10 Hydrology, Geology and Hydrogeological Assessment

Introduction

10.1.1 This chapter of the EIAR considers the likely significant effects on water and soils associated with the construction and operation of the Proposed Development. The specific objectives of the chapter are to:

- describe the current baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address the likely significant effects;
- assess the residual effects remaining following the implementation of mitigation measures.
- The assessment has been carried out by EnviroCentre Ltd.

10.1.2 The chapter is supported by:

- Technical Appendix 10.1: Peat Landslide Risk Assessment;
- Technical Appendix 10.2: Peat Management Plan; and
- Technical Appendix 10.3: PWS within 2 km of Proposed Development infrastructure.

10.1.3 Figures 10.1 – 10.7 are referenced in the text where relevant.

Legislation, Policy and Guidance

10.1.4 The assessment has been undertaken primarily using a qualitative assessment based on professional judgement, legislation, and statutory and general guidance.

10.1.5 There is a range of environmental legislation that any development must adhere to throughout the life of the project. Key legislation relating to the water environment includes.

- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Water Environment and Water Services (Scotland) Act 2003;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR);
- The Water Environment (Miscellaneous) (Scotland) Regulations 2017;
- The Private Water Supplies (Scotland) Regulations 2006;
- Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009; and
- Flood Risk Management (Scotland) Act 2009.

Policy

10.1.6 The assessment has been conducted in accordance with the following policy:

- National Planning Framework 4 (NPF4) and Planning Advice Notes regarding Planning and Flooding; and
- Aberdeenshire Local Development Plan 2023

Design and Location Guidance

10.1.7 This assessment has been conducted in accordance with the principles containing in the following key guidance publications:

- CIRIA Report C521, Sustainable urban drainage systems - design manual for Scotland and Northern Ireland;
- CIRIA Report C532, Control of water pollution from construction sites: Guidance for consultants and contractors;
- CIRIA Report C648, Control of water pollution from linear construction projects: Technical guidance;
- CIRIA Report C649, Control of water pollution from linear construction sites: Site guide;
- CIRIA Report C753, The SuDS Manual;
- Forestry Commission (2011) Forests & water guidelines, 5th Edition;
- Scottish Executive (2012) River crossings & migratory fish: Design guidance;
- Scottish Government (2000) River Crossings and Migratory Fish: Design Guidance;
- Scottish Natural Heritage (2014) A handbook on environmental impact assessment;
- Scottish Natural Heritage (2013) Constructed Tracks in the Scottish Uplands;
- Scottish Environment Protection Agency (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide;

- Scottish Environment Protection Agency Policy No. 19, Groundwater protection policy for Scotland;
- Scottish Environment Protection Agency Policy No. 26: Policy on the Culverting of Watercourses;
- Scottish Environment Protection Agency Planning Guidance Note 50 - Controlling the Environmental Effects of Surface Mineral Workings;
- Scottish Environment Protection Agency Position Statement WAT-PS-06-02, Culverting of watercourses;
- Scottish Environment Protection Agency WAT-SG-25, Good practice guide - river crossings;
- Scottish Environment Protection Agency WAT-SG-31, Special requirements for civil engineering contracts for the prevention of pollution;
- Scottish Environment Protection Agency (2014) Land Use Planning System SEPA Guidance Note 31, Guidance on assessing the impacts of development proposals on groundwater abstractions and groundwater dependent terrestrial ecosystems;
- Scottish Renewables (2015) Good practice during windfarm construction (co-authored by Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland, and Historic Environment Scotland); and
- SNIFFER (2009) A Functional Wetland Typology for Scotland.

