9 Geology, Hydrology and Hydrogeology

9.1 Introduction

9.1.1 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: Proposed Development Description**.

9.1.2 It outlines the embedded good practice methods which have been incorporated into the design and will 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.

9.1.3 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.

9.1.4 The chapter is supported by:

- **Technical Appendix 9.1: Peat Landslide Hazard Risk Assessment (PLHRA);**
- **Technical Appendix 9.2: Peat Management Plan (PMP);**
- **Technical Appendix 9.3: Schedule of Watercourse Crossings; and**
- **Technical Appendix 9.4: Private Water Supply Risk Assessment (PWSRA)**.

9.1.5 **Figures 9.1 – 9.8** are referenced in the text where relevant.

9.1.6 The assessment uses information and findings presented in **Chapter 7** to inform the assessment of potential effects on possible areas of Groundwater Dependent Terrestrial Ecosystems (GWDTE) which are presented in this chapter.

9.2 Legislation, Policy and Guidance

9.2.1 The aquatic environment in Scotland is afforded significant protection through key statutes and the regulatory activity of Scottish Environment Protection Agency (SEPA) and local authorities. Relevant legislation and guidance documents have been reviewed and considered as part of this assessment.

Legislation

- EU Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- The Environment Act 1995;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Environmental Protection Act 1990;
- The Flood Risk Management (Scotland) Act 2009;
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
- 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; and
- Private Water Supplies (Scotland) Regulations 2006.

Planning Context

9.2.2 National Planning Framework 4 (NPF4)[1] provides planning guidance and polices regarding sustainable development. The **Planning Statement** provides a detailed overview of the relevant planning policy. Policies relevant to this chapter include:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 4 (Natural Places);
- Policy 5 (Soils);
- Policy 11 (Energy);
- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).

9.2.3 In addition, the Highland Council (THC)'s Highland-wide Local Development Plan (HwLDP)[2] provides planning guidance on the type and location of the development that can take place in the region. The HwLDP presents development polices of which the following are relevant to this chapter:

- Policy 53: Minerals;
- Policy 54: Mineral Wastes;
- Policy 55: Peat and Soils;
- Policy 60: Other Important Habitats and Article 10 Features;
- Policy 62: Geo-diversity;

[1] Scottish Government (2023) National Planning Framework 4 (NPF4)

[2] The Highland Council (2012) Highland-wide Local Development Plan (HwLDP)

- Policy 63: Water Environment;
- Policy 64: Flood Risk;
- Policy 66: Surface Water Drainage; and
- Policy 67: Renewable Energy Developments.

Guidance

9.2.4 The following guidance is also applicable to the assessment.

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

- PAN 50 Controlling the Environmental Effects of Surface Mineral Workings (1996);
- PAN 61 Planning and Sustainable Urban Drainage Systems (2001); and
- Online Planning Advice on Flood Risk (which supersedes PAN 69) (2015).

9.2.6 SEPA Guidance on Pollution Prevention (GPP):

- GPP01 Understanding your environmental responsibilities – good environmental practices (2021);
- GPP02 Above Ground Oil Storage (2021);
- GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems (2022);
- GPP05 Works and Maintenance in or near Water (2018);
- GPP06 Working at Construction and Demolition Sites (2023);
- GPP08 Safe Storage and Disposal of Used Oils (2021);
- GPP13 Vehicle Washing and Cleaning (2021);
- GPP21 Pollution Incident Response Planning (2021); and
- GPP22 Dealing with Spills (2018).

9.2.7 Construction Industry Research and Information Association (CIRIA) publications:

- C532, Control of Water Pollution from Construction Sites (2001);
- C648, Control of Water Pollution from Linear Construction Projects – Technical Guidance (2006);
- C741, Environmental Good Practice on Site (2015);
- C753, The SUDS Manual (2015); and
- R179, Ground Engineering Spoil: Good Management Practice (1997).

9.2.8 SEPA Publications[3]

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

9.2.9 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, NatureScot, Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland, 2024, Good Practice during Windfarm Construction; 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.

9.3 Consultation

9.3.1 Consultation for the Proposed Development was undertaken with statutory and non-statutory bodies as set out in **Chapter 4: Approach to EIA**.

9.3.2 The outcome of the relevant consultations with regards to soil, geology (including peat) and the water environment is summarised in **Table 9.1**.

Table 9.1: Consultation Responses

Consultee	Summary of Key Issues	Where addressed in Chapter
Energy Consents Unit Scoping Response	Scottish Water provided information on whether there are any drinking water protected areas or Scottish Water assets on which the development could have any significant effect. Scottish	Refer to Scottish Water response below.

[3] Several SEPA guidance documents are currently in the process of being reviewed following publication of NPF4.

Consultee	Summary of Key Issues	Where addressed in Chapter
14 May 2024	Ministers request that the company contacts Scottish Water (via EIA@scottishwater.co.uk) and makes further enquiries to confirm the 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.	Assessments of potential impacts on the water environment, including Scottish Water to confirm assets and DWPAs which may be affected, are discussed in Section 9.5 of this Chapter.
Energy Consents Unit Scoping Response 14 May 2024	Scottish Ministers request that the Company investigates the presence of any private water supplies which 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 Company should provide an assessment of the potential impacts, risks, and any mitigation which would be provided.	Potential impacts on private water supplies and proposed mitigation measures, as required, are discussed in **Technical Appendix 9.4** (PWSRA) and summarised in this chapter.
Energy Consents Unit Scoping Response 14 May 2024	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. The Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition), published at http://www.gov.scot/Publications/2017/04/8868, should be followed in the preparation of the EIA report, which should contain such an assessment and details of mitigation measures. Where a PLHRA is not required clear justification for not carrying out such a risk assessment is required.	Potential impacts on peat and proposed mitigation measures are summarised in this chapter and discussed in full in **Technical Appendix 9.1** (PLHRA) and **Technical Appendix 9.2** (PMP).
Energy Consents Unit Scoping Response 14 May 2024	Where borrow pits are proposed as a source of on-site aggregate they should be considered as part of the EIA process and included in the EIA report detailing information regarding their location, size and nature. Ultimately, it would be necessary to provide details of the proposed depth of the excavation compared to the actual topography and water table, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement, and details of the proposed restoration profile. The impact of such facilities (including dust, blasting and impact on water) should be appraised as part of the overall impact of the working. Information should cover the requirements set out in 'PAN 50: Controlling the Environmental Effects of Surface Mineral Workings'.	A borrow pit report is included as **Technical Appendix 3.2.**
The Highland Council Scoping Response	The EIAR needs to address the nature of the hydrology and hydrogeology of the site, and of the potential impacts on water courses, water supplies including private supplies, water quality, water quantity and on aquatic flora and fauna. Impacts on	This chapter assesses the potential effects of the Proposed
1 May 2024	watercourses, lochs, groundwater, other water features including bog pools surrounding the proposed infrastructure, and sensitive receptors such as water supplies, need to be assessed and it demonstrated will not be degraded by site drainage and excavations. Measures to prevent erosion, sedimentation or discolouration will be required, along with monitoring proposals and contingency plans. Assessment will need to recognise periods of high rainfall that will impact on any calculations of run-off, high flow in watercourses and hydrogeological matters. The applicant is strongly advised at an early stage to consult Scottish Environment Protection Agency (SEPA) as the regulatory body responsible for the implementation of the Controlled Activities (Scotland) Regulations 2005 (CAR), however it is likely that a map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment, and details of any related CAR applications will be required to be included with the EIAR. SEPA will identify whether a CAR license is necessary and the extent of information required to assess any license application.	Development on the water environment. Required mitigation measures and best practice that would be adopted are also presented in this Chapter.
The Highland Council Scoping Response 1 May 2024	If culverting should be proposed, either in relation to new or upgraded tracks, then it should be noted that SEPA has a general presumption against modification, diversion or culverting of watercourses. Schemes should be designed to avoid crossing watercourses, and to bridge watercourses where this cannot be avoided. The EIAR will be expected to identify all water crossings and include a systematic table of watercourse crossings or channelling, with detailed justification for any such elements and design to minimise impact. The table should be accompanied by photography of each watercourse affected and include dimensions of the watercourse. It may be useful for the applicant to demonstrate choice of watercourse crossing by means of a decision tree, taking into account factors including catchment size (resultant flows), natural habitat and environmental concerns. Further guidance on the design and implementation of crossings can be found on SEPA's Construction of River Crossings Good Practice Guide.	A schedule of watercourse crossings is included as **Technical Appendix 9.3** which includes initial hydraulic calculations for the 1 in 200 year flood event plus climate change.
The Highland Council Scoping Response 1 May 2024	The Council's Flood Risk Management Team had no comments to make at this stage. However, there are a number of watercourses on the site therefore the following applies: • A minimum of a 50m buffer of all watercourses/bodies and turbines/crane hardstandings, which should be shown on a suitably scaled drawing; • All tracks should be kept a minimum 10m away from any waterbody except water crossings; • Access tracks not acting as preferential pathways for runoff and efforts being made to retain existing natural drainage wherever possible; • Natural flood management techniques should be applied to reduce the rate of runoff where possible; use of SuDS to achieve pre-development runoff rates and to minimise erosion on existing watercourses;	It is confirmed that a 50m buffer to all watercourses / bodies has been applied, as shown on **Technical Figure 9.1**. It is confirmed that watercourse crossings would be sized to pass the 0.5% AEP plus an allowance for climate change, see **Technical Appendix 9.3**.

