Chapter 10 Geology, Hydrology and Hydrogeology

Contents

10 Geology, Hydrology and Hydrogeology

10.1.1 This Chapter considers the likely significant effects of the Proposed Development on geology (including peat and soils) and the water environment (hydrology and hydrogeology). The assessment of potential impacts has been made on the basis of the Proposed Development layout as fully described in **Chapter 3: Project Description**.

10.1.2 It outlines the embedded good practice methods which have been incorporated into the design and would be used during the construction and operation of the Proposed Development to prevent or reduce identified effects and risks. Further mitigation methods to address any potential effects are proposed where appropriate, and residual effects are assessed.

10.1.3 The assessment has been carried out under the supervision of Gordon Robb (BSc, MSc, MBA, C.WEM, FCIWEM), of SLR Consulting Ltd. He has more than 30 years' experience assessing wind farm and electrical transmission projects in similar site settings.

10.1.4 The Chapter is supported by:

- **Technical Appendix 10.1**: Peat Landslide Hazard Risk Assessment (PLHRA);
- **Technical Appendix 10.2**: Peat Management Plan (PMP);
- **Technical Appendix 10.3**: Schedule of Watercourse Crossings; and
- **Confidential Technical Appendix 10.4**: Private Water Supply Risk Assessment (PWSRA).

10.1.5 **Figures 10.1 - 10.8** are referenced in the text where relevant.

10.1.6 The assessment uses information and findings presented in **Chapter 8: Ecology** to inform the assessment of potential effects on possible areas of Groundwater Dependent Terrestrial Ecosystems (GWDTEs) which are presented in this Chapter.

10.2 Legislation, Policy and Guidance

Legislation

- EC Water Framework Directive (2000/60/EC).
- EU Drinking Water Directive (98/83/EC).
- The Environment Act 1995.
- Environmental Protection Act 1990.
- The Flood Risk Management (Scotland) Act 2009.
- Water Environment and Water Services (Scotland) Act 2003.

- Water Environment (Controlled Activities) (Scotland) Amendment Regulations (CAR) 2013.
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017.
- The Water Supply (Water Quality) (Scotland) Regulations, 2001.
- Private Water Supplies (Scotland) Regulations 2006.

Planning Context

10.2.1 **Chapter 5: Statutory and Policy Framework** of this Environmental Impact Assessment (EIA) Report addresses the planning policy position in full and should be referred to. However, in summary National Planning Framework 4 (NPF4) adopted by the Scottish Government on 13 February 2023 provides planning guidance and polices regarding sustainable development, tackling climate change and achieving net zero. The policies relevant to this Chapter include:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 4 (Natural Places);
- Policy 5 (Soils);
- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).

10.2.2 Additionally, Midlothian Council (MC) Local Development Plan (November 2017) provides planning guidance on the type and location of development that can take place in the region. The Local Development Plan provides a number of policies of which the following are relevant to this study;

- Policy ENV 5: Peat and Carbon Rich Soils;
- Policy ENV 9: Flooding
- Policy ENV 10: Water Environment;
- Policy ENV 12: Internationally Important Nature Conservation Sites;
- Policy ENV 13: Nationally Important Nature Conservation Sites;
- Policy NRG 2: Wind Energy; and
- Policy IMP 3: Water and Drainage.

Guidance

10.2.3 Planning Advice Notes (PANs), published by the Scottish Government, including:

- PAN 50 Controlling the Environmental Effects of Surface Mineral Workings;
- PAN 61 Planning and Sustainable Urban Drainage Systems; and
- PAN 69 Planning and Building Standards Advice on Flooding.

10.2.4 Scottish Environment Protection Agency (SEPA) Pollution Prevention Guidance Notes (PPG) and Guidance of Pollution Prevention (GPP):

- GPP01 Understanding your environmental responsibilities – good environmental practices;
- GPP02 Above Ground Oil Storage;
- GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
- GPP05 Works and Maintenance in or near Water;
- GPP06 Working at Construction and Demolition Sites;
- PPG07 Safe Storage - The Safe Operation of Refuelling Facilities;
- GPP08 Safe Storage and Disposal of Used Oils;
- GPP13 Vehicle Washing and Cleaning;
- GPP21 Pollution Incident Response Planning; and
- GPP22 Dealing with Spills.

10.2.5 CIRIA publications:

- C532, 2001, Control of Water Pollution from Construction Sites;
- C648, 2006, Control of Water Pollution from Linear Construction Projects – Technical Guidance;
- C741, 2015, Environmental Good Practice on Site; and
- C753, 2015, The SUDS Manual.

10.2.6 SEPA publications:

- SEPA, 2010, Engineering in the Water Environment: Good Practice Guide – River Crossings;
- SEPA, 2010, Engineering in the Water Environment: Good Practice Guide – Sediment Management;
- SEPA, 2017, Guidance: Development on Peat and Offsite Uses of Waste Peat;
- SEPA. 2009, Groundwater Protection Policy for Scotland, Version 3;
- SEPA, 2017, Land Use Planning System Guidance Note 4, Version 9;
- SEPA, 2018, Land Use Planning System SEPA Guidance Note 2a, Version 2;
- SEPA, 2015, Land Use Planning System SEPA Guidance Note 2e, Version 1;
- SEPA, 2017, Land Use Planning System SEPA Guidance Note 31, Version 3;
- SEPA, 2015, Position Statement – Culverting of Watercourses, Version 2.0; and
- SEPA, 2010, Regulatory Position Statement – Developments on Peat.

10.2.7 Other Guidance:

- Scottish Natural Heritage (now NatureScot), 2013, Constructed Tracks in Scottish Uplands, 2nd Edition;
- Scottish Government, 2017, Proposed Electricity Generation Developments: Peat Landslide Hazard Best Practice Guide;
- Scottish Government, 2017, Guidance on Development on Peatland, Peatland Survey;
- A joint publication by Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland, 2019, Good Practice during Windfarm Construction, Version 4; and
- Scottish Renewables and SEPA, 2012, Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.

10.3 Consultation

10.3.1 Consultation for the Proposed Development was undertaken with statutory and non-statutory bodies during 2023 as set out in **Chapter 4: Approach to EIA**. The outcome of the relevant consultations with regards to soil, geology and the water environment is summarised in **Table 10.1**.

Table 10.1: Consultation Responses

Consultee	Summary of Key Issues	Where addressed in Chapter
Midlothian Council Scoping Response 13 February 2023	The potential adverse effects on peat and carbon rich soils within the site are further grounds for concern.	Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **Technical Appendix 10.1** (PLHRA) and **Technical Appendix 10.2** (PMP).
Scottish Water Scoping Response 16 February 2023	The Proposed Development falls within a drinking water catchment where a Scottish Water abstraction is located. Scottish Water abstractions are designated as Drinking Water Protected Areas (DWPAs) under Article 7 of the Water Framework Directive (WFD). Gladhouse Reservoir supplies Rosebery Water Treatment Works (WTW) and it is essential that water quality and water quantity in the area are protected.	Assessments of potential impacts on the water environment, including Scottish Water assets and DWPAs, is assessed in this Chapter.

Consultee	Summary of Key Issues	Where addressed in Chapter
	We deem this proposal to present a risk to water quality. It is a relatively small catchment therefore there may be less opportunity for dilution and a potential higher risk of activities affecting water quality. Some of the soils in this catchment appear to be peats and peaty gleys. Peat that is in unfavourable condition or disturbed can exacerbate the release of organic material into the water environment which can affect WTW processes and water supply. We would welcome consideration of the precautions specific to protecting drinking water in peatland areas and any opportunities for peat restoration.	
NatureScot Scoping Response 15 March 2023	The site contains an area of Class 1 nationally important carbon-rich soils, deep peat and priority peatland habitat and is therefore likely to be of high conservation value. Development proposals on peat will always require a site-specific and detailed peat and vegetation survey and the result from that should inform the need for a peat slide risk assessment and a peat management plan. We encourage developments to avoid carbon-rich soils, deep peat and priority peatland habitat and to minimise losses of the highest quality peatland habitat. Where avoidance is not possible mitigation measures are required.	Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **Technical Appendix 10.1** (PLHRA) and **Technical Appendix 10.2** (PMP).
Scottish Environment Protection Agency (SEPA) Scoping Response 23 March 2023	In this case, where much of the site is on peat, we expect the application to be supported by a comprehensive site-specific peat management plan (PMP). The proposal should be in accordance with National Planning Framework 4 (NPF4) and information should be provided to demonstrate compliance with Policy 5 of NPF4. It should be clearly demonstrated how impacts on peat have been minimised via location, layout and design of all proposed infrastructure in line with mitigation hierarchy. We are likely to object to proposals where infrastructure is located on peat >1m and it is not demonstrated that the mitigation hierarchy has been followed and, if required, proposals for peat restoration into a functioning peatland system identified. The planning submission must a) demonstrate how the layout has been designed to minimise disturbance of peat and consequential release of CO2 and b) outline the preventative / mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, cable trenches, or the storage and re-use of excavated peat. The submission must include: • a detailed map of peat depths with all the built elements overlain to demonstrate how the development avoids areas of deep peat and other sensitive receptors. • a table which details the quantities of acrotelmic, catotelmic and amorphous peat	A comprehensive programme of peat depth probing, characterisation and condition assessment has been undertaken and has informed the project design and evolution (see **Chapter 3**). Detailed consideration of peat depths and measures to required safeguard peat are presented in **Technical Appendix 10.1** (PLHRA) and **Technical Appendix 10.2** (PMP) and summarised in this Chapter.