10.1.8 The following SEPA Pollution Prevention Guidelines (PPGs) and Guidelines for Pollution Prevention (GPPs) have also been considered in the assessment:

- GPP 1 Understanding your environmental responsibilities – good environmental practices;
- GPP 2 Above ground oil storage tanks;
- GPP 3 Use and design of oil separators in surface water drainage systems;
- GPP 5 Works in, near or liable to affect watercourses;
- GPP 6 Working at construction and demolition sites;
- PPG 7 Safe operation of refuelling facilities;
- GPP 8 Safe Storage and Disposal of Used Oil;
- GPP 13 Vehicle washing and cleaning;
- GPP 21 Pollution Incident Response Planning;
- GPP 22 Dealing with spills; and
- GPP 26 Safe Storage – Drum and intermediate bulk containers.

10.1.9 The methodology to assess environmental effects and identify proposed mitigation measures has been designed to accord with this guidance where applicable.

Consultation

10.1.10 A EIA Scoping Report was submitted to the Energy Consents Unit (ECU) and all statutory consultees in August 2022. 4.3.8 The ECU consulted with a variety of statutory and non-statutory consultees before providing an EIA Scoping Opinion in October 2022, refer to Chapter 4: Approach to the EIA for further information on the EIA Scoping Request. The responses from a number of these consultees included comments relating to the water environment and soils, including SEPA and NatureScot where relevant.

10.1.11 Following the receipt of the EIA Scoping Opinion (Technical Appendix 4.2), a Gatecheck Report was submitted to the ECU, setting out the scoping responses received would be addressed within the EIA. A Gatecheck response was received from the ECU in May 2023 which included responses from NatureScot and SEPA which have been included in **Table 10.1.**

Table 10.1: Summary of Consultation Responses

Consultee	Gatecheck/Other Consultation	Summary Response	Comment
NatureScot	Gatecheck Report Response	Where peatland is affected, there will need to be sufficient peatland restoration in order to mitigate losses and deliver biodiversity enhancement. Part of the site has undergone Peatland Action restoration works in 2020. From Figure 2.2 it appears T11, T12 and associated access tracks are either on or adjacent to this area. It is important that this Peatland Action area is fully considered in the EIA report. We advise that if the Peatland Action restoration footprint is affected, the applicant should clearly explain the implications, including in terms of Peatland Action funding and additional restoration works.	Peatland habitat enhancement is detailed within the Outline Biodiversity Enhancement Management Plan (**Technical Appendix 8.5**). Previous habitat restoration carried out within the catchment of the Burn of Lythebauds is shown within **Figure 10.6** and will not be directly impacted by the Proposed Development infrastructure. Indirect impacts are discussed in section 0.
SEPA	Scoping/Gatecheck Report	SEPA requested that all relevant information and mapping be included within the EIAR as well as providing generic advice on information required.	Impact on hydrology has been assessed within this Chapter. Potential pollution risk of all stages of the Proposed Development have been assessed within Section 0 this Chapter. Mitigation measures are included in Section 0 of this Chapter.
Aberdeenshire Council	Scoping Report	The Scoping report has asked no questions in relation to this chapter; therefore, the following observations have been made: Surface Water Drainage must be considered within the application. It is noted that there is little commentary in relation to peat, other than a confirmation that some may be present on site. This will require further investigation, with disturbance of peat avoided wherever possible.	Surface water flows and level alterations are assessed within sections 10.1.76 to 10.1.81. Impacts on peat are assessed within sections 0 and 0.
Aberdeenshire Council	Private Water Supply Information Request	Aberdeenshire Council provided details of registered PWS within 2 km of the Proposed Development boundary.	PWS sources within 2 km of Proposed Development are listed within **Technical Appendix 10.3**. Potential significant impacts are assessed within sections 10.1.81 to 10.1.86.
Torphins Community Council (TCC)	Scoping/Gatecheck Report	TCC rates the potential risks to the large number of private water supplies across the wider community area surrounding the site as a very high priority to be fully understood and addressed to eliminate risks.	Details of PWS consultation undertaken are presented in section 10.1.60. All data received has been considered in the assessment. A 2 km PWS source assessment radius from the Proposed Development has been applied for further assessment of identified PWS sources. This is considered appropriate as a result of the limited connectivity within groundwater (described further in section 10.1.61), and the effects of attenuation and dilution within watercourses at this distance which make impacts at a distance of 2 km unlikely. PWS sources within 2 km of the Proposed Development are listed within **Technical Appendix 10.3.** Potential significant impacts are assessed within **sections 10.11.9** to **10.11.14**.
Cluny, Midmar & Monymusk Community Council	Scoping Report	Due to the large number of private water supplies to the north of the Hill of Fare, some of which may run further than 2km from the Hill itself, we believe that there is a requirement for the scope of monitoring to be out with the 2km described.	
Echt & Skene Community Council (ESCC)	Scoping Report	The potential effects and the scope of monitoring before, during and after construction should not be limited to 2km, but should instead cover a wider area and include all private water supplies derived directly from run-off and/or ground water/springs from the Hill of Fare.	