Consultee	Summary of Key Issues	Where addressed in Chapter
	• Water crossings in the form of culverts or bridges, or upgrades to existing crossings must be designed to accommodate to 1 in 200 year flood event, plus climate change; • Land rising within any floodplain to be avoided; if ultimately required, compensatory storage must be provided; and, • The EIAR should be informed by the Council's Flood Risk and Drainage Impact Assessment Supplementary Guidance.	Principles, design standards and best practice measures for the management and control of drainage that would be adopted by the Principal Contractor are included within this chapter.
The Highland Council Scoping Response 1 May 2024	The EIAR must consider the risks of engineering instability relating to presence of peat on the site. A comprehensive peat slide risk assessment in accordance with the Scottish Government Best Practice Guide for Developers will be expected. Assessment should also address pollution risk and environmental sensitivities of the water environment. It should include a detailed map of peat depth and evidence that the scheme minimises impact on areas of deep peat. The EIAR should include site-specific principles on which construction method statements would be developed for engineering works in peat land areas, including access roads, turbine bases and hard standing areas, and these should include particular reference to drainage impacts, dewatering and disposal of excavated peat. As previously noted, the EIAR should include a full assessment on the impact of the development on peat. Policy 55 Peat and Soils, of the Highland Wide LDP, states that development proposals should demonstrate how they have avoided unnecessary disturbance, degradation or erosion of peat and soils. As such, the phase 1 peat depth survey as proposed in the Scoping Report is welcomed in order to ensure that the final infrastructure design avoids deep peat and any sensitive habitats. The mitigation hierarchy must be followed, with impacts avoided and minimised where possible. SEPA can provide detailed advice on methodology for peat probing and the peat assessment. The peat depth survey should be presented as a table detailing re-use proposals.	Potential impacts on peat and proposed mitigation measures are summarised in this chapter and discussed in full in **Technical Appendix 9.1** and **Technical Appendix 9.2** and where the results of site-specific peat depth probing are presented.
The Highland Council Scoping Response 1 May 2024	Carbon balance calculations should be undertaken and included within the EIAR with a summary of the results provided focussing on the carbon payback period for the wind farm.	Carbon balance calculations are presented as **Technical Appendix 12.2**
The Highland Council Scoping Response 1 May 2024	The EIAR should fully describe the likely significant effects of the development on the local geology including aspects such as borrow pits, earthworks, site restoration and the soil generally including direct effects and any indirect. Proposals should demonstrate construction practices that help to minimise the use of raw materials and maximise the use of secondary aggregates and recycled or renewable materials. Where borrow pits are proposed the EIAR should include information regarding the location, size and nature of these borrow pits including information on the depth of the borrow pit floor and the borrow pit final reinstated profile, Site Management Plan and pollution prevention measures. Borrow pits should be located in an area	A borrow pit assessment is presented as **Technical Appendix 3.2.**
	demonstrating the least environmental impact, while any aggregate sourced from offsite should not impact on the chemistry of the existing groundwater and must be of a high enough quality not to cause siltation to waterbodies or wetlands. Including this information can avoid the need for further applications.	
The Highland Council Scoping Response 1 May 2024	In order to protect peatland and limit carbon emissions from carbon rich soils a Peatland Management Plan (PMP) should be provided. The PMP should demonstrate that proposals: • Avoid peatland in near natural condition, as this has the lowest greenhouse gas emissions of all peatland condition categories; • Minimise the total area and volume of peat disturbance. Clearly demonstrate how the infrastructure layout design has targeted areas where carbon rich soils are absent or the shallowest peat reasonably practicable. Avoid peat > 1m depth; • Minimise impact on local hydrology; and • Include adequate peat probing information to inform the site layout and demonstrate that the above has been achieved. As a minimum this should follow the requirements of the Peatland Survey – Guidance on Developments on Peatland (2017).	A Site-specific Peat Management Plan (**Technical Appendix 9.2**) has been prepared which shows how soils and peat will be safeguarded.
The Highland Council Scoping Response 1 May 2024	The Peatland Condition Assessment photographic guide lists the criteria for each condition category and illustrates how to identify each condition category. This should be used to identify peatland in near natural condition and can be helpful in identifying areas where peatland restoration could be carried out.	The condition of the peat is discussed in **Technical Appendix 9.2** (PMP) and **Technical Appendix 7.5** (outline Habitat Management Plan).
The Highland Council Scoping Response 1 May 2024	In line with the requirements of Policy 5d of NPF4, the development proposal should include plans to restore and/or enhance the site into a functioning peatland system capable of achieving carbon sequestration. The PMP should also include: • Information on peatland condition; • Information demonstrating avoidance and minimisation of peat disturbance; • Excavation volumes of acrotelmic, catotelmic and amorphous peat. These should include a contingency factor to consider variables such as bulking and uncertainties in the estimation of peat volumes; • Proposals for temporary storage and handling; • Reuse volumes in different elements of site reinstatement and restoration. Handling and temporary storage of peat should be minimised. catotelmic peat should be kept wet, covered by vegetated turves and re-used in its final location immediately after excavation. It is not suitable for use in verge reinstatement, re-profiling/ landscaping, spreading, mixing with mineral soils or use in bunds. Disposal of peat is not acceptable. It should be clearly demonstrated that all peat disturbed by the development can be used in site reinstatement (making good areas which have been disturbed by the development) or peatland restoration (using	A Site-specific Peat Management Plan (**Technical Appendix 9.2**) has been prepared which shows how soils and peat will be safeguarded.