Consultee	Summary of Key Issues	Where addressed in Chapter
	which will be excavated for each element and where it will be re-used during reinstatement. • dependent upon the volumes of peat likely to be encountered and the scale of the development, applicants must consider whether a PMP is required or whether the above information be best submitted as part of the schedule of mitigations. SEPA welcomes the approach to assessing the impact on GWDTE. GWDTE are protected under the WFD and therefore the layout and design of the development must avoid impact on such areas. The following information must be included: • a map demonstrating that all GWDTE and existing groundwater abstractions are outwith 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions. • if minimum buffers cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. We are likely to seek conditions securing appropriate mitigation for all GWDTE affected. A minimum buffer of 50m around each loch or watercourse should be applied. If this minimum buffer cannot be achieved, each breach must be numbered on a plan with associated photographs of the location, dimension of the loch or watercourse and drawings of what is proposed in terms of engineering works. Watercourse crossings must be designed to accommodate the 0.5% Annual Exceedance Probability (AEP) flows, or information provided to justify smaller structures. If it is thought the development could result in an increased risk of flooding to a nearby receptor then a Flood Risk Assessment must be submitted in support of the planning application. Provided watercourse crossings are designed to accommodate the 1 in 200 year event (plus climate change) and other infrastructure is located well away from watercourses we do not foresee from current information a need for detailed information on flood risk A schedule of mitigation must be submitted which include reference to best practice pollution prevention and construction techniques and regulatory requirements.	Potential impacts on GWDTE in this Chapter and areas of potential GWDTE shown on shown on **Figure 10.8**. Buffers to watercourses and lochs has been applied and is shown on **Figure 10.1.** A schedule of watercourse crossings is included in **Technical Appendix 10.3**. Potential impacts on the water environment and best practice construction methods which would be adopted to mitigate these are included in this Chapter.
Energy Consents Unit Scoping Response 13 April 2023	Scottish Ministers request that the company contacts Scottish Water and makes further enquires to confirm whether there any Scottish Water assets which may be affected by the development and includes details in the EIA report of any relevant mitigation measures to be provided. Scottish Ministers request that the company investigates the presence of any private water supplies that may be impacted by the development. The EIA report should include details of any supplies identified by this investigation, and if any supplies are identified, the	Additional consultation with Scottish Water has been undertaken (see below). A private water supply risk assessment (PWSRA) is

Consultee	Summary of Key Issues	Where addressed in Chapter
	company should provide an assessment of potential impacts, risk and any mitigation which would be provided. Scottish Ministers consider that where there is a demonstrable requirement for peat landslide hazard and risk assessment (PLHRA), the assessment should be undertaken as part of the EIA process to provide Ministers with a clear understanding of whether the risks are acceptable and capable of being controlled by mitigation measures. Where a PLHRA is not required clear justification for not carrying out such a risk assessment is required.	included in **Technical Appendix 10.4**. Required mitigation to safeguard sources potentially at risk is given. A site specific PLHRA and PMP is included in **Technical Appendix 10.1** and **Technical Appendix 10.2**.
Scottish Water Additional Consultation 25 May 2023	Gladhouse Reservoir is a Scottish Water source catchment, with an abstraction point located approximately 2km downstream of the proposed turbines adjacent to Black Burn. It is considered that any impact from a pollution event would be low however, as a precautionary measure, mitigation in this catchment is required and Scottish Water must be notified of any pollution incidents that could impact the reservoir.	Assessments of potential impacts on the water environment, including Scottish Water assets and DWPAs, is included in this Chapter. Measures to safeguard water flow paths and quality are given.

10.4 Methodology

Scope of Assessment

10.4.1 The scope of the assessment has been determined through a combination of professional judgement, reference to relevant guidance documents and consultation with stakeholders.

10.4.2 On the basis of the desk based and survey work undertaken, policy, guidance and standards, the professional judgement of the Environmental Impact Assessment (EIA) team, feedback from consultees and experience from other relevant projects, the following topics areas have been scoped out of the assessment:

- Detailed flood risk and drainage impact assessment. Published mapping confirms the site is not located in an area identified as being at flood risk. A simple screening of potential flooding sources (fluvial, coastal, groundwater, infrastructure etc.) is presented in the EIA Report (see Section 10.5) and measures that would be used to control the rate and

quality of runoff will be specified in the Construction Environmental Management Plan (CEMP) which would be agreed with MC prior to any development;

- Water quality monitoring: As the assessment is informed by classification data obtained from SEPA and which shows that there are no known sources of potential water pollution, no additional water quality monitoring is considered necessary to complete the assessment. Note water quality monitoring is proposed prior to, during and post construction if the Proposed Development were to be granted consent. Details of monitoring suites, locations, frequencies and reporting would be specified in the CEMP;
- Potential effects on geology: With the exception of peat, there are no protected geological features within the application boundary or study area. Furthermore, the nature of the activities during construction, operation and decommissioning of the Proposed Development would not alter regional superficial or solid geology. Potential effects on peat and carbon rich soils are not scoped out of the assessment and are considered in full; and
- Potential decommissioning effects are expected to be the same as potential construction effects. Decommissioning the Proposed Development and its associated infrastructure would be carried out in accordance with an approved decommissioning plan which would be expected to include the same safeguards as those provided during the construction stage of the project. Potential decommissioning effects are therefore scoped out of this assessment.

Baseline Characterisation

Study Area

10.4.3 The study area includes all of the proposed site infrastructure and a 1 km buffer from the site boundary (see **Figure 10.1**).

10.4.4 The study area for potential cumulative effects uses the catchments in the study area, with a maximum downstream, distance of 5 km from the Proposed Development. Beyond this 5 km distance, any effect is considered to be so diminished as to be undetectable and therefore not significant.

Desk Study / Field Survey

10.4.5 An initial desk study has been undertaken to determine and confirm baseline characteristics by reviewing available information on soils, geology,

hydrology and hydrogeology. The following sources of information have been consulted in order to characterise the baseline conditions:

- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping;
- UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) webservice[1];
- NatureScot SiteLink[2];
- James Hutton Institute, National Soil Map of Scotland (1:250,000 scale) and Carbon and Peatland 2016 data[3];
- British Geological Survey (BGS) Onshore Geoindex[4];
- BGS Hydrogeological Maps of Scotland (1:100,000 scale)[5];
- SEPA rainfall data[6];
- SEPA flood maps[7];
- SEPA environmental data[8];
- Data requests with SEPA regarding details of registered / licenced abstractions and discharges (March 2023); and
- Data requests with MC and Scottish Borders Council (SBC) regarding details of historical flooding records and private water abstractions (March 2023).

10.4.6 The project hydrologists, geologists and ecologists have worked closely on this assessment to ensure that appropriate information is gathered to allow a comprehensive impact assessment to be completed.

10.4.7 Detailed site visits and walkover surveys have been undertaken by SLR on the following dates:

- September 2022 to conduct initial peat and soil depth probing exercise;
- January 2023 to conduct additional peat and soil depth probing exercise;
- July 2023 to complete watercourse crossing survey and private water supply survey and conduct additional peat and soil depth probing exercise; and
- August 2023 to complete additional watercourse crossing survey and private water supply survey.

10.4.8 The field work has been undertaken in order to:

- verify the information collected during the desk and baseline study;
- undertake a visual impact assessment of the main surface waters 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 (in consultation with the project ecologist);
- visit any potential watercourse crossings and prepare a schedule of potential watercourse crossings if required;
- inspect rock exposures and establish by probing, an estimate of overburden thickness, peat depth and stability;
- confirm underlying substrate, based on the type of refusal of a peat probe and by coring; and
- allow appreciation of the site, 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.

10.4.9 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.

10.4.10 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 Methods

10.4.11 The significance of potential effects 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.

10.4.12 The assessment methodology has also been informed by experience of carrying out such assessments for a range of wind farm and other developments, knowledge of the geology and water environment characteristics in Scotland and cognisance of good practice.