Consultee	Gatecheck/Other Consultation	Summary Response	Comment
Scottish Water	Scoping	Scottish Water advised that the Proposed Development lies within a Drinking Water Protected Area (DWPA) and requested that this be acknowledged within documentation and provided guidance on pollution prevention for working within DWPAs. The turbines all seem to surround the restoration area with turbine T13 sitting directly on top of or adjacent to a grip that was blocked when SNH undertook this work. It would be advisable to liaise further with SNH on this and look to relocating T13 in particular. Also, the underground cable is sited quite close to the Burn of Lythebauds, and this also appears to go through an area of deep peat. 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.	Review of the Drinking Water Protected Areas mapping does not show the site itself within a DWPA catchment, however, it is acknowledged that the site drains to the River Dee with an abstraction located at Inchgarth for Public supply. As detailed in **section 10.1.66** this intake is located 16 km from the site and no impacts are anticipated. No direct impacts on previous peatland restoration are anticipated and impacts on peat are assessed within sections 0 and 0. A Construction Environment Management Plan (CEMP) and Contingency Plan to be provided and agreed with Scottish Water prior to commencement of construction.
Dee District Salmon Fishery Board	Scoping	Dee District Salmon Fishery Board agree that the potential significant effects in table 7.1 are scoped into the Environmental Impact Assessment (EIA).	Potential significant effects on the water environment are assessed within this chapter.

Methodology

Scope of Assessment

Scope of Assessment and Baseline Characterisation

Study Area

10.1.12 This assessment covers a range of components including, surface water hydrology (including flooding), hydrogeology, Ground Water Dependent Terrestrial Ecosystems (GWDTE), water quality, water abstractions (including private water supplies and other water supplies), geology and soils (including peat).

10.1.13 The study areas for the different components were as follows:

- Surface water hydrology, hydrogeology and water quality: the assessment focused on surface water hydrology within the Site but characteristics of the wider catchments have been considered where relevant (including assessment of cumulative impacts and designated sites);
- GWDTEs: From those within the Site and up to 250 m from the proposed location of excavations over 1 m depth and within 100 m of excavations under 1 m depth;
- Water abstractions: Abstractions, such as private water supplies, public water supplies and SEPA abstractions registered under CAR within 2 km of the Site were considered in the assessment; and
- Geology, soils and peat: Assessment focused on the area within the Site.

10.1.14 The water environment and soils baseline study for the Proposed Development was undertaken using the following methodology:

- Desk-based review of published information, including catchment characteristics, surface water features, drainage conditions, geology, hydrogeology, soils, and the design of proposed works within the Study Area;
- Consultation with key parties and other interested groups to ensure the relevant water environment and soils issues were addressed within the assessment;
- Walk-over surveys of the Site;
- Peat depth surveys, and in-situ and laboratory testing of peat characteristics (further details provided in **Appendix 10.1** and **Appendix 10.2**);
- Analysis of the application site hydrology, including surface catchment mapping, hydrological regime and water body status;
- Analysis of the application site hydrogeology, including underlying geology, hydrogeological regime and groundwater vulnerability;
- Identification of water supplies and groundwater dependent terrestrial ecosystems (GWDTEs), and development of a baseline conceptual site model for GWDTEs;
- Analysis of soil characteristics, sensitivity and pressures; and
- Identification of sensitive receptors.