Consultee	Summary of Key Issues	Where addressed in Chapter
	disturbed peat for habitat restoration or improvement works in areas not directly impacted by the development, which may need to include locations outwith the development boundary). The faces of cut batters, especially in peat over 1m, should be sealed to reduce water loss of the surrounding peat habitats, which will lead to indirect loss of habitat and release of greenhouse gases. This may be achieved by compression of the peat to create an impermeable subsurface barrier, or where slope [sic].	
SEPA Scoping Response 7 March 2024	The proposed location of the turbines avoids impacts on watercourses shown on the 1:50,000 OS map which is welcomed; the developer is reminded to also consider any smaller scale water features. As long as the 50 m buffer from infrastructure to watercourses is applied and there are not any existing groundwater abstractions within 250 m of excavation then we are content with the approach that no detailed flood risk assessment, drainage detail or water monitoring results are submitted as part of the submission.	Noted. It is confirmed that a 50m buffer to all watercourses / bodies has been applied, as shown on **Figure 9.1**. Groundwater abstractions, including private water supplies are summarised in this chapter and presented in full in **Technical Appendix 9.4**.
SEPA Scoping Response 7 March 2024	We welcome the inclusion of the phase 1 peat probing work as part of the scoping report; it shows that nearly all of the development will be on peat, and that there are a number of areas where the peat is deep, which the final location of any infrastructure should avoid. We also note that some of the site is Class 1 Peatland and we highlight the requirements for Peatland Condition Survey in the attached appendix.	Noted. Potential impacts on peat are summarised in this chapter and discussed in full in **Technical Appendix 9.1** and **Technical Appendix 9.2**. The condition of the peat is discussed in Section 7.6 in **Chapter 7**.
SEPA Scoping Response 7 March 2024	The submission should include a draft Habitat Management Plan, or similarly named document, which should include specific proposals to offset/compensate for direct and indirect impacts on peatland, and to provide environmental enhancement.	Outline Habitat Management Plan is included as **Technical Appendix 7.5.**
SEPA Scoping Response 7 March 2024	As indicated above we would very much welcome further pre-application discussions with the developer once further peat probing and habitats NVC survey has been carried out and the layout has been updated as a result. The layout should clearly show how impacts on deeper peat and near natural peatland has been avoided.	See **Figure 7.2** for Phase 1 survey results, and **Figure 7.3** for NVC survey results. **Chapter 2** of the EIA Report also discusses in detail the design evolution and aims of the Proposed Development, including how peatland and sensitive habitats have been avoided as far as possible.
NatureScot Scoping Response 16 April 2024	River Spey Special Area of Conservation (SAC). The SAC is protected for its internationally important populations of salmon, freshwater pearl mussel, sea lamprey and otter. The southern part of the proposed development site is within the catchment of the River Dulnain which is part of the SAC. Tributaries within the proposed development site such as the Allt Leth-allt are therefore connected to the SAC. Potential for direct and indirect impacts to the SAC should therefore be considered through a shadow HRA to be submitted as part of the EIAR. Key issues to consider would be potential for impacts from watercourse crossings, and potential for release of pollutants and in particular peat or non-peat sediment to watercourses during construction works, through surface water run-off or potential peat slide risk/slope instability. All of the SAC's qualifying features would be sensitive to adverse changes in water quality. We would expect any future application to demonstrate how water quality within the SAC and its tributaries would be protected during the construction, operation and decommissioning of the wind farm, as well as any proposed habitat management works.	Assessment of potential impacts on the River Spey SAC is included in this Chapter and **Chapter 7**, as well as **Technical Appendix 8.3** (the Shadow HRA).
NatureScot Scoping Response 16 April 2024	We note that an Outline Construction Environmental Management Plan (CEMP) would be prepared as part of the EIAR which would include information on the specific environmental requirements and good practice to be included in the construction phase. Details of peat and soil management measures, and the site-specific mitigation measures that would be in place to prevent and control erosion and surface water run-off would be useful to provide at the application stage, with particular attention to the period during and immediately after construction. Advice on Good practice during Wind Farm construction can be found at: https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction. The scoping report (Q10.2) queries the need for a detailed drainage design at application stage. We recommend that in terms of the SAC it would be useful to see as much detail as possible on water management during the construction stage.	Outline CEMP is presented as **Technical Appendix 3.1.** Good practice measures with respect to geology and the water environment which will inform the final CEMP are outlined in Section 9.6 of this chapter.
NatureScot Scoping Response 16 April 2024	The Slochd Geological Conservation Review (GCR) site. Although not designated a SSSI, this site is of national importance for geology. On the basis of information submitted to date this site looks unlikely to be affected but it is partly located within the north-east edge of proposed development site and, should the layout change, the potential for direct or indirect impacts may need considered. Provided the EIA confirms there would be no direct or indirect impacts to this site we are content that it is scoped out of the EIA.	It is confirmed that no element of the Proposed Development is located within the Slochd GCR site, as discussed in Section 9.5 and shown on **Figure 9.1.**

Consultee	Summary of Key Issues	Where addressed in Chapter
NatureScot Scoping Response 16 April 2024	We recommend that survey results are used to inform the design and layout process, so that the development avoids, where possible, sensitive habitats such as blanket bog and montane heath. Where this is not possible, impacts should be minimised and suitable mitigation, restoration and/or compensation measures be proposed. We note that the applicants intend to make use of existing access tracks where possible. Assessment should consider the extent of habitat loss and damage, both direct and indirect, temporary and permanent, and suitable mitigation and/or restoration measures be presented in an Outline Habitat Management Plan and Peat Management Plan.	Outline Habitat Management Plan is included as **Technical Appendix 7.5** and Peat Management Plan is presented as **Technical Appendix 9.2**.
NatureScot Scoping Response 16 April 2024	We recommend that the applicants refer to our updated peatland guidance at: https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management. This includes advice on the mitigation hierarchy; survey and assessment; and mitigation and enhancement, including peatland restoration techniques, Habitat Management Plans and the level of information which would be expected for a future application. The proposed development site includes areas mapped as Class 1 peatland. The scoping report describes the peatland habitat in the north of the site as modified. In line with our guidance an assessment of peatland condition should be provided in the EIAR, and we recommend this is guided by the template provided in Annex 1 of the guidance. NPF4 Policy 5 (Soils) provides protection for carbon-rich soils and peatlands. NPF4 Policy 5d requires that 'where development on peatland, carbon-rich soils or priority peatland is proposed, a detailed site-specific assessment will be required'. Development proposals on peat should be supported by a site-specific and detailed peat survey, a Peat Management Plan and a Peat Landslide Hazard Risk Assessment (PLHRA). We advise that site-specific assessments and surveys inform the project design and siting to ensure compliance with the mitigation hierarchy. Appendix 10.1 does not include peat probing information for the southern part of the site. We assume that this area will also be covered by survey work in order to assess potential impacts to peatland habitats and the River Spey SAC.	Potential impacts on peat and the condition of peat are summarised in this chapter and discussed in full in **Technical Appendix 9.1**, **Technical Appendix 9.2** and **Technical Appendix 7.5**.
NatureScot Scoping Response 16 April 2024	We note that where practical sensitive habitat such as blanket bog will be avoided by design. Where impacts cannot be avoided, they should be minimised, and our current recommendation is that restoration to achieve offsetting (i.e. compensation rather than biodiversity enhancement) should be in the order of 1:10 (lost:restored), i.e. 1ha loss of peatland should result in measures to restore 10ha of peatland. The guidance recommends that any proposed enhancement should be in addition to this, for example 10% of the baseline blanket bog habitat. Policy 3 (Biodiversity) also applies to all development proposals, so any proposal affecting carbon-rich soils and peatlands must take into account the requirements to conserve, restore and enhance biodiversity, including priority peatland habitats. Links to current guidance relevant to peatland survey and assessment can be found at: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-standing-advice-and-guidance-documents.	Habitat restoration is considered in **Chapter 7** and an outline Habitat Management and Biodiversity Enhancement Plan (HMBEP) is presented as **Technical Appendix 7.5**.
Scottish Water Scoping Response 6 March 2024	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). Tomatin Borehole supplies Tomatin Water Treatment Works (WTW) and it is essential that water quality and water quantity in the area are protected. In the event of an incident occurring that could affect Scottish Water we should be notified immediately using the Customer Helpline number 0800 0778 778. The hills upon which the wind farm is to be constructed are drained by three affluents of the River Findhorn. Downstream, in the floodplain, the river is hydraulically connected to the sand-and-gravel aquifer that is tapped by the Tomatin Borehole. The risk to the borehole is thought to be low, however hydrocarbons or fines may be released during the construction phase of the windfarm and the risk should be managed by the use of plant nappies, drip trays or spill kits etc. Scottish Water have produced a list of precautions for a range of activities. This details protection measures to be taken within a DWPA, the wider drinking water catchment and if there are assets in the area. Please note that site specific risks and mitigation measures will require to be assessed and implemented. These documents and other supporting information can be found on the activities within our catchments page of our website at www.scottishwater.co.uk/slm PFAS is an emerging concern for us, and it has not been confirmed within the report if the turbines are to be PFAS free, something that will need to be made clear to us as this progressing through the planning phases. PFAS should be included in any water quality monitoring the developer is going to undertake ahead of, during and after construction. We welcome receipt of this notification about the proposed activity within a drinking water catchment where a Scottish Water abstraction is located. The fact that this area is located within a drinking water catchment should be noted in future documentation. Also, anyone working on site should be made aware of this during site inductions. We should be further consulted as this application progresses and should be made aware before any activity begins on site.	Assessments of potential impacts on the water environment, including Scottish Water assets and DWPAs, is assessed in this Chapter.

9.4 Methodology

Scope of Assessment

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

9.4.2 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 9.5) and measures that would be used to control the rate and quality of runoff will be specified in the CEMP which would be agreed with THC prior to any development;
- **Baseline 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 baseline 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; and
- **Potential effects on geology:** With the exception of peat, no development is proposed within any protected geological features. Furthermore, the nature of the activities during construction, operation and decommissioning of the Proposed Development would not alter regional or solid geology. Potential effects on peat and carbon rich soils are not scoped out of the assessment and are considered in full.