10.4.13 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of potential effects presented by the Proposed Development, such as those detailed in the site-specific outline Biodiversity Enhancement Management Plan (oBEMP) (**Technical Appendix 8.6**), PMP (**Technical Appendix 10.2**) and PLHRA (**Technical Appendix 10.1**).

10.4.14 The criteria for determining the significance of effect are provided in **Table 10.2, Table 10.3, and Table 10.4.**

Sensitivity Criteria

10.4.15 The sensitivity of the receiving environment (i.e., baseline quality of the receiving environment) is defined as its ability to absorb and 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 10.2**. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 10.2: Criteria for Assessing Sensitivity of Receptor

Sensitivity	*Definition*
High	• soil type and associated land use is highly sensitive (e.g. unmodified blanket bog peatland); • SEPA WFD Water Body Classification: High-Good or is close to the boundary of a classification Moderate to Good or Good to High; • receptor is of high ecological importance or national or international value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) which may be dependent upon the hydrology of the Site; • receptor is at risk from flooding in the future (2080s) and/or water body acts as a current active floodplain or flood defence; • receptor is used for public and/or private water supply (including Drinking Water Protected Areas (DWPA); • groundwater vulnerability is classified as high; and • if a GWDTE is present and identified as being of high sensitivity.
Moderate	• soil type and associated land use is moderately sensitive (e.g. arable, commercial forestry); • SEPA Water Framework Directive Water Body Classification Poor to Moderate; and • moderate classification of groundwater aquifer vulnerability.
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); • SEPA Water Framework Directive Water Body Classification Poor or Bad; • receptor is at not at risk of flooding in the future (2080); and • receptor is not used for water supplies (public or private).
Not Sensitive	• receptor would not be affected by the Proposed Development, e.g., lies within a different and unconnected hydrological / hydrogeological catchment.

Magnitude of Impact

10.4.16 The potential magnitude of impact would depend upon whether the potential effect would cause a fundamental, material or detectable change. In addition, the timing, scale, size and duration of the potential effect resulting from the Proposed Development are also determining factors. The criteria that have been used to assess the magnitude of impact are defined in **Table 10.3**.

Table 10.3: Criteria for Assessing Magnitude of Impact

Magnitude of Impact	*Criteria*	*Definition*
Major	Results in loss of attribute	Long term or permanent changes to the baseline geology, hydrology, hydrogeology and water quality such as: • permanent degradation and total loss of soils habitat (inc. peat) and geology; • loss of important geological structure/features; • wholesale changes to watercourse channel, route, hydrology or hydrodynamics; • changes to the site resulting in an increase in 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 attribute	Material and short to medium term changes to baseline geology, hydrology, hydrogeology and water quality, such as: • loss of extensive areas of soils and peat habitat, damage to important geological structures/features; • some changes to watercourses, hydrology or hydrodynamics; • changes to site resulting in an increase in 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 attribute	Detectable but non-material and transitory changes to the baseline geology, hydrology, hydrogeology and water quality, such as: • minor or slight loss of soils and peat or slight damage to geological structures/feature; • minor or slight changes to the watercourse, hydrology or hydrodynamics; • changes to site resulting in slight increase in runoff well within the drainage system capacity; • minor changes to erosion and sedimentation patterns; • minor changes to the water chemistry of surface runoff and groundwater; and • 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/integrity	No perceptible changes to the baseline geology, hydrology, hydrogeology and water quality such as: • no impact or alteration to existing important soils (inc. peat) geological environs;

Magnitude of Impact	Criteria	Definition
		• 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 Criteria

10.4.17 The sensitivity of the receiving environment together with the magnitude of impact determines the significance of the effect, which can be categorised into level of significance as identified in **Table 10.4**.

10.4.18 The table provides a guide to assist in decision making. 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.

Table 10.4: Significance of Effect

Magnitude of Impact	Sensitivity of Receptor			
	High	Moderate	Low	Not Sensitive
Major	Major	Major	Moderate	Negligible
Medium	Moderate	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

10.4.19 Effects of 'major' and 'moderate' significance, as outlined in Table 10.4 are considered to be 'significant' in terms of the EIA Regulations.

Cumulative Effects

10.4.20 The assessment also considers potential cumulative effects associated with other material developments within 5 km of the nearest element of the Proposed Development 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 which are likely to affect soils or geology, surface water and groundwater.

Mitigation

10.4.21 Any potential effects of the Proposed Development on geology or the water environment identified by the assessment have been addressed and mitigated by the design and the application of good practice guidance to be implemented as standard during construction and operation to prevent, reduce or offset effects where possible. As such a number of measures would form an integral part of the construction process and these have been taken into account prior to assessing the likely effects of the Proposed Development (embedded mitigation). Where appropriate tailored mitigation measures have been identified prior to determining the likely significance of residual effects.

10.4.22 Good practice measures would be applied in relation to pollution risk, sediment management, peat management and management of surface runoff rates and volumes. This would form part of the CEMP to be implemented for the Proposed Development which would be secured by a planning condition and would be prepared prior to construction commencing.

10.4.23 The final CEMP would include details and responsibilities for environmental management onsite for environmental aspects and would outline the necessary surface water management, oil and chemical delivery and storage requirements, waste management, traffic and transport management and would specify monitoring requirements for wastewater, water supply and all appropriate method statements and risk assessments for the construction of the Proposed Development.

Residual Effects

10.4.24 A statement of residual effects, following consideration of any further specific mitigation measures where identified, is then given.

Assumptions, Limitations and Confidence

10.4.25 1The assessment uses site investigation, survey data and publicly available data sources, including but not limited to SEPA, NatureScot, Met Office, MC, SBC, and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

10.4.26 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.

10.5 Baseline

Current Baseline

Site Setting

10.5.1 The Proposed Development site is located approximately 4 km south of Gorebridge and 9.5 km south-east of Penicuik, on the northern edge of the Moorfoot Hills. The site is centred at British National Grid (BNG) 333890, 654405 and comprises farm land with fragmented areas of moorland and forestry.

10.5.2 Ground elevations generally decrease north-westward towards Gladhouse Reservoir and the River South Esk. Elevations across the site range from 270 m Above Ordnance Survey (AOD) within northern corner of the site to 490 m AOD near the summit of Mauldslie Hill, toward the south.

10.5.3 The standard average annual rainfall (SAAR) for the River South Esk surface water catchment that drains the site, based on data obtained from the FEH webservice, confirms an annual rainfall of 860 mm.

10.5.4 SEPA has provided precipitation data for the nearest rain gauge (Gladhouse Reservoir at BNG 330010, 654464, located approximately 1.8 km north-west of the site). In 2022 a precipitation total of 830 mm was recorded, similar to the SAAR data provided by FEH.

10.5.5 An extract of OS mapping of the site, which shows its setting, is presented as **Figure 10.1**.

Statutory Designated Sites

10.5.6 A review of NatureScot SiteLink webpage confirms that there are no statutory designated sites located within the site boundary.

10.5.7 Within 1 km of the site, the following designated sites are recorded:

- Moorfoot Hills Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) is located approximately 145 m south of the site at its closest extent. The SSSI and SAC has been designated for breeding bird assemblage, upland habitat assemblage including blanket bog and dry heaths and upland birch woodland. The SSSI and SAC are located in a different surface water catchment (River Tweed) to the Proposed Development and therefore not considered to be hydraulically connected to the Proposed Development. Therefore, the SSSI and SAC are not considered further in this Chapter.
- Gladhouse Reservoir SSSI, Special Protection Area (SPA) and RAMSAR site is located approximately 700 m north-west of the site at its closest

extent and encompasses the entire reservoir. The SSSI, SPA and RAMSAR has been designated for its non-breeding pink-footed goose (Anser brachyrhynchus) population. The designated feature is not water related and therefore has not been considered further in this Chapter. Potential effects on the SSSI, SPA and RAMSAR site are considered further in **Chapter 8: Ecology** and **Chapter 9: Ornithology**. Measures to safeguard water quality and flow to the reservoir are addressed in this Chapter.

Geology

Soils

10.5.8 An extract of the 1:250,000 Scotland's Soils mapping is presented as **Figure 10.2**. The principal soil types recorded at the site are predominantly brown soils and noncalcareous gleys. Basin peat and podzols are noted within the western extent and along the southern boundary near Broad Law respectively.

Superficial Geology (including Peat)

10.5.9 Priority peatland mapping (see **Figure 10.3**) published by Scottish Natural Heritage (now NatureScot) indicates that the north-western and south-eastern extent of the site lies within areas of Class 3, Class 4, and Class 5 peatland whereby occasional, or no peatland habitats may be recorded, however, the soils may be carbon-rich and deep peat may be present.