Field Survey

10.1.15 Hydrology walk-over surveys were carried out on 17th and 18th May 2023 to appraise site drainage conditions and inspect sensitive receptors.

10.1.16 Between 15th - 17th December 2021 and 19th – 20th January 2022 initial investigative peat depth survey undertaken across the Phase 1 Peat Mapping Area on a 100 m grid.

10.1.17 A geomorphological walkover survey was carried out on 16th and 17th December 2021 of the west of the site (Phase 1 site boundary) to ground truth the features identified from the aerial photography, and to identify other features which are more difficult to identify from the aerial photography (for example the presence of peat pipes, peat cutting ridges).

10.1.18 Between 9th-25th May 2023 targeted Phase 2 peat survey was undertaken in line with the Proposed Development's layout at the time (Chapter 3, Layout 7 -Infrastructure Layout Chill). Peat depths were recorded at 50 m intervals and 10 m offset along the proposed track, at the centre of each turbine with four points at 10 m and 20 m buffers and all other infrastructure probed on a 10 m grid.

10.1.19 Between 29th -30th August 2023 additional surveying of the Proposed Development layout in response to the layout changes at the Site shown within **Chapter 3 Figure 1.2**. Peat depths were recorded at the same spacing as the targeted phase 2 survey.

10.1.20 Further information is also contained within **Appendix 10.1** and **Appendix 10.2**.

10.1.21 In-situ and laboratory testing of peat characteristics, including shear strength, Von Post classification, moisture content, bulk density and carbon content, was carried for 6 locations across the Site.

Methodology for Establishment of Effects

10.1.22 Following the baseline study the assessment of potential effects on the water environment and soils was undertaken, based on the following methodology:

- Identification of potential impacts and their significance;

- Identification and assessment of appropriate mitigation measures relevant to the Proposed Development; and
- Assessment of residual environmental effects.

10.1.23 Five criteria have been used in evaluating the residual effects of the Proposed Development on the water environment and soils. These are:

- Type of effect, i.e. whether it is positive, negative, neutral or uncertain.
- Duration of the impact, i.e. short, medium or long term.
- Probability of the effect occurring based on the scale of certain, likely, possible or unlikely.
- Sensitivity of the feature affected, i.e. high, medium or low (see Table 10.2).
- Impact magnitude in relation to the resource that has been evaluated, i.e. high, medium, low or negligible (see **Table 10.3**).

Significance Evaluation Methodology

10.1.24 The criteria set out in **Table 10.2** and **Table 10.3** have been used to develop a simplified matrix to assess the effect of the Proposed Development on the water environment and soils, which is set out in **Table 10.4.** The assessment of residual effects also takes into consideration the probability of the effect occurring (certain, likely, possible or unlikely) and the duration of the effect (short (less than 2 years), medium (2 – 5 years), long term (more than 5 years) or permanent. This methodology is derived from the SNH Environmental Assessment Handbook. All direct and indirect impacts causing **moderate** or **major** effects, as identified within **Table 10.4**, are considered to be significant in terms of the EIA Regulations.

Table 10.2: Criteria for Assessing Receptor Sensitivity

Receptor Sensitivity	Table Heading - EIAR Chapter
Low	Receptors with a high capacity to accommodate change, low value or poor condition and no significant uses, for example: • Receptor is not an internationally, nationally or locally designated site. • Not classified as a surface water body for the River Basin Management Plan. • Surface water body not significant in terms of fish spawning and no other sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body not used for abstraction. • Surface water body not used for recreation directly related to water quality e.g. angling, swimming, watersports. • Low or very low productivity aquifer with no identified abstractions. • GWDTEs with low to moderate dependency on groundwater (as defined by the site-specific conceptual model).
Medium	Receptors with a moderate capacity to accommodate change, medium value or condition and limited use, for example: • Receptor is not an internationally or nationally designated site. May be a locally designated site. • Salmonid species may be present and surface water body may be locally important for spawning. No other sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body used for private water supply or medium scale industrial/ agricultural abstractions. • Surface water body used for occasional or local recreation e.g. local angling clubs. • Moderate productivity aquifer. • Groundwater body supports identified private water supplies or medium scale industrial/ agricultural abstractions. • GWDTEs with moderate to high dependency on groundwater (as defined by the site-specific conceptual model). • Carbon-rich soils which have been affected by historic or current land management practices.
High	Receptors with a low capacity to accommodate change, high value or condition and significant use, for example: • Receptor is an internationally or nationally designated site. • Surface water body supports sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body used for public water supply or large scale industrial/ agricultural abstractions. • Surface water body important for recreation directly related to water quality e.g. swimming, watersports, angling. • High or very high productivity aquifer. • Groundwater body supports public water supply or large scale industrial/ agricultural abstractions. • GWDTEs which form a qualifying feature, or part thereof, for an internationally or nationally designated site. • Carbon-rich soils which form part of intact, active blanket bog in good condition.

Table 10.3: Criteria for Assessing Impact Magnitude

Receptor Sensitivity	Table Heading - EIAR Chapter
Negligible	Very slight change from baseline conditions. Change barely distinguishable, approximating to the 'no change' situation.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of the baseline condition will be similar to pre-development circumstances/patterns.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post-development character/ composition/ attributes of baseline will be partially changed.
High	Total loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post-development character/composition/attributes will be fundamentally changed.

Table 10.4: Criteria for Assessing Effects

Receptor Sensitivity	Magnitude of Impact	
High	High	Major
High	Medium	
Medium	High	
High	Low	Moderate
Low	High	
Medium	Medium	
Medium	Low	Minor
Low	Medium	
Low	Low	
High, Medium or Low	Negligible	Negligible

10.1.25 The mitigation required to minimise the effects of these impacts has been identified using all available data and professional judgement, considered in the light of the legislative or planning context (where relevant). Where survey work was not carried out, desk study information was used to support the assessment.

10.1.26 Additional assessment has been carried out with regards peat landslide risk (**Appendix 10.1**), to management and reuse of excavated peat (**Appendix 10.2**),

10.1.27 Residual effects, following implementation of the identified mitigation measures were assessed using the methodology detailed above.

10.1.28 Cumulative effects of all the developments in the proposed scheme area were also considered focusing on the relevant catchments and sub-catchments.

Baseline

Current Baseline

Site Description and Topography

10.1.29 The Proposed Development is located within areas of upland heather moorland with nine distinct hill tops present on the Site.

10.1.30 The Site is characterised by upland plateaus and surrounding hillslopes. In the west and centre of the Site, five distinct hill tops are present with associated flatter plateaus (Hill of Fare, Hill of Corfiedly, Tornamean, Craigrath and Blackyduds), the highest of which being Hill of Fare in the west of the Site (peak of 470 metres Above Ordnance Datum (mOAD)). The ground gradually slopes towards the Burn of Lythebauds in the north, and towards the Burn of Corrichie in the south-east. Relatively flatter upland moorlands are present in the centre of the Site, including the flat plateau of Brown Hill. The ground then slopes up to the steeper slopes of three remaining hilltops, Marquis's Hillock and Meikle Tap in the south of the Site and Greymore in the north. Relatively flatter heather moorlands are present in the east of the Site. Ground levels in the Site range between approximately 312 mAOD to 470 mAOD.

Designated Sites

10.1.31 The Proposed Development is located within the catchment of the River Dee Special Area of Conservation (SAC), with the River Dee located approximately 2.3 km southwest of the Site at its closest point. The River Dee SAC is designated for Freshwater Pearl Mussels, Otter and Atlantic Salmon (JNCC, 2023).