Baseline Characterisation

Study Area

9.4.3 The study area is shown on **Figures 9.1 to 9.8** and includes all of the proposed infrastructure and a 500m buffer from the Site boundary. Beyond this distance, any effect is considered to be so diminished as to be undetectable and therefore not significant.

9.4.4 The study area for potential cumulative effects uses the catchments in the study area and extends to 5km from the Site boundary.

Desk Study / Field Survey

9.4.5 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[4];
- NatureScot SiteLink[5];
- The James Hutton Institute, National Soil Map of Scotland (1:250,000 scale)[6];
- Scottish Natural Heritage (now NatureScot) Carbon and Peatland 2016 data[7];
- British Geological Survey (BGS) Onshore Geoindex[8];
- BGS Hydrogeological Maps of Scotland (1:100,000 scale)[9];
- SEPA rainfall data[10];
- SEPA flood maps[11];
- SEPA reservoir indundation map[12];
- SEPA environmental data[13]; and
- THC private water supply database[14].

9.4.6 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. Details of the ecological surveys undertaken across the Site are found in **Chapter 7: Ecology**.

[4] UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) Webservice, available online at https://fehweb.ceh.ac.uk/ [Accessed September 2024]
[5] NatureScot, SiteLink, available online at https://sitelink.nature.scot/home [Accessed September 2024]
[6] The James Hutton Institute, National Soil Map of Scotland, available online at https://soils.environment.gov.scot/maps/soil-maps/national-soil-map-of-scotland/ [Accessed September 2024]
[7] Scottish Natural Heritage (now NatureScot) Carbon and Peatland 2016 data, available online at https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/ [Accessed September 2024]
[8] British Geological Survey, onshore Geoindex, available online at https://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed September 2024]
[9] British Geological Survey, Hydrogeological maps of Scotland, available online at https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/ [Accessed September 2024]
[10] SEPA, Rainfall data for Scotland, available online at https://www2.sepa.org.uk/rainfall/ [Accessed September 2024]
[11] SEPA, Flood Maps, available online at https://beta.sepa.scot/flooding/flood-maps/ [Accessed September 2024]
[12] SEPA, Reservoir Inundation Maps, available online at https://map.sepa.org.uk/reservoirsfloodmap/Map.htm [Accessed September 2024]
[13] SEPA, Environmental data, available online at https://www.sepa.org.uk/environment/environmental-data/ [Accessed September 2024]
[14] THC, Private Water Supply Database, available online at https://map-highland.opendata.arcgis.com/datasets/ded172bbade24650bb2c1baec5e0d318 [Accessed September 2024]

9.4.7 Phase 1 peat depth survey was undertaken across most of the Site by Atmos Consulting in October 2022, and on an additional area in October 2023, which was later incorporated into the Site.

9.4.8 Detailed Site visits and walkover surveys have been undertaken by SLR on the following dates:

- May / June 2024 to complete watercourse crossing survey and conduct additional peat and soil depth probing exercise; and
- May 2024 to complete additional watercourse crossing survey and private water supply survey.

9.4.9 The fieldwork 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.

9.4.10 The desk study and field surveys have been used to identify potential development constraints and have been used as part of the iterative design process. Further details on the design process and evolution of the Proposed Development are found in **Chapter 2: Site Description and Design Evolution**.

9.4.11 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

9.4.12 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.

9.4.13 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.

9.4.14 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 detailed in the outline habitat management plan, peat management plan and peat landslide hazard risk assessment (see **Technical Appendix 7.5**, **Technical Appendix 9.2** and **Technical Appendix 9.1** respectively).

9.4.15 The criteria for determining the significance of effect are provided in **Table 9.2**, **Table 9.3**, and **Table 9.4**.

Sensitivity Criteria

9.4.16 The sensitivity of the receiving environment (i.e. baseline quality of the receiving environment) is defined as its ability to absorb an effect without a detectable change and can be considered through a combination of professional judgement and a set of pre-defined criteria which are set out in **Table 9.2**. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 9.2: 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 Effect

9.4.17 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 9.3**.

Table 9.3: 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; • 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

9.4.18 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 9.4**.

9.4.19 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 9.4: 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

9.4.20 Effects of ‘major’ or ‘moderate’ significance, as outlined in **Table 9.4**, are considered to be ‘significant’ in the context of the EIA Regulations.

Cumulative Effects

9.4.21 The assessment also considers potential cumulative effects associated with other material developments within 5km 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

9.4.22 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 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.

9.4.23 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.

9.4.24 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

9.4.25 A statement of residual effects, following consideration of any further specific mitigation measures where identified, is then given in Section 9.8.

Assumptions, Limitations and Confidence

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

9.4.27 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.

9.5 Baseline

Current Baseline

Site Setting

9.5.1 The Site is located approximately 5.5km south of the village of Tomatin in the Scottish Highlands and is centred at Grid Reference E 279727 / N 822732. The Site comprises predominately managed upland grouse moorland with agricultural fields and mixed woodland at lower altitudes.

9.5.2 Ground elevations vary between 750m Above Ordnance Datum (AOD) within the south-western corner of the Site near the summit of Carn Dubh'lc an Deoir to approximately 330m AOD along the north-western boundary of the Site near the River Findhorn. Elevations generally decrease north-westward towards to the River Findhorn.

9.5.3 SEPA provided precipitation data[10] for the Tomatin No.2 rain gauge (station number 564863) which is located approximately 2.8km north-west of the Site at E 278910 / N 829309. In 2023, an annual rainfall of 1209.2mm was recorded.

9.5.4 The standard average annual rainfall (SAAR) based on data obtained from the FEH webservice[4] for the Allt Lathach surface water catchment (a tributary of the River Findhorn that drains the centre of the Site), confirms a similar annual rainfall of 1096mm.

Statutory Designated Sites

9.5.5 A review of NatureScot SiteLink webpage[5] indicates that the following designated sites are located within the study area:

- Kinveachy Forest Site of Special Scientific Interest (SSSI) is located within the south-eastern extent of the Site, near turbines T1 and T2. The Kinveachy Forest has also been designated as a Special Area of Conservation (SAC) and Special Area of Protection (SPA) approximately 650m south-east of the Site at its closest extent. The SSSI, SAC and SPA has been designated for breeding bird assemblage including capercaillie and Scottish crossbill and several woodland habitats including native pinewood, bog woodland and Caledonian forest. The designated site is located downstream of the Proposed Development and is therefore hydraulically connected to the Proposed Development. Measures to maintain existing water flow paths and water quality are presented in this chapter and potential effects as a consequence of the Proposed Development on the SSSI, SAC and SPA are also considered in **Chapter 7: Ecology**;

- The Slochd Geological Conservation Site (GCR) (site number 3318) is located within the north-eastern corner of the Site. The GCR has been designated for important outcrops of the basal Dalradian strata of the Northern Grampian Highlands. No development is proposed within the GCR site. The nearest element of the Proposed Development is located approximately 1.1km north-west of the GCR site and therefore the GCR is not considered to be at risk from the Proposed Development and is not considered further; and
- Slochd SAC is located approximately 170m north-west of the Site at its closest extent. The SAC has been designated for dry heath upland habitat. The designated feature is not water related and therefore has not been considered further in this Chapter. Potential effects on the SAC site are considered further in **Chapter 7: Ecology**.

9.5.6 The River Dulnain is located approximately 1.7km south-east of the Site at its closest extent and has been designated as part of the River Spey SAC. The SAC has been designated for the aquatic species populations it supports including Atlantic salmon, freshwater pearl mussel, otter and sea lamprey all of which are considered sensitive to changes in water quality. The south-eastern extent of the Site drains to the River Spey and therefore the SAC is considered to be hydraulically connected to the Proposed Development. It has therefore been considered further in this assessment. Potential effects as a consequence of the Proposed Development on the SAC are also considered in **Chapter 7: Ecology**.

Soils

9.5.7 An extract of the 1:250,000 Scotland's Soils mapping[6] is presented as **Figure 9.2**. The principal soil types recorded at the Site are predominantly peat, peaty podzols and peaty gleys. Humus-iron podzols and alluvial soils are noted along the north-eastern boundary of the Site, near the River Findhorn, and montane soils are noted near the hilltops within the southern extent of the Site.

Superficial Geology (including Peat)

9.5.8 BGS mapping[8], shown on **Figure 9.3**, illustrates that the majority of the northern and western extent of the Site is underlain by glacial till deposits whilst the southern and eastern extents of the Site are underlain by peat and blanket head deposits.

9.5.9 Areas of alluvium, glaciofluvial sheet deposits, and glaciofluvial ice-contact deposits are noted along the banks of the larger watercourses within the Site, particularly near the River Findhorn, Wester Strathnoon Burn, Allt Lathach and Allt Leth-allt.

9.5.10 Small areas of hummocky deposits (comprising diamicton gravel, sand and silt) are also recorded across the Site and some of the hill tops locally are shown to be absent of any superficial deposits.

9.5.11 Priority peatland mapping[7] (see **Figure 9.4**) published by Scottish Natural Heritage (now NatureScot) indicates that the majority of the Site is located within Class 5 peatland whereby no peatland habitats may be recorded, however, the soils may be carbon-rich and deep peat may be present. Areas of Class 1 peatland and a very small area of Class 2 peatland are recorded within the eastern and southern extent of the Site. Class 1 and 2 peatland is potentially nationally important carbon-rich soil, deep peat, and priority peatland habitat of potential high conservation value.

9.5.12 Class 3 peatland is also noted along the north-eastern boundary of the Site whilst Class 4 and mineral soils (Class 0) are noted within the eastern and southern extents of the Site near the hilltops locally. Class 3 peatland areas may record occasional peatland habitats, carbon-rich soils and areas of deep peat whilst Class 4 and 0 are not considered to represent areas associated with peatland habitats.

9.5.13 As part of the baseline assessment, a comprehensive peat probing exercise was conducted by Atmos Consulting Ltd and SLR which informed the PLHRA and PMP (**Technical Appendix 9.1** and **Technical Appendix 9.2** respectively). In summary, the Site investigations have confirmed:

- the depth of soils and peat was recorded at more than 2,204 locations;
- all elements of the proposed Site infrastructure have benefitted from peat probing;
- a programme of peat augering has also been undertaken to assess the characteristics of the peat at the Site;
- approximately 72% of all peat probes recorded a peat depth of less than 1m (approximately 42% recorded a depth of less than 0.5m); and
- peat was classified using the Von Post classification[15] as between H3 and H5, showing insignificant to moderate decomposition.

[15] Von Post L. Granlund E., (1926), 'Södra Sveriges torvtillgånger,1' Sverges Geol.Unders. Avh., C335, 1-127.

Bedrock Geology and Linear Features

9.5.14 An extract of the regional BGS bedrock geological mapping[8] is presented on **Figure 9.5** which shows that the Site is underlain by several metamorphic units comprising semipelites, psammites, calc-silicates and quartzites.

9.5.15 Several small igneous intrusions are noted across the Site.

9.5.16 Inferred zones of sheared rocks are noted on the boundaries of the bedrock units, particularly within eastern extent of the Site. Small, inferred faults and glacial meltwater channels are also noted across the Site.

Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

9.5.17 Extracts of the BGS 1:625,000 scale regional hydrogeological mapping[8] and 1:100,000 scale aquifer productivity and groundwater vulnerability datasets[9] are presented in **Figure 9.6** and **Figure 9.7** respectively.

9.5.18 **Figure 9.6** confirms that the Proposed Development is underlain by Precambrian rocks classified as low productivity aquifer whereby small amounts of groundwater are expected in near surface weathered zones and secondary fractures.

9.5.19 A description and hydrogeology classification of the geological units at the Site are presented in **Table 9.5**.

Table 9.5: Hydrogeological Classification of Geological Units

Period	Geological Unit (see Figures 9.3 and 9.5)	Hydrogeological Characterisation	Hydrogeological Classification (see Figure 9.7)
Pleistocene to Recent	Glacial 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 a significant aquifer.
	Glaciofluvial, river terrace and alluvium 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. Moderate to High productivity.
Precambrian	Metamorphic bedrock and igneous intrusions	Generally, without groundwater except at shallow depths in near surface weathered zones and secondary fractures.	Fracture flow. Low to very low productivity.

9.5.20 Groundwater vulnerability is divided into five classes (1 to 5) with 1 being the least vulnerable and 5 being the most vulnerable, as shown on **Figure 9.7**. Review of **Figure 9.7** 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 4a and 4b with discrete areas of Class 5 noted. Highest vulnerabilities (Class 5) are noted where no or limited superficial deposits are recorded.

Groundwater Levels and Quality

9.5.21 Groundwater recharge at and surrounding the Site is limited by the following factors:

- steeper topographic gradients will result in rainfall forming surface water runoff;
- the peat and glacial till deposits inhibit infiltration owing to their generally low bulk permeability; and
- the underlying bedrock displays a low permeability that inhibits groundwater recharge.

9.5.22 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 superficial deposits and within the weathered zone, fractures or faults within the bedrock deposits.

9.5.23 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.

9.5.24 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 have identified that the study area is underlain by two groundwater bodies:

- The majority of the Site is underlain by Strathnairn, Speyside and Cairngorms (SEPA ID: 150709) groundwater body. In 2022 (the last reporting cycle) the groundwater body was classified with a Good overall status with no pressures identified; and
- The north-eastern extent of the study area, near River Findhorn, is underlain by Findhorn and Muckle Burn Valleys Sand and Gravel groundwater body (SEPA ID: 150812) which was classified in 2022 with a Good overall status with no pressure identified.

Groundwater Dependant Terrestrial Ecosystems

9.5.25 A National Vegetation Classification (NVC) habitat mapping exercise was conducted as part of the ecology baseline assessment, and this has been used to identify potential areas of GWDTE within the Site. The methodology and results of the NVC habitat mapping exercise is discussed in detail within **Chapter 7**. With reference to SEPA LUPS-31 guidance[16], areas of potential GWDTE are shown on **Figure 9.8**.

9.5.26 The location of the potential GWDTE and their likely dependency on groundwater is discussed in **Table 9.6**.

Table 9.6: Potential Groundwater Dependant Terrestrial Ecosystems

NVC Community	GWDTE Potential	Location and Discussion
M6	High	M6 dominated polygons are located within the south-eastern extent of the Site. The polygons are noted along banks of watercourses, including the Caochan na Cuileige and Allt Coire Phris Mhoir watercourses. Given this location it is considered that these habitats are generally sustained by surface water, runoff and waterlogging of soils rather than groundwater. During the Site walkover, a spring was noted upstream of the M6 polygon on the eastern slopes of the Carn Phris Mhoir so it is likely that this area is partially supported by groundwater, however, no development is proposed upgradient or within 250m of the spring. The spring is therefore not assessed further as it is not considered at risk.
W4	High	W4 dominated polygons are located within the north-western extent of the Site in three locations; adjacent to the confluences of the River Findhorn and Caochan a'Phuil, west of the Wester Strathnoon Burn and along the banks of the Allt Phris. The polygons are shown along the banks of watercourses and therefore it is considered that these habitats are sustained by surface water and waterlogging of soils from rainfall and surface water.

9.5.27 A review of **Table 9.6** shows that the majority of potential high GWDTE are located within watercourse corridors. 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.

9.5.28 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 9.6**.

9.5.29 As discussed in **Table 9.6**, one spring was noted during the Site walkover upgradient of an M6 polygon, as shown on **Figure 9.8**. The Proposed Development is located out with the 250m buffer specified by SEPA guidance and therefore this polygon is not assessed further as it is not considered at risk.

Local Hydrology

9.5.30 The Site is located within surface water catchments of the River Findhorn to the north and River Spey to the south, in particular the River Dulnain sub catchment.

9.5.31 The River Findhorn flows generally north-eastwards along the north-western boundary of the Site. Several tributaries of the River Findhorn rise within the Site including the Wester Strathnoon Burn, Allt Lathach, Clune Burn and Allt Phris. These tributaries flow generally north-westwards towards the River Findhorn.

9.5.32 The River Dunlain flows generally north-eastwards approximately 1.7km south-east of the Site, before discharging into the River Spey approximately 16.5km east of the Site. Several tributaries of the River Dunlain rise within the Site including the Allt an t-Sionnach, Caochan na Cuileige and Allt Coire Phris Mhoir.

9.5.33 The River Findhorn catchment has been designated as a Drinking Water Protected Area (DWPA). Consultation with Scottish Water (see **Table 9.1**) confirms that the designation is associated with a borehole in Tomatin which supplies the Tomatin WTW. Scottish Water confirm that the River Findhorn is hydraulically connected to

[16] SEPA (2017) Land Use Planning System, SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3.

the sand and gravel aquifer which supplies the borehole. The borehole is located downstream of the Proposed Development.

9.5.34 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 9.6**.

Surface Water Quality

9.5.35 SEPA classify larger watercourses within the Site as part of its responsibility under the WFD. A summary of the SEPA classifications reported in 2022 (latest reporting cycle) is shown in **Table 9.7**.

Table 9.7: Surface Water Quality

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical Status	Hydromorphology	Pressures
River Dulnain - Allt an Aonaich (23110)	Good	Good	High	Good	None
River Dulnain - Upper Catchment (23107)	Good`	Good	High	High	None
River Dulnain - Lower Catchment (23106)	Good	Good	High	Good	None
River Findhorn - Tomatin to Garbole (23012)	Good	Good	High	Good	None

9.5.36 Smaller watercourses within the Site are not monitored or classified by SEPA.

Fisheries

9.5.37 Fisheries within the area are managed by the Findhorn, Nairn and Lossie Rivers Trust (FNLRT) in partnership with the Findhorn District Salmon Fishery Board (FDSFB). Fishery interests are discussed in more detail and assessed within **Chapter 7: Ecology**.

Watercourse Crossings

9.5.38 The Proposed Development has sought to utilise existing tracks and access routes where possible. Twelve new watercourse crossings and two existing crossings associated with existing tracks which are proposed to be upgraded as part of the Proposed Development. The locations of the proposed crossings are shown on **Figure 9.1** and a schedule of these crossing points, which includes photographs and dimensions of each crossing, is found in **Technical Appendix 9.3**.

Flood Risk

9.5.39 SEPA has developed national flood maps that present modelled flood extents for river, coastal, surface water and groundwater flooding[11]. 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.

9.5.40 SEPA have also produced reservoir inundation maps for sites currently regulated under the Reservoir Act 1975[12].

9.5.41 A summary of the potential sources of flooding and a review of the potential risks posed by each source is presented in **Table 9.8**. Current and future flood maps which account for the potential effects of climate change (to 2080s) published by SEPA have been reviewed.

Table 9.8: 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 330m AOD. In addition, SEPA mapping indicates that the Site is not at coastal flood risk.
Fluvial Flooding	Yes (minor)	SEPA mapping indicates that the majority of the Site is not at risk from fluvial flooding. Floodplains are noted along the banks of the larger watercourses within the Site, however, flood extents are shown to be confined to the watercourse corridors. It is noted that the SEPA flood maps are unlikely to show flooding associated with the smaller watercourses within the Site. In these instances, floodplains are also likely to be limited and confined to the watercourse corridors. With the exception of watercourse crossings, no development is proposed within 50m of the watercourses and waterbodies. It is therefore considered that fluvial flooding at the Site is not considered a development constraint.

Potential Source	Potential Risk to the Site	Justification
Surface Water Flooding	Yes (minor)	SEPA have identified several small areas of surface water flood risk across the Site, which generally coincides with watercourse corridors. Flood extents are shown to be very small, never forming larger, linked areas or flow paths. 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. This concurs with the desk-based assessment whereby limited groundwater is expected.
Flooding due to dam or reservoir failure	No	SEPA has produced reservoir inundation maps for sites currently registered under Reservoirs Act 2011. Review of these maps indicates that the Site is not at risk from a reservoir breach.
Flood Defence Breach	No	SEPA indicate there are no Flood Protection Schemes within the study area. In addition, no formal flood defences are noted on the Scottish Flood Defence Asset Database within the study area.
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 Licensed Abstractions

9.5.42 A review of SEPA's environmental database indicates that there are 17 Controlled Activity Regulation (CAR) authorisations within the study area:

- 11 discharges for private sewage and one discharge of waste sheep dip;
- one bridge engineering work and one for river bank reinforcements on the River Findhorn;
- one authorisation for a new sewage treatment discharge;
- one abstraction for hydropower; and
- one authorisation where the activity is unknown.

9.5.43 The abstraction licence (CAR/L/1010493) is located at Altchosach, Tomatin which located approximately 300 m north-west of the Site Boundary. The abstraction is located downstream of the Proposed Development, near the Allt Cosach. A review of THC private water supply (PWS) database indicates that there are eight PWSs within the study area. In addition, a programme of Site investigation has been undertaken to confirm the location of PWS locations.

9.5.44 The risk the Proposed Development poses to PWSs has been considered as part of this assessment and is presented in **Technical Appendix 9.4**. It confirms that:

- two PWS sources are potentially at risk from the Proposed Development, although one has not been confirmed by the Site visit;
- four PWS sources are not at risk from the Proposed Development; and
- two properties are confirmed to be on mains water supplies.

9.5.45 **Technical Appendix 9.4** confirms the measures that are required to safeguard these PWSs 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

9.5.46 **Table 9.9** confirms the receptors identified by the baseline study and the field investigation programme, and their sensitivity based upon the criteria contained in **Table 9.2**. 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 9.9: Receptor Sensitivity

Receptor	Sensitivity	Reasons for Sensitivity
Water Dependent Designated Sites	High	The Kinveachy Forest SSSI, SAC and SPA and River Spey SAC is considered hydraulically connected to the Proposed Development.
Peat and Carbon-rich Soils	High	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.
Superficial and Bedrock Geology	Not sensitive	Deposits have been shown to be common regionally and have no rarity value. The Slochd GCR site is recorded in the study area, however, no development is proposed within or near to the GCR site.
Hydrogeology	High	Groundwater beneath the Site has been classified as Good and vulnerability is classified as Class 4 and 5.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. It has been shown that the habitats, with the exception of one M6 polygon, are not sustained by groundwater but by surface water. Measures will be required to sustain existing surface water flow paths to these habitats. No development is proposed within 250m of the spring which sources the M6 habitat.
Hydrology	High	Watercourses within the Site have been classified by SEPA with a Good overall status. The River Findhorn surface water catchment has been also been designated as a DWPA.
Flooding	Moderate	Negligible flood risk (limited to discrete areas of fluvial flooding adjacent to watercourses and minor areas of surface water flooding) has been identified on-Site, but the Proposed Development has potential to alter surface water flow paths and increase flood risk to receptors downstream.
Drinking Water Protected Areas	High	The majority of the Site is located within the surface water catchment of the River Findhorn which has been designated as a DWPA.
Private Water Supplies	High	Private water supplies have been confirmed within the study area, two of which could be at risk from the Proposed Development without appropriate controls.
Licenced Abstractions	High	One licenced abstraction is noted downstream of the Proposed Development.

Future Baseline

9.5.47 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.

9.5.48 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.

9.5.49 These potential changes are considered in the assessment of effects.

9.6 Assessment of Potential Effects

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

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

9.6.2 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

9.6.3 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 Description and Design Evolution**. 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 Occurrence and Avoidance

9.6.4 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 (>1m) and where possible limited development to areas of peat less than 1m or where peat is absent.

Buffer to Watercourses

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

9.6.6 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 and use existing tracks where technically feasible.

Groundwater Dependant Habitats

9.6.7 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) 100m of roads, tracks and trenches, or (b) within 250m of borrow pits and foundations, then it is necessary to assess how the potential GWDTE may be affected by the Proposed Development.

9.6.8 It has been shown that areas identified as potentially highly groundwater dependent within the Site are likely to be sustained by incident rainfall and local surface water runoff rather than groundwater (see Section 9.5). Areas which may be supported by groundwater are not considered to be at risk from the Proposed Development.

9.6.9 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 Environmental or Ecological Clerk of Works (ECoW) at the time of the construction who would ensure existing surface water flow paths and water flushes are maintained, and who's role and responsibilities will be secured in the CEMP.

Good Practice Methods

9.6.10 Good practice measures would be applied in relation to pollution risk, sediment management and management of surface runoff rates and volumes. These are set out in the Outline CEMP found in **Technical Appendix 3.2** and would form part of the final CEMP.

9.6.11 Key good practice measures are stated below. In undertaking the assessment of potential effects from the Proposed Development, good practice measures are

assumed to be embedded mitigation. As appropriate, these mitigation measures will be outlined within the CEMP or by an appropriately worded condition post determination, as required.

9.6.12 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, operation and decommissioning phases.

General Measures

9.6.13 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.

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

9.6.15 Measures will be included in the final CEMP for dealing with pollution/sedimentation/flood risk incidents and would be developed prior to construction. This will be adhered to should any incident occur, reducing the effect as far as practicable.

9.6.16 The final CEMP would contain details on the location of spill kits, will 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 will be identified to deal with any major environment incidents.

9.6.17 A wet weather protocol will 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, and supervising personnel.

9.6.18 Roles will be assigned to Site staff and the inspection and maintenance regimes of sediment and runoff control measures would be adopted during these periods. In extreme cases, this protocol will dictate that work on-Site may have to be temporarily suspended until weather/ground conditions allow.

Ecological / Environmental Clerk of Works

9.6.19 To ensure all reasonable precautions are taken to avoid negative effects on the water environment, a suitably qualified ECoW will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological and hydrological matters. The ECoW will be required to be present on-Site during the construction phase and will carry out monitoring of works and briefings with regards to any ecological and hydrological sensitivities on the Site to the relevant staff of the Principal Contractor and subcontractors.

9.6.20 With respect to the water environment, the ECoW will also have responsibility to ensure water flow paths and quality to water dependant habitat are sustained during all phases of the Proposed Development.

Safeguarding of Carbon-rich Soils and Peat

9.6.21 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 9.2**) which details the volume of acrotelmic and catotelmic peat which will be disturbed and how this will be safeguarded and reused on Site. Further, the condition of the peat, and areas of peat that would potentially benefit from restoration have been identified and are discussed in **Chapter 7** and **Technical Appendix 7.5** (HMBEP).

9.6.22 As shown in **Technical Appendix 9.1** (PLHRA) and **Technical Appendix 9.2** (PMP) measures have been proposed to ensure the stability of peat and carbon rich soils and that peat and soils that will be disturbed by the Proposed Development can be safeguarded and beneficially re-used on-Site. The Policy aims of NPF4, regarding soils and peat, are therefore met; further details are provided below.

Peat Management

9.6.23 A detailed review of the distribution and depth of peat at the Site is contained in **Technical Appendix 9.2**. The Site design has largely avoided areas of deep peat and where peat will be encountered by the Proposed Development, it can be readily managed and accommodated within the Site layout without significant environmental impact. No surplus peat will be generated, and the volumes of peat / peaty soil generated from the proposed excavations will be used to reinstate track verges, turbine bases, crane hardstandings and restoration of onsite borrow pits.

Peat Landslide Hazard

9.6.24 The Site-specific PLHRA (**Technical Appendix 9.1**) confirms, regarding peat stability, that there are very few areas of peat instability risk across the Proposed Development and the hazard impact assessment concluded that, with the employment of appropriate mitigation measures, all of the areas of peat instability can be considered as an insignificant risk.

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

9.6.26 Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in **Technical Appendix 9.1**. 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 will be required;
- careful micrositing 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 will require minimal maintenance; and
- developing drainage systems that will not create areas of concentrated flow or cause over/under-saturation of peat habitats.

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

Water Quality Monitoring

9.6.28 Water quality monitoring before and during the construction phase will 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 will be carried out at a specified frequency (depending upon the construction phase) on these catchments.

9.6.29 Monitoring will continue throughout the construction phase and immediately post construction. Monitoring will 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 will increase during the construction phase if remedial measures to improve water quality are implemented. Water quality monitoring plans will be developed during detailed design. Scottish Water, SEPA, THC, NatureScot, FNLRT and FDSFB would be consulted on the plans and the respective roles and responsibilities of all parties would be outlined within the final CEMP.

9.6.30 It is also proposed that the private water supplies that are considered potentially at risk from the Proposed Development, as discussed in **Technical Appendix 9.4** and the licenced abstraction at Altchosach are also included as part of the monitoring programme.

9.6.31 The performance of the good practice measures will 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

9.6.32 Good practice measures in relation to pollution prevention will include the following:

- refuelling will take place at least 50m from watercourses and where there is no risk that oil from a spill could directly enter the water environment;
- foul water generated on-Site will 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 will be strictly enforced on-Site to minimise the potential for accidents to occur;
- drip trays will be placed under stationary vehicles which could potentially leak fuel/oils;
- areas will be designated for washout of vehicles which are a minimum distance of 50m from a watercourse;
- washout water will also be stored in the washout area before being treated and disposed of;
- no direct or indirect discharges to watercourses without prior treatment in buffer zones or adjacent to proposed infrastructure using appropriate SuDS measures. These measures would be included in the formal drainage management plan and the final CEMP;
- water will be prevented as far as possible, from entering excavations;

- procedures will 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 will 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.

9.6.33 Site investigation (e.g., trial pitting and/or boreholes) will be undertaken prior to any construction works where excavation will be required to establish the wind farm and it will inform detailed design and construction methods to ensure pollution risk is further considered prior to construction. These methods will be specified in the final CEMP.

Erosion and Sediment

9.6.34 Good practice measures for the management or erosion and sedimentation will include the following:

- all stockpiled materials will be located out with a 50m buffer from watercourses, including on up gradient sides of tracks and battered to limit instability and erosion;
- stockpiled material will either be seeded or appropriately covered, minimising the area of exposed/bare ground;
- monitoring of stockpiles/excavation areas during rainfall events;
- water will 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 will be separated and dirty water will be filtered before entering the water environment;
- if the material is stockpiled on a slope, silt fences will 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, will 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 will be developed - this may include silt traps, check dams and/or diffuse drainage;
- silt/sediment traps, single size aggregate, geotextiles or straw bales will 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 will avoid periods of heavy rainfall where possible; and
- construction personnel and the Principal Contractor will carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

Fluvial Flood Risk

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

9.6.36 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 will include the following:

- drainage systems will 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 will 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 will be developed and construction personnel made familiar with the implementation of these.

9.6.37 Further information on ground conditions and drainage designs will be provided in the final CEMP.

Water Abstractions

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

- water use will be planned so as to minimise abstraction volumes;

- water will be re-used where possible;
- abstraction volumes will be recorded; and
- abstraction rates and volumes will be agreed with SEPA to prevent significant water depletion in any third party water source.

Watercourse Crossings

9.6.39 Twelve new watercourse crossings and two existing crossing which are proposed to be upgraded are required to facilitate the Proposed Development as detailed within **Technical Appendix 9.3** and shown on **Figure 9.1**.

9.6.40 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 THC as part of the final CEMP.

Construction Effects

Peat and Soils

9.6.41 It has been shown (see **Technical Appendix 9.1** and **Technical Appendix 9.2** and Good Practice Methods 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.

9.6.42 In addition, the Applicant is committed to delivering a Habitat Management and Biodiversity Plan (see **Technical Appendix 7.5**) which outlines the proposed peatland habitat restoration and enhancements. The final details will be provided and agreed with consultees prior to construction commencing, and which it is expected will be secured by a condition of consent. Habitat management works would be undertaken in accordance with the best practice detailed in this Chapter and which would mitigate potential effects on peat and carbon rich soils.

9.6.43 Peat is a high sensitivity receptor. With the identified safeguards and proposed good practice methods, the magnitude of effect 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

9.6.44 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.

9.6.45 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.

9.6.46 The risk of a pollution incident occurring will 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.

9.6.47 The baseline assessment has shown that the watercourses surrounding the Proposed Development and groundwater beneath the Proposed Development (including Kinveachy Forest SSSI, SAC and SPA, River Spey SAC, PWSs and River Findhorn DWPA) are considered high sensitivity receptors.

9.6.48 The preceding section describes Good Practice Measures that will be set out in the CEMP to minimise the risk of a pollution event occurring. These measures will also include an emergency response plan which will be triggered in the case of an accident occurring to minimise pollution risk. The magnitude of impact associated with a pollution event is therefore considered negligible and thus the significance of effect is **negligible** and **not significant.**

Erosion and Sedimentation

9.6.49 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.

9.6.50 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.

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

9.6.52 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 Kinveachy Forest SSSI, SAC and SPA, River Spey SAC, PWSs and River Findhorn DWPA) are considered high sensitivity receptors. The level of effect is therefore assessed as **negligible** and **not significant**.

Flood Risk

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

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

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

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

9.6.57 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

9.6.58 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**.

Infrastructure and Man-Made Drainage

9.6.59 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.

9.6.60 Dewatering associated with construction of turbine foundations is temporary and will 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.

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

9.6.62 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. However, as discussed in Section 9.5, the geology at Site has a low bulk hydraulic conductivity which means the extent of any dewatering will be very small when compared to surface and groundwater catchments and the potential magnitude of temporary groundwater ingress will be small.

9.6.63 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**.

Water Abstraction

9.6.64 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. The magnitude of impact on groundwater-surface water interactions is considered negligible. The significance of effect is therefore **negligible**, and **not significant**.

Water Dependent Designated Sites, DWPAs, Licenced Abstractions and PWSs

9.6.65 It has been shown that the eastern extent of the Proposed Development is located within the River Dunlain surface water catchment which is hydraulically connected to the Kinveachy Forest SSSI, SAC and SPA and River Spey SAC. The remainder of the Site is located within the surface water catchment of the River Findhorn which has been designated as a DWPA associated with a borehole abstraction in Tomatin. In addition, several private water supplies have been identified as potentially at risk from the Proposed Development (see **Technical Appendix 9.4**) and a licenced abstraction is noted downstream of the Proposed Development.

9.6.66 The water dependent designated sites, PWSs, DWPA and licenced abstractions are considered high sensitivity receptors. With the best practice construction techniques to protect the quality and quantity of surface water and groundwater receptors outlined above, in combination with the proposed monitoring programme (see example in **Technical Appendix 9.4**) the magnitude of impact is assessed as

negligible and the resultant significance of effect is assessed as **negligible** and **not significant**.

Operational Effects

9.6.67 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.

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

Peat and Soils

9.6.69 No excavation, movement or storage of peat or soils is anticipated to occur during the operational Site life.

9.6.70 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

9.6.71 The possibility of a pollution event occurring during operation is very unlikely. There will be a limited number of vehicles required on-Site for routine maintenance and for the operation of the Proposed Development. Relevant good practice measures such as traffic management plans, use of spill kits and drip trays etc (as outlined in the Good Practice Methods section) will be applied throughout operation of the Proposed Development. Storage of fuels/oils on-Site will be limited to the hydraulic oil required in turbine gearboxes and this would be bunded to prevent fluid escaping.

9.6.72 The Good Practice Measures (to be set out in the final CEMP) will minimise the risk of a pollution event occurring to negligible and measures will 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

9.6.73 During the operation of the Proposed Development, it is not anticipated that there will 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.

9.6.74 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, will 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 will remain and be maintained to slow runoff velocities and prevent erosion until vegetation becomes established.

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

9.6.76 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 or adjacent to the water environment may require approval from SEPA under the CAR (depending upon the nature of the activity).

Fluvial Flood Risk

9.6.77 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 will be undertaken, reducing the likelihood of a blockage occurring.

9.6.78 The SuDS drainage measures deployed alongside access tracks and turbine bases etc. during construction will be maintained and used to locally collect, treat and discharge incident rainfall runoff. These measures will also attenuate the rate of runoff and mitigate the potential for flood risk to be increased off-site.

9.6.79 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

9.6.80 Operation of the Proposed Development will require limited activities relative to the construction phase.

9.6.81 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**.

Water Dependent Designated Sites, DWPAs, Licenced Abstractions and PWSs

9.6.82 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**.

Decommissioning Effects

9.6.83 Potential decommissioning effects are expected to be the similar to potential construction effects. Decommissioning the wind farm 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.

9.6.84 The magnitude of impact for decommissioning the Proposed Development is therefore considered negligible and the potential effect on identified receptors is **negligible** and **not significant**.

9.7 Mitigation

9.7.1 The Applicant is committed to the implementation of the good practice measures described above. On this basis, there are no predicted significant effects and under the terms of the EIA Regulations no specific mitigation measures during construction are required.

9.7.2 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, THC, FNLRT and FDSFB and it is expected to include monitoring of the watercourses which drain from the Site.

9.7.3 The Applicant is committed to delivering a Habitat Management and Biodiversity Plan (see **Technical Appendix 7.5**) which outlines the proposed peatland habitat restoration and enhancements. The final details will be provided and agreed with consultees prior to construction commencing, and which it is expected will be secured by a condition of consent. Habitat management works would be undertaken in accordance with the best practice detailed in this Chapter and which would mitigate potential effects on peat and carbon rich soils.

9.7.4 As detailed in **Technical Appendix 9.1**, 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 Applicant, and again, secured by an appropriately worded predevelopment condition of consent.

9.7.5 As detailed in **Technical Appendix 9.2,** 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 Applicant. This would be specified in a Site-specific CEMP and would be secured by an appropriately worded predevelopment condition of consent.

9.8 Assessment of Residual Effects

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

9.9 Assessment of Cumulative Effects

9.9.1 No other developments are noted both within 5km of the Proposed Development and within the same surface water catchment as the Proposed Development. Therefore, cumulative effects are not anticipated as a result of the Proposed Development.

9.10 Summary

9.10.1 An assessment has been carried out of the likely impacts of the Proposed Development on the hydrological, hydrogeological, geological environment within a defined study area (comprising land within 500m of the Site boundary). The assessment has considered Site preparation, construction, operation and decommissioning of the Proposed Development.

9.10.2 Following the identification and assessment of the key receptors, taking into account the potential effects listed above, a comprehensive suite of embedded mitigation and good practice measures has been incorporated into the design, including avoidance of areas of deep peat and inclusion of extensive water buffer areas. In addition, a Site-specific CEMP as well as detailed design of infrastructure

and associated mitigation will be implemented to protect the groundwater and surface water resources from pollution and minimise changes to the hydrological environment.

9.10.3 The impact assessment has taken into account the hydrological regime, highlighting that the principal effects will occur during the construction phase. Following the successful design and implementation of mitigation measures the significance of construction effects on all identified receptors are not defined as significant. The assessment of predicted operational effects has determined the significance of effects on all receptors to be of no significance.

9.10.4 Good practice design and construction of the Proposed Development delivered through a skilled team of competent workers, with mitigation and compliance monitored in collaboration with SEPA, THC and other engaged stakeholders, will result in a risk that is considered to be not significant in terms of the EIA Regulations.

9.10.5 A summary of assessed effects and identified mitigation measures required to reduce the potential effects to acceptable levels are identified in **Table 9.10**.

Table 10.1: Summary of Residual Effects

Likely Significant Effect	Mitigation	Means of Implementation	Residual Effect
Construction Effects			
Degradation of peat and carbon rich soils.	Mitigation by design and good practice measures.	Final CEMP to be submitted for the written approval of THC, SEPA and NatureScot prior to construction commencing. Geotechnical Risk Register. Implementation of Peat Management Plan.	Not significant.
Generation of pollution impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Final CEMP to be submitted for the written approval of THC, SEPA and NatureScot prior to construction commencing. Confirmatory water quality monitoring which will be agreed with Scottish Water, SEPA, NatureScot, THC, FNLRT 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 THC, 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 THC, SEPA and NatureScot prior to construction commencing.	Not significant.
Flood risk.	Good practice measures.	Commitment to deploy SuDS and prepare a detailed drainage design as part of the final CEMP.	Not significant.
Water dependent designated sites, DWPAs and PWS sources.	Good practice measures.	Final CEMP to be submitted for the written approval of THC, SEPA and NatureScot prior to construction commencing. Confirmatory water quality monitoring the scope and frequency of which will be agreed with Scottish Water, SEPA, NatureScot, THC, FNLRT and FDSFB prior to construction commencing.	Not significant.
Operational Effects			
Generation of pollution impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Appropriate storage and handling of potential pollutants in accordance with CAR authorisations.	Not significant.
Erosion and sedimentation impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Appropriate drainage design that incorporates sediment management measures, including sediment traps, to attenuate and treat runoff. Adopted through a long-term operational drainage and monitoring programme.	Not significant.
Drainage and dewatering impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Good practice measures adopted through a long-term operational drainage and monitoring programme.	Not significant.

Likely Significant Effect	Mitigation	Means of Implementation	Residual Effect
Flood risk.	Good practice measures.	Inspection of the operational drainage system and compliance with the attenuated rate of runoff agreed with THC at the detailed design stage. Removal of blockages from watercourse crossings in the unlikely event of occurrence.	Not significant.
Water dependent designated sites, DWPAs and PWS sources.	Good practice measures.	Good practice measures adopted through a long-term operational monitoring programme.	Not significant.