10.5.10 On the northern site boundary Class 1 priority peatland is recorded. Class 1 peatland is potential nationally important carbon-rich soil, deep peat, and priority peatland habitat of potential high conservation value.

10.5.11 No peatland is shown in the centre of the site.

10.5.12 BGS mapping, shown on **Figure 10.4**, illustrates that the majority of the site is underlain by till. Areas of glaciofluvial deposits (comprising gravel, sand and silt) are recorded, typically toward the south of the site. Areas of peat are noted within the western extent of the site and small areas of alluvium are noted adjacent to larger watercourses. The southern boundary of the site is shown to be absent of any superficial deposits.

10.5.13 As part of the baseline assessment, a comprehensive peat probing exercise has been conducted which informed the PLHRA and PMP (**Technical Appendix 10.1 and 10.2**). In summary, the site investigations have confirmed:

- the depth of soils and peat was recorded at more than 2,300 locations;

- a programme of peat augering has also been undertaken to assess the characteristics of the peat at the site;
- 88% of all peat probes recorded a peat depth of less than 1m; and
- where encountered, most of the peat is classified as between H2 and H5, using the Von Post classification, showing insignificant to moderate decomposition.

Bedrock Geology and Linear Features

10.5.14 An extract of the regional BGS bedrock geological mapping is presented on **Figure 10.5** which shows that the site is underlain by the following units:

- Inverclyde Group, which comprises mudstones, siltstones and sandstones and underlies the north-western extent of the site and the majority of the Proposed Development; and
- Portpatrick Formation, which comprises a wacke and siltstone turbidite succession and underlies the south-eastern extent of the site.

10.5.15 A small granite igneous intrusion is shown within the southern extent of the site within the Portpatrick Formation.

10.5.16 Inferred faults are noted on either side of the bedrock units, one of which is located within the centre of the site. The faults trend generally north-east to south-west.

Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

10.5.17 Extracts of the BGS regional hydrogeological mapping and groundwater vulnerability (see **Figure 10.6** and **Figure 10.7**) confirm that some of the superficial deposits and bedrock units beneath the site are likely to contain groundwater. A description and hydrogeology classification of the geological units at the site are presented in **Table 10.5**.

10.5.18 The BGS classify the Inverclyde Group bedrock unit as a moderately productive aquifer representing a multi-layered aquifer with fracture flow yielding up to 10 l/s whilst the Portpartrick Formation is classified as a low productivity aquifer, with limited groundwater in near surface weathered zone and secondary fractures.

Table 10.5: Hydrogeological Classification of Geological Units

Period	Geological Unit	Hydrogeological Characterisation	Hydrogeological Classification
Pleistocene to Recent	Till	Sand and gravel horizons within this unit are capable of storing groundwater, although their lateral and vertical extent realises a variable and often small groundwater yield. Clay within this unit acts as an aquitard to the more permeable sand and gravel lenses and will hinder/prevent large scale groundwater movement. Regionally, groundwater flow will be limited by the variability of these deposits and consequently any groundwater yields are normally low.	Not a significant aquifer
	Peat	Where not degraded or eroded, characteristically wet underfoot and dominated by Sphagnum. Typically peat consists of two layers: the upper very thin (up to 30 cm) acrotelm layer contains upright stems of Sphagnum mosses and allows relatively free water movement and the lower catotelm layer comprising the thicker bulk of peat where individual plant stems have collapsed. Water movement in the catotelm layer is very slow and normally the water table in a peat never drops below the acrotelm layer.	Not classified
	Glaciofluvial Deposits	Sand and gravel horizons within this unit can store groundwater and permit groundwater movement. Their limited extent can hinder their ability to provide reliable groundwater yields, but groundwater can be shallow especially where the sand and gravel lie above till.	Intergranular flow High productivity
	Alluvium	Sand and gravel horizons within this unit can store groundwater, although their lateral and vertical extent realises a variable and often small groundwater yield. Groundwater levels and flow within the alluvium is generally in continuity with surface water in the adjacent watercourses.	Intergranular flow Moderate to High productivity
Cretaceous	Inverclyde Group	Multi-layered aquifer. Groundwater flow and storage will preferentially occur in the more permeable sandstone horizons and the less permeable siltstones and mudstones will act as aquitards between the sandstones.	Intergranular and fracture flow Moderate productivity
Ordovician	Portpatrick Formation	Generally, without groundwater except at shallow depths in near surface weathered zone and secondary fractures.	Fracture flow Low productivity

10.5.19 Groundwater vulnerability is divided into five classes (1 to 5) with 1 being the least vulnerable and 5 being the most vulnerable. Review of Figure 10.7 shows that the potential groundwater vulnerability in the uppermost aquifer, and with respect to the Proposed Development, has been generally ascribed a vulnerability of Class 2, 3 and 4 beneath the proposed infrastructure and 5 to the south of this (where no or little superficial deposits are recorded). Lower vulnerabilities are recorded where the peat and till superficial deposits are shown on BGS mapping.

Groundwater Levels and Quality

10.5.20 Groundwater recharge at and surrounding the site is limited by the following factors:

- steeper topographic gradients, especially toward the south, will result in rainfall forming surface water runoff; and
- the peat and glacial till deposits inhibit infiltration owing to their generally low bulk permeability.

10.5.21 SEPA do not maintain any groundwater level monitoring locations within the study area. 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, glaciofluvial and alluvium deposits and within the bedrock deposits.

10.5.22 All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2013 and require protection for their current use or future potential as drinking water resources.

10.5.23 The current status of groundwater bodies in Scotland has been classified by SEPA in accordance with the requirements of the Water Framework Directive (WFD). SEPA identify two groundwater bodies beneath the site:

- Gladhouse (SEPA ID: 150486) groundwater body, was classified in 2020 (the last reporting cycle) with an Overall Status of Good and no pressures are identified; and
- Peebles, Galashiels and Hawick (SEPA ID: 150697) groundwater body, was classified in 2020 (again the last reporting cycle) with an Overall Status of Good and no pressures are identified.

Groundwater Dependent Terrestrial Ecosystems

10.5.24 A national vegetation classification (NVC) habitat mapping exercise was conducted in April 2023 as part of the ecology baseline assessment, and this has been used to identify potential areas of GWDTE within the site. The

results of the NVC habitat mapping exercise are discussed in detail within **Chapter 8** and areas of potential GWDTE are shown on **Figure 10.8**.

10.5.25 The assessment of GWDTE has been undertaken with reference to NVC communities which are cited in SEPA guidance[9]. In addition, and as discussed in **Chapter 8: Ecology and Appendix 8.1**, areas of JA, JAN and JE, which are not included SEPA guidance, have been considered as a potentially moderate GWDTE community.

10.5.26 Four categories have been used to classify potential GWDTE areas:

- Highly Dominant, where potential high GWDTE habitat dominate the polygon (over 50% of the polygon);
- Highly Sub-dominant, where potential high GWDTE habitat makes up a sub-dominant percentage of the polygon (less than 50% of the polygon);
- Moderately Dominant, where potential moderate GWDTE dominate the polygon (over 50% of the polygon) and no potential high GWDTE habitat is present; and
- Moderately Sub-dominant, where potential moderate GWDTE habitat makes up a sub-dominant percentage of the polygon (less than 50% of the polygon) and no potential high GWDTE habitat is present.

10.5.27 The location, distribution, and discussion of the potential for groundwater to support areas of potential GWDTA at site is summarised in **Table 10.6**.

Table 10.6: Groundwater Dependent Terrestrial Ecosystems

NVC Community	GWDTE Potential	Location and Discussion
M6	High	M6 dominated polygons within the site are located adjacent to the Latch Burn watercourse within the northern extent of the site. Given this location likely to be sustained by surface water and waterlogging of soils from rainfall and surface water.
M15	Moderate	M15 dominated polygons are located on sloped ground underlain by glacial till or adjacent to watercourses and underlain by alluvial deposits, particularly within the northern extent of the site. It is therefore unlikely to be sustained by groundwater.
M23	High	M23 dominated polygons are located on sloped ground adjacent watercourse corridors outside of the site boundary. Two polygons are noted within the south-eastern extent of the site on sloped ground which is underlain either by Portpatrick Formation bedrock or glaciofluvial superficial deposits. There is potential for these to be sustained by groundwater.
M25	Moderate	M25 dominated polygons are located in large areas within the north-western extent of the site, generally underlain by glacial till and peat. Distribution not typical of emergent groundwater, such as a spring, and therefore assessed as sustained by rainfall and water logging of low permeability soils.

NVC Community	GWDTE Potential	Location and Discussion
MG9	Moderate	MG9 dominated polygon within the site limited to a polygon on sloped ground adjacent to and along the banks of a tributary of the Black Burn within the southern extent of the site. The polygon is located at a higher elevation than the nearest element of the Proposed Development and extends to the south-west away from the proposed infrastructure. Therefore, it is not considered to be at risk.
MG10	Moderate	MG10 dominated polygons within the site comprise linear polygons particularly within the eastern extent of the site, largely corresponding with sloped ground near to or adjacent to watercourse corridors or drainage ditches within the agricultural land. Given this location likely to be sustained by surface water and waterlogging of soils from rainfall and surface water.
W6	Moderate	W6 dominated polygon is located outside of the study area, adjacent to the minor road and near the banks of an unnamed tributary of the Purvies Hill Burn, near Outerston to the north of the site. Not considered further as >250 m from any element of the Proposed Development.
W7	High	W7 dominated polygons are located outside of the site, along the banks of the Gladhouse Reservoir, approximately 800m north-west of the site. Not considered further as >250 m from any element of the Proposed Development.
JA, JAN, and JE	Moderate	JA, JAN and JE dominated polygons are noted across the site. Large areas of these habitats in the north of the site are located on low permeability glacial till and are likely to be sustained by incident rainfall and waterlogging of soils. Toward the south, where it is known there are springs, it is likely that groundwater does sustain, at least in part, this habitat. The springs are located at a higher elevation than the proposed infrastructure and the water catchment to the springs extends to the south and away from the Proposed Development. It is considered very unlikely therefore that the Proposed Development would affect the yield of the springs and would not impair the quality of emergent groundwater. Measures will be required to maintain surface flow paths downstream of the springs.

10.5.28 A review of **Table 10.6** shows that the majority of the potential high and moderate GWDTE are located within watercourse corridors or underlain by glacial till and peat superficial deposits. M15 and M25 habitats, which cover larger areas of the site, are not associated with a particular ground elevation nor any specific geological units. In addition, no flush features were recorded by the NVC survey. This distribution is not typical of a habitat sustained by groundwater but rather it is likely to be supported by rainfall, surface water runoff and water logging of soils. Buffers to areas of potential GWDTE specified in SEPA guidance therefore do not apply to areas of potential GWDTE within the site.

10.5.29 Safeguards to maintain these habitats, and the sources of surface water to these habitats will need to be maintained during construction and operation of the Proposed Development, as discussed in **Section 10.6**.

10.5.30 There are two M23 dominated polygons within the south-eastern extent of the site which may be supported by groundwater:

- One is located on the northern slopes of Wull Muir to the south of the B7007 approximately 270 m south and at a higher elevation of the nearest element of the Proposed Development. This is out with of the 250 m buffer specified by SEPA guidance and therefore not assessed further as it is not considered at risk.
- The second M23 dominated polygon is located approximately 190 m south-east of turbine T1 at its closest extent. The water source which supports the potential GWDTE habitat is located at an elevation some 50 m higher than the proposed turbine and the water catchment to the M23 habitat extends to the south and away from the Proposed Development. It is therefore considered not at risk from the Proposed Development.

Hydrology

Local Hydrology

10.5.31 The site is located within surface water catchment of the River South Esk, in particular the following sub catchments (see **Figure 10.1**):

- Gore Water / Middleton Burn. The majority of the site is located within the surface water catchment of the Middleton North Burn and Middleton South Burn, both of which discharge into the Gore Water approximately 3.5 km north-east of the site. The Middleton North Burn flows generally north and north-eastwards through the centre of the site, whilst the Middleton South Burn flows generally north-eastwards along the northern boundary. Both burns and several tributaries of the burns (including the Latch Burn, a tributary of the Middleton North Burn) rise within the site boundary.
- Gladhouse Reservoir. The western extent of the site, including turbines T1 to T4 and T7, are located within the surface water catchment of the Gladhouse Reservoir, which is located approximately 700 m north-west of the site at its closest extent. The reservoir is fed by the Black Burn which rises within the site boundary.

10.5.32 The Gladhouse Reservoir surface water catchment has been designated as a DWPA. Consultation with Scottish Water confirmed that the Gladhouse Reservoir supplies Rosebery WTW and that the abstraction point is located

approximately 2 km downstream of the Proposed Development. Scottish Water, in their consultation response, considered that the Proposed Development poses a low risk to this DWPA. Measures to safeguard existing surface water flow paths and water quality, and thus maintain baseline conditions, are discussed in **Section 10.6**.

10.5.33 The Heriot Water / Blackhope Water surface water catchment, immediately south of the site is also designated as a DWPA, however no development is proposed within this catchment and therefore it is not considered further.

Surface Water Quality

10.5.34 SEPA classify larger watercourses within the site as part of its responsibility under the WFD. The quality of watercourses and waterbodies relevant to the site are presented in **Table 10.7**. It is shown that the watercourses and Gladhouse Reservoir have an overall classification of Poor to Moderate.

Table 10.7: Surface Water Quality

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical Status	Hydromorphology	Pressures
River South Esk - Gladhouse Reservoir sluice to Redside Burn confluence (3803)	Poor ecological potential	Poor	Not monitored	Moderate	Barrier to fish migration and modification to bed, banks and shores
Gladhouse Reservoir (100302)	Poor ecological potential	Poor	Good	Poor	Barrier to fish migration
Gore Water / Middleton South Burn (3819)	Moderate	Moderate	Good	Good	Barrier to fish migration and diffuse source pollution from rural sources

10.5.35 Smaller watercourses which rise within the site are not monitored or classified by SEPA.

Fisheries

10.5.36 Fisheries within the area are managed by the Forth Rivers Trust (FRT) in partnership with the Forth District Salmon Fishery Board (FDSFB). Fishery interests are discussed in more detail and assessed within **Chapter 8**.

Watercourse Crossings

10.5.37 Eleven new watercourse crossings are required to facilitate the Proposed Development. The locations of the proposed crossings are shown on Figure

10.1 and schedule of these crossing points, which includes photographs and dimensions of each crossing is shown in **Technical Appendix 10.3**.

Flood Risk

10.5.38 SEPA has developed national flood maps that present modelled flood extents for river, coastal, surface water and groundwater 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. 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 (1:1000). Or a 0.1% chance of happening in any one year.

10.5.39 The flood risk from each of these potential sources is discussed in **Table 10.8** and where relevant reference is made to the national SEPA flood mapping. Current and future flood maps which account for the potential effects of climate change (to 2080) published by SEPA have been reviewed.

Table 10.8: Flood Risk Screening

Potential Source	Potential Risk to the site	Justification
Coastal Flooding	No	The site is remote from the coast and situated at an elevation of at least 270 m AOD.
Fluvial Flooding	No	SEPA flood maps indicate that the site is not at risk from fluvial flooding. SEPA flood maps do not show flooding of the smaller watercourses within the site, however, floodplains associated with the watercourses are likely to be limited and confided to the watercourse corridors and within the buffer applied to watercourses as part of the project evolution.
Surface Water Flooding	No	SEPA flood maps indicate that the site is not at risk from surface water flooding. Therefore, surface water flooding is not considered a development constraint.
Groundwater Flooding	No	Review of the SEPA groundwater flood map confirms that the study area is not at risk from groundwater flooding.
Flood Defence Breach (Failure)	No	SEPA has produced reservoir inundation maps for sites currently registered under Reservoirs (S) Act 2011. Review of these maps indicates that the site is not at risk from a reservoir breach.

Potential Source	Potential Risk to the site	Justification
Flooding from Artificial Drainage Systems	No	The Proposed Development is located within a remote area and no flood defences are recorded within the study area.

Private Water Supplies and Licenced Abstractions

10.5.40 Consultation with MC and SEPA has been undertaken to gather details of private and licenced water abstractions within the study area.

10.5.41 SEPA has provided information of Controlled Activity Regulation (CAR) authorisations within the study area. Five authorisations are recorded, the details of which are as follows:

- two discharges of private sewage;
- one abstraction for drinking water supply (private); and
- two authorisations for Carcant Wind Farm, the details of which were not provided by SEPA.

10.5.42 The authorisation for the drinking water supply is discussed and assessed in **Technical Appendix 10.4**.

10.5.43 A data request was made to MC and SBC who provided details of private water supply (PWS) sources. In addition, a programme of site investigation has been undertaken to confirm the location of PWS locations.

10.5.44 The risk the Proposed Development poses to PWSs has been considered as part of this assessment and is presented in **Technical Appendix 10.4**. It confirms that:

- two PWS sources are potentially at risk from the Proposed Development;
- seven PWS sources are not at risk from the Proposed Development; and
- two properties have been confirmed to be on mains water supplies.

10.5.45 **Technical Appendix 10.4** confirms the measures that are required to safeguard these PWS and the licensed drinking water supply (private) and presents a monitoring schedule which can be used to confirm that the PWSs are not impaired should the Proposed Development be granted planning permission.

Summary of Sensitive Receptors

10.5.46 **Table 10.9** confirms the receptors identified by the baseline study and the field investigation programme, and their sensitivity based upon the criteria contained in **Table 10.2**. These receptors form the basis of the assessment

and are used in conjunction with an estimate of the magnitude of impact to determine the significance of any potential effect.

Table 10.9: Receptor Sensitivity

Receptor	Sensitivity	Reasons for Sensitivity
Water Dependent Designated Sites	Not sensitive	No water dependent designated sites are noted within the study area. They are not considered further in this assessment. The quality and yield of water shed to Gladhouse Reservoir is assessed in hydrology and hydrogeology below.
Soils and Geology	High - Peat	Class 1 peatland and carbon rich soils have been recorded within the site. With the exception of peat, the superficial and bedrock geology is rare and is not considered sensitive of further in this assessment.
Hydrogeology	High	Groundwater beneath the site has been classified as Good.
Hydrology	High	Surface water downstream of the site have been classified as Poor to Moderate overall status. Watercourses within the site are not monitored by SEPA and as a "worst case" it is assumed to have a Good overall status. The west of the site drains to Gladhouse Reservoir which is a water source used by Scottish Water and a designated site.
Flooding	Moderate	No or very little flood risk (limited to discrete areas of fluvial flooding adjacent to watercourses) has been identified on-site, but the Proposed Development has potential to alter surface water flow paths and increase flood risk.
Private Water Supplies	High	Several private water supplies have been confirmed within the study area and which could be at risk from the Proposed Development without appropriate controls.
Licenced Abstractions	High	A licenced water abstraction has (private) been recorded within the study area which could be at risk from the Proposed Development without appropriate controls.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. It has been shown that the habitats are not sustained by groundwater but by surface water. Measures will be required to sustain existing surface water flow paths to these habitats.

Future Baseline

10.5.47 Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside higher average temperatures. This suggests that there may 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. Peak fluvial and surface water flows associated with extreme storms events may also increase in volume and velocity, and sea level rise is anticipated. There potential changes are considered in the assessment of effects.

10.5.48 Whilst there is uncertainty surrounding the future baseline environment, there are no other anticipated changes on the soils or geology, hydrological or hydrogeological environment throughout the anticipated lifetime of development besides climate change.

10.6 Assessment of Potential Effects

10.6.1 The assessment of effects is based on the Proposed Development description outlined in **Chapter 3** and is structured as follows:

- details of embedded mitigations included in the development design;
- construction effects of the Proposed Development; and
- operational effects of the Proposed Development.

10.6.2 The effects have been identified with reference to relevant guidance, through consultation and project team discussions, through targeted research on hydrological and water quality effects and by considering the information provided by the project engineers on infrastructure and construction methods.

Embedded Mitigation

Design Iterations

10.6.3 The Proposed Development has undergone extensive design iterations and evolution in response to the constraints identified as part of the baseline studies and field studies so as to avoid and/or minimise potential effects on receptors where possible, as outlined in **Chapter 2: Site Selection and Design Iteration**. This has included areas of peat and carbon rich soils, geological, hydrological and hydrogeological constraints which include slope stability, watercourse locations, areas of potential flooding, and GWDTEs. Details of the embedded mitigation are given below.

Peat and Peat Management

10.6.4 The potential presence of peat within the site formed a key consideration in the design of the Proposed Development. Informed by the extensive programme of peat probing undertaken across the site, typically the design has avoided areas of deeper peat (>1 m) and where possible limited development to areas of peat less than 1 m or where peat is absent.

10.6.5 The peat depth probing data has been used to accurately determine the volume of peat which will be disturbed by the Proposed Development. This data has been used to prepare a site specific PMP (**see Technical Appendix 10.2**) which details the volume of acrotelmic and catotelmic peat which would be disturbed and how this would be safeguarded and reused on site. Further, the condition of the peat, and areas of peat that would benefit from restoration have been identified and are discussed in **Chapter 8 and associated oBEMP (Technical Appendix 8.6)**.

10.6.6 As shown in **Technical Appendix 10.1** (PLHRA) and **Technical Appendix 10.2** (PMP) measures have been proposed to ensure the stability of peat and carbon rich soils and that peat and soils that would be disturbed by the Proposed Development can be safeguarded and beneficially re-used on site.

Peat Management

10.6.7 A detailed review of the distribution and depth of peat at the site is contained in **Technical Appendix 10.2**. As the site design has avoided areas of deep peat and where peat would be encountered by the Proposed Development it can be readily managed and accommodated within the site layout. No surplus peat would be generated, and the limited volumes of peat generated from the proposed excavations would be used to reinstate track verges, turbine bases, cane hardstandings and restoration of on-site borrow pits.

Peat Landslide Hazard

10.6.8 A site specific PLHRA (**see Technical Appendix 10.1**) confirms regarding peat stability that there are very few areas of peat instability risk and the hazard impact and consequence assessment concludes that, with the employment of appropriate mitigation measures, there is an insignificant risk of peat slide risk.

10.6.9 A Design and Geotechnical Risk Register would be compiled to include risks relating to peat instability, as this would be beneficial to both the Developer and the Contractor in identifying potential risks that may be involved during construction.

10.6.10 Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in **Technical Appendix 10.1**. These include:

- measures to ensure a well-maintained drainage system, to include the identification and demarcation of zones of sensitive drainage or hydrology in areas of construction;
- minimisation of 'undercutting' of peat slopes, but where this is necessary, a more detailed assessment of the area of concern would be required;
- careful micro-siting of turbine bases, crane hardstandings and access track alignments to minimise effects on the prevailing surface and sub-surface hydrology;
- raising peat stability awareness for construction staff by incorporating the issue into the site induction (e.g. peat instability indicators and good practice);
- introducing a 'Peat Hazard Emergency Plan' to provide instructions for site staff in the event of a peat slide or discovery of peat instability indicators;
- developing methodologies to ensure that degradation and erosion of exposed peat deposits does not occur as the break-up of the peat top mat has significant implications for the morphology, and thus hydrology, of the peat (e.g. minimisation of off-track plant movements within areas of peat);
- developing robust drainage systems that would require minimal maintenance; and
- developing drainage systems that would not create areas of concentrated flow or cause over/under-saturation of peat habitats.

10.6.11 Notwithstanding any of the above good construction practices and methodologies, detailed design and construction practices would need to consider the particular ground conditions and the specific works at each location throughout the construction period. An experienced and qualified engineering geologist/geotechnical engineer would be appointed as a supervisor, to provide advice during the setting out, micro-siting and construction phases of the Proposed Development.

Buffer to Watercourses

10.6.12 In accordance with wind farm construction best practice guidelines and SEPA consultation advice, a 50 m buffer has been applied to watercourses (as shown on OS 1:25:000 mapping) where technically feasible.

10.6.13 The design has strived to minimise the number of locations where infrastructure does encroach within the buffer. The layout of the access tracks was also designed to minimise the requirement for watercourse crossings.

10.6.14 The majority of the Proposed Development is located outside of this buffer (see **Figure 10.1**) with the following exceptions:

- a small part of the proposed hardstanding associated with turbine T4, T6, T9, T12; and
- a small part of the proposed turning circle between turbines T2 and T3.

10.6.15 It is recognised during construction within the watercourse buffer there is a need for increased monitoring and management of the works. Specific drainage management plans, methods statements, monitoring, and pollution incident response plans relevant to the works at these locations are required and need to be agreed with statutory consultees, including SEPA.

10.6.16 Examples of the additional safeguards that would be deployed at these locations and included in the management plans, subject to agreement with consultees, 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 and actions and contact details should a pollution event be recorded.

Groundwater Dependant Habitats

10.6.17 SEPA's wind farm planning guidance states a NVC survey should be undertaken to identify wetland areas that might be dependent on groundwater. If potential GWDTE are identified within (a) 100 m of roads, tracks and trenches, or (b) within 250 m of borrow pits and foundations, then it is necessary to assess how the potential GWDTE may be affected by the Proposed Development.

10.6.18 It has been shown that areas identified as potentially highly or moderately groundwater dependent within the site are likely to be sustained by incident rainfall and local surface water runoff rather than groundwater. Areas which may be supported by groundwater are not considered to be at risk from the Proposed Development.

10.6.19 Measures, such as permeable access tracks and regular cross track drains, have been proposed to safeguard existing water flow paths and maintain existing water quality. It is considered therefore that the water dependent habitats identified by the NVC mapping can be sustained. This would be confirmed, in accordance with good practice, by the Ecological Clerk of Works (ECoW) at the time of the construction who would ensure existing surface water flow paths and water flushes are maintained.

Good Practice Methods

10.6.20 Good practice measures would be applied in relation to pollution risk, sediment management and management of surface runoff rates and volumes. These would form part of the final CEMP.

10.6.21 Key good practice measures are stated below, and the assessment incorporates these measures as part of the Proposed Development. Any further specific mitigation which may be required to reduce the significance of a potential effect is identified in the assessment of likely effects during the construction and operation phases.

General Measures

10.6.22 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.

10.6.23 Prior to construction, a site-specific drainage plan would be produced. This would consider any existing local drainage which may not be mapped and incorporate any site-specific mitigation measures identified during the assessment.

10.6.24 Measures would be included in the final CEMP for dealing with pollution/sedimentation/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.

10.6.25 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 specialist spill response contractor would be identified to deal with any major environment incidents.

10.6.26 A wet weather protocol would be developed. This would detail the procedures to be adopted by all staff during periods of heavy rainfall. Tool box talks would be given to engineering /construction /supervising personnel.

10.6.27 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 would dictate that work onsite may have to be temporarily suspended until weather/ground conditions allow.

Water Quality Monitoring

10.6.28 Water quality monitoring before and during the construction phase would be undertaken for the surface water catchments that drain from the site to ensure that none of the tributaries of the main channels are carrying pollutants or suspended solids. Monitoring would be carried out at a specified frequency (depending upon the construction phase) on these catchments.

10.6.29 Monitoring would continue throughout the construction phase and immediately post construction. Monitoring would be used to allow a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. Water quality monitoring plans would be developed during detailed design. Scottish Water, SEPA, MC, NatureScot, FRT and FDSFB would be consulted on the plans and would be contained within the final CEMP.

10.6.30 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.

Pollution Risk

10.6.31 Good practice measures in relation to pollution prevention would include the following:

- refuelling would take place at least 50 m from watercourses and where there is no 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 onsite to minimise the potential for accidents to occur;
- drip trays would be placed under stationary vehicles which could potentially leak fuel/oils;
- areas would be designated for washout of vehicles which 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;
- if any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly prior to treatment;
- 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 CAR, to minimise the potential for accidental spillage; 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.

Erosion and Sedimentation

10.6.32 Good practice measures for the management or 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;

- stockpiled material would either be seeded or appropriately covered, minimising the area of exposed bare ground;
- monitoring of stockpiles/excavation areas during rainfall events;
- water would be prevented as far as possible, from entering excavations through the use of appropriate cut-off drainage;
- where the above 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, specifically borrow pit 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 and the Principal Contractor would carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

Fluvial Flood Risk

10.6.33 Sustainable Drainage Systems (SuDS) shall be incorporated as part of the Proposed Development.

10.6.34 SuDS techniques aim to mimic pre-development runoff conditions and balance or throttle flows to the rate of runoff that might have been experienced at site prior to development. Good practice in relation to the management of surface water runoff rates and volumes and potential for localised fluvial 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;
- appropriate drainage would attenuate runoff rates and reduce runoff volumes to ensure minimal effect upon flood risk;
- where necessary, check dams would be used within cable trenches in order to prevent trenches developing into preferential flow pathways and trenches shall be backfilled with retained excavated material; 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.

10.6.35 Further information on ground conditions and drainage designs would be provided in the final CEMP.

Water Abstractions

10.6.36 For any water for construction activities good practice that would be followed in addition to the CAR regulations includes:

- water use would be planned so as to minimise abstraction volumes;
- water would be re-used where possible;
- abstraction volumes would be recorded; and
- abstraction rates and volumes would be agreed with SEPA to prevent significant water depletion in any third party water source.

Watercourse Crossings

10.6.37 Eleven new watercourse crossings are required for the Proposed Development as detailed within **Technical Appendix 10.3** and shown on **Figure 10.1**.

10.6.38 The crossings would be designed to pass the 200-yr flood event plus an allowance for climate change and their design and construction details would be agreed with SEPA and MC as part of the final CEMP.

Construction Effects

Peat and Soils

10.6.39 It has been shown (see Technical Appendix 10.1 and Technical Appendix 10.2 and Embedded Mitigation Section) that the disturbance of peat and soils as a result of the construction of the Proposed Development can be minimised and the peat deposits and carbon rich soils safeguarded.

10.6.40 Peat is a high sensitivity receptor. With the identified safeguards and proposed good practice methods, the potential impact on deposits of carbon rich soils and peat is assessed as negligible and thus the significance of effect is **negligible and therefore not significant**.

Pollution Risk

10.6.41 During the construction phase, there is the potential for a pollution event to affect surface and ground waterbodies impacting on their quality. This would have a negative impact on these receptors, potentially resulting in degradation of the water quality which would impact on any aquatic life and private and public water supplies abstracting from the watercourses and groundwater.

10.6.42 Pollution may occur from excavated and stockpiled materials during site preparation and excavation of borrow pits. Contamination of surface water runoff from machinery, leakage and spills of chemicals from vehicle use and the construction of hardstandings also have the potential to affect surface and ground waterbodies. Potential pollutants include sediment, oil, fuels and cement.

10.6.43 The risk of a pollution incident occurring would be managed using industry standard good practice measures as detailed in the preceding section. Many of these practices are concerned with undertaking construction activities away from watercourses, sensitive peat and vegetation habitats and identifying safe areas for stockpiling or storage of potential pollutants that could otherwise lead to the pollution.

10.6.44 The baseline assessment has shown that the watercourses surrounding the Proposed Development and groundwater beneath the Proposed Development (including PWSs, licensed water supplies and Gladhouse Reservoir) are considered High sensitivity receptors.

10.6.45 The Good Practice Measures (to be set out in the CEMP) would minimise the risk of a pollution event occurring to negligible and there are measures which would be put in place in the case of an accident occurring to mitigate pollution risk. The magnitude of impact associated with a pollution event is considered negligible and thus significance of effect is **negligible** and **not significant**.

Erosion and Sedimentation

10.6.46 Site traffic during the construction phase has the potential to cause erosion and increase sedimentation loading during earthworks, and due to increased areas of hardstanding and such features as stockpiles, tracks and excavations etc., which could be washed by rainfall into surface water features. This has the potential to reduce surface water quality, increase turbidity levels, reduce light and oxygen levels and affect ecology including fish populations.

10.6.47 Excavation of borrow pits, construction of hardstandings, diversion of drainage channels and the construction of water crossings associated with the Proposed Development are the key sources of erosion and sediment generation. Adherence to good practice measures would ensure that any material generated is not transported into nearby watercourses, to groundwater, or onto areas of peat or GWDTE.

10.6.48 The implementation of location specific good practice measures will form part of the final CEMP and would be used to minimise the potential for erosion and sedimentation.

10.6.49 After consideration of good practice measures, the magnitude of impact associated with erosion and sedimentation is assessed as negligible. Peat, GWDTE, groundwater and surface water (including PWSs, licensed water supplies and Gladhouse Reservoir) are considered high sensitivity receptors. The level of effect is therefore assessed as **negligible** and **not significant**.

Flood Risk

10.6.50 Construction of hardstandings including the substation compound, construction compound and turbine bases would create impermeable surface areas which could increase runoff rates and volumes.

10.6.51 Adherence with good practice measures including appropriate drainage design and compliance with the final CEMP would limit potential impacts to being local and short duration and so of negligible magnitude.

10.6.52 It is proposed that any rainwater and limited groundwater ingress which collects in the turbine excavations during construction would be stored and attenuated prior to controlled discharge to ground adjacent to the excavation.

10.6.53 Attenuation of runoff generated within the proposed turbine excavations would allow settlement of suspended solids within the runoff prior to discharge in accordance with 'Site control' component of the SuDS 'management train'.

10.6.54 The potential level of effect on flood risk, which is considered to have a moderate sensitivity, is therefore assessed as being **negligible** and **not significant**.

10.6.55 The magnitude of the increase in the impermeable area is not sufficient to have a measurable effect on groundwater levels, as the extent of the impermeable area is insignificant compared to the extent of the underlying geology and groundwater.

Infrastructure and Man-Made Drainage

10.6.56 Excavations associated with construction works (e.g. cut tracks, turbine bases foundations, cable trenches, borrow pits etc.) can result in local lowering of the water table. This is an important consideration in areas of peat deposits, where the water table is characteristically near the ground surface.

10.6.57 Dewatering associated with construction of turbine foundations is temporary and would not be required post construction. Cable laying, without appropriate mitigation measures, can also lower high groundwater levels and provide a preferential drainage route for groundwater movement that can lead to local and permanent drying of soils, superficial deposits and/or water supplies.

10.6.58 The design of the Proposed Development has avoided areas of high ecological or habitat interest, including GWDTE, wherever possible.

10.6.59 Location specific good practice measures will form part of the final CEMP and would be used to minimise the potential for drainage and dewatering effects.

10.6.60 During the construction of the Proposed Development, water may be abstracted for uses such as dust suppression, vehicle washing, batching plant activities and welfare facilities. The volume of water and mitigation required would be regulated through a CAR abstraction licence which would be agreed with SEPA.

10.6.61 The sensitivity of the receptor (groundwater and water supplies and habitat that may be dependent on groundwater) has been assessed as being High. The magnitude of impact is assessed as negligible and therefore the potential significance of effect of changing groundwater levels and flow due to dewatering is considered **negligible** and **not significant**.

Drinking Water Protected Areas

10.6.62 It has been shown that the west of the Proposed Development is located within a DWPA associated with Gladstone Reservoir. To ensure that the DWPA is not impaired it will be necessary to sustain existing surface water flows and quality shed from the Proposed Development.

10.6.63 The DWPA is considered a high sensitivity receptor. With the best practice construction techniques to protect surface water and groundwater receptors outlined above, in combination with the proposed monitoring programme (see example in Technical Appendix 10.4) the magnitude of impact is assessed as negligible, and the resultant significance of effect is assessed as **negligible** and **not significant**.

Operational Effects

10.6.64 During the operational phase of the Proposed Development, it is anticipated that routine maintenance of infrastructure and tracks would be required across the site. This may include work such as maintaining access tracks and drainage and carrying out maintenance of turbines.

10.6.65 Should any maintenance be required on-site during the operational life of the project which would involve construction type activities; mitigation measures would be adhered to along with the measures in the final CEMP to avoid potential effects.

Peat and Soils

10.6.66 No excavation, movement or storage of peat or soils is anticipated during the operational site life.

10.6.67 Peat is a high sensitivity receptor. The potential impact on deposits of soil and peat is therefore assessed as **negligible** and **not significant**.

Pollution Risk

10.6.68 The possibility of a pollution event occurring during operation is very unlikely. There would be a limited number of vehicles required on-site for routine maintenance and for the operation of the Proposed Development. Storage of fuels/oils on-site would be limited to the hydraulic oil required in turbine gearboxes and this would be bunded to prevent fluid escaping.

10.6.69 The proposed battery storage would be installed and operated in accordance with manufacturers and SEPA guidelines. As part of the detailed site design drainage of the battery storage, and measures that would be used to control and manage storm water runoff, during routine operation would be agreed with SEPA and NatureScot. In addition, the drainage design would consider the necessary controls required to manage spills or firewater

in the unlikely event of an accident occurring during operation of the battery storage.

10.6.70 The Good Practice Measures (to be set out in the final CEMP) would minimise the risk of a pollution event occurring to negligible and there are measures which would be put in place in the case of an accident occurring to mitigate pollution risk. The magnitude of a pollution event during the operational phase of the Proposed Development is assessed as negligible, as no detectable change would likely occur. Therefore, the significance of effect for a pollution event during the operational phase of the Proposed Development is predicted to be **negligible** and **not significant**.

Erosion and Sedimentation

10.6.71 During the operation of the Proposed Development, it is not anticipated that there would be any significant excavation or stockpiled material beyond the clearing of SuDS features to maintain their efficiency, reducing the potential for erosion and sedimentation effects.

10.6.72 Immediately post-construction, newly excavated drains and track dressings may be prone to erosion as any vegetation would not have matured. Appropriate design of the drainage system, incorporating sediment traps, would reduce the potential for the increased delivery of sediment to natural watercourses. Potential effects from sedimentation or erosion during the operational phase are considered to come from linear features on steeper slopes, where velocities in drainage channels are higher. Immediately post-construction, flow attenuation measures would remain and be maintained to slow runoff velocities and prevent erosion until vegetation becomes established.

10.6.73 The magnitude and impact associated with a short duration erosion and sedimentation event would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on identified receptors is **negligible** and **not significant**.

10.6.74 Should any non-routine maintenance be required at the sections of track crossing wet areas (defined visually on-site by a contractor or operational personnel) there would be potential for erosion and sedimentation effects to occur due to the existence of disturbed material. Should this type of activity be required, then the good practice measures as detailed for the construction phase would be required on a case by case basis. Extensive work at water crossings/adjacent to the water environment may require approval from SEPA under the CAR (depending upon the nature of the activity).

Fluvial Flood Risk

10.6.75 The risk of an effect on fluvial flood risk arises as a result of a potential restriction of flow at a permanent water crossing following intense rainfall. In accordance with good practice routine inspection and clearing of watercourse crossings at the site would be undertaken, reducing the likelihood of a blockage occurring. In the unlikely event of a blockage any flooding would be localised and the magnitude of impact is assessed as negligible, and thus the significance of effect is assessed as **negligible** and **not significant**.

Infrastructure and Man-Made Drainage

10.6.76 Operation of the Proposed Development would require limited activities relative to the construction phase.

10.6.77 The magnitude of a potential effect on groundwater and sub-surface flows as a result of permanent hardstandings and associated drainage would be negligible on the overall groundwater body due to the dispersed nature of the proposed hardstanding. The significance of effect is **negligible** and **not significant**.

Drinking Water Protected Areas

10.6.78 With the best practice techniques to protect surface water and groundwater receptors outlined above the magnitude of impact is assessed as negligible and the resultant significance of effect is assessed as **negligible** and **not significant**.

10.7 Mitigation

10.7.1 As there are no predicted significant effects under the terms of the EIA Regulations, other than the good practice measures that the Developer would implement as standard (and as described above), no additional specific mitigation during construction is required.

10.7.2 It has been recognised in this assessment that a programme of water monitoring would be required prior to any construction activity and during construction of the Proposed Development. The monitoring programme would be agreed with Scottish Water, SEPA, NatureScot, MC, FRT and FDSFB and it is expected to include monitoring of the watercourses which drain from the site.

10.7.3 As detailed in **Technical Appendix 10.1**, it is proposed that a geotechnical risk register is maintained during the construction and post-construction phase of the Proposed Development. It is expected that this would be

maintained by the Developer, and again, secured by an appropriately worded predevelopment condition of consent.

10.7.4 As detailed in **Technical Appendix 10.2**, during and following construction the drainage measures deployed at the site (temporary and permanent) would be subject to routine inspection by the dedicated site ECoW and the Developer. This would be specified in a site-specific CEMP and would be secured by an appropriately worded predevelopment condition of consent.

10.8 Assessment of Residual Effects

10.8.1 No significant residual effects on soils and peat, geology, surface water or groundwater receptors are predicted during the construction and operational phases of the Proposed Development.

10.9 Assessment of Cumulative Effects

10.9.1 The assessment also considers potential cumulative effects associated with other developments within the same surface water catchments as the Proposed Development and within a distance of 5 km from the nearest element of proposed infrastructure.

10.9.2 A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the site in combination with other wind farm developments which are likely to affect soils, geology, surface water and groundwater.

10.9.3 No other developments are noted both within 5 km of the Proposed Development and within the same surface water catchment as the Proposed Development. No cumulative effects are anticipated, therefore, as a result of the Proposed Development.

10.10 Summary

10.10.1 A summary of assessed effects and identified mitigation measures required to reduce the potential effects to acceptable levels are identified in **Table 10.10**.

Table 10.10: Summary of Potential Effects

Potential Significant Effect	Mitigation	Means of Implementation	Residual Effect
Degradation of Peat and Carbon Rich Soils	Mitigation by design and good practice measures.	Final CEMP to be submitted for the written approval of MC, SEPA and NatureScot prior to	Not significant

Potential Significant Effect	Mitigation	Means of Implementation	Residual Effect
		construction commencing. Geotechnical Risk Register. Implementation of Peat Management Plan.	
Generation of Pollution Impairing Surface Water, Groundwater, Habitat and Water Supplies	Good practice measures	Final CEMP to be submitted for the written approval of MC, SEPA and NatureScot prior to construction commencing. Confirmatory water quality monitoring which will be agreed with Scottish Water, SEPA, NatureScot, MC, FRT and FDSFB prior to construction commencing.	Not significant
Erosion and Sedimentation Impairing Surface Water, Groundwater, Habitat and Water Supplies	Good practice measures	Final CEMP to be submitted for the written approval of MC, SEPA and NatureScot prior to construction commencing.	Not significant
Drainage and Dewatering Impairing Surface Water, Groundwater, Habitat and Water Supplies	Good practice measures	Final CEMP to be submitted for the written approval of MC, SEPA and NatureScot prior to construction commencing.	Not significant

10.11 References

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