10.1.32 No other designated sites related to the water environment are located within 3 km of the Site.

Surface Water

10.1.33 The headwaters of two watercourses originate in the site which drain in an easterly direction. The Burn of Lythenbauds is present in the north-east of the site which confluences with the Gormack Burn approximately 400 m north-east of the site. The Burn of Corrichie originates in the south-east of the site and confluences with the Rae Burn approximately 1,600 m east of the site.

10.1.34 To the north-west of the Site the headwaters of an unnamed burn drain northwards towards Upper Tillenhilt which confluences with the Auchorie Burn. To the east of

the site the proposed access route runs adjacent to the Landerberry Burn. To the south-west of the Site there are a series of smaller drains and tributaries which confluence with the Blacklinn Burn, however these do not extend into the Site. An overview of surface water features and sensitive receptors is shown in **Figure 10.1**.

10.1.35 Within the Site there are a series of smaller hydrological features (small ponds or depressions) primarily within the west of the Site. A larger gully has been identified in the west of the Site. During a site walkover a series of manmade ditches were observed, which are believed would have historically drained the areas to the south into the gully feature. Additionally, some gullies were identified draining off the Burn of Lythebauds, and some natural drainage areas were observed draining towards the two burns.

10.1.36 Watercourses within the Site drain to the River Dee, with the exception of the Auchorie Burn which drains north to the River Don.

10.1.37 Catchments for the Site were derived from Ordnance Survey Terrain 5 elevation data and are shown in **Figure 10.2**, key catchment and sub-catchment data for the Site are presented in **Table 10.5** with details of which infrastructure is located within the catchment and of watercourse classifications under the River Basin Management Plans (RBMP) with the latest classifications given for 2020.

Table 10.5: Watercourses and Catchments

Catchment	Watercourse/Sub-catchment	SEPA RBMP Classification	Description
River Dee	Burn of Lythebauds	Overall classification of Moderate in 2020 (ID: 23320). Classified as a heavily modified water body on account of physical alterations.	Originates in north of Site and flows north-eastwards. Catchment includes T1, T13 and part of T16 and T15 as well as associated infrastructure. The northern borrow pit search area is included within this catchment.
River Dee	Landerberry Burn	Not classified	Originates within the east of the site before flowing north-eastwards. Proposed upgraded access tracks are located within this catchment.
River Dee	Burn of Corrichie	Overall classification of Good in 2020 (ID: 23325),	Originates within the south of the Site before flowing eastwards. Catchment includes T6, T7, T8, T11, T12, T14 and associated infrastructure as well as the Battery Storage infrastructure, control building and substation and borrow pit search areas.
River Dee	Unnamed Catchment 1	Not classified	No surface water features within site. No Development infrastructure within this catchment.
River Dee	Unnamed Catchment 2	Not classified	No surface water features within site. T10 and associated infrastructure is located within this catchment.
River Dee	Unnamed Catchment 3	Not classified	No surface water features within site. T9 and associated infrastructure is located within this catchment.
River Dee	Blacklinn Burn	Not classified	No surface water features within site. T5 and part of T4 and associated infrastructure is located within this catchment.
River Don	Auchorie Burn (Cluny Burn)	Overall classification of Good in 2020 (ID: 23309). The water body has been classified as a heavily modified water body on account of physical alterations	No surface water features within site. T52, T3 and part of T4 and associated infrastructure is located within this catchment.

Flood Risk

10.1.38 SEPA's Indicative Flood Maps (SEPA, 2023a) do not indicate any risk of fluvial flooding within the Site, with the exception of the Burn of Corrichie, as the contributing catchments of the watercourses are too small to be included in this method. Isolated patches of surface water flood risk are shown within the site, considered to correspond with small topographical depressions.

10.1.39 However, the SEPA flood mapping does show a High risk of fluvial and surface water flooding immediately outwith the Site corresