation, planning policy and guidance regulated by



statutory consultees. These standards, with respect to geology, peat, hydrology and hydrogeology, ensure that potential impacts are mitigated and controlled at source.

- 8.10.4 The magnitude of cumulative impact is therefore considered negligible and the potential effect on identified receptors is **negligible** and **not significant**.

8.11 Summary and Statement of Significance

- 8.11.1 An assessment of the potential effects of the Proposed Development on hydrology, hydrogeology and geology (including peat) within a defined Study Area (comprising land within 500 m of the Site boundary) has been undertaken. The assessment has considered the construction and operational phases of the Proposed Development.
- 8.11.2 The Proposed Development design has been informed by site-specific surveys that have been used to verify the findings of a comprehensive desk study and identify key receptors.
- 8.11.3 Embedded mitigation and industry standard good practice measures have been identified that afford protection to the water environment. In addition, a site-specific CEMP and OEMP has been committed.
- 8.11.4 It has been shown, as a consequence of the Proposed Development design and with the adoption of industry standard good practice, delivered through a skilled team of competent workers, with mitigation and compliance monitored in collaboration with SEPA, EAC and other engaged stakeholders, the significance of effects on all identified receptors is considered to be negligible and are defined as not significant in the context of the EIA Regulations.
- 8.11.5 A summary of the assessed receptors and identified mitigation measures required to reduce the potential effects to acceptable levels is identified in **Table 8-11**.



Table 8-11: Summary of Potential Effects on Geology, Hydrology, Hydrogeology and Peat

Description of Effect	Mitigation/Enhancement Measure(s)	Significance of Residual Effect	
		Level and Significance	Beneficial/ Adverse
During Construction & Decommissioning			
Potential adverse effects on water which drains to Muirkirk Uplands SSSI.	- Mitigation by design including avoiding areas of deep peat. - Adherence to good practice measures which will be adopted through a final CEMP to maintain water flow and quality which will be submitted with written approval of EAC.	Negligible (Not Significant)	Neutral
Degradation of peat and carbon rich soils through lowering of the water table.	- Mitigation by design by avoiding areas of deep peat and adherence to good practice measures. - Adoption of a PMP which will be outlined in the final CEMP with written approval of EAC.	Negligible (Not Significant)	Neutral
Pollution risk from fuel, oil, concrete or other hazardous substances and increased sedimentation to watercourses where the Proposed Development encroaches into the watercourse buffers.	- Adherence to good practice measures which will be adopted through a final CEMP which will be submitted with written approval of EAC. - Confirmatory water quality monitoring, the scope and frequency of which will be agreed with EAC prior to construction commencing	Negligible (Not Significant)	Neutral
During Operation			
Potential adverse effects on water which drains to Muirkirk Uplands SSSI, designated for Blanket Bog.	Adherence to good practice measures outlined in the final CEMP and adopted through a longer-term OEMP.	Negligible (Not Significant)	Neutral
Cumulative Effects			
No cumulative effects are anticipated as a result of the Proposed Development.			



8.12 References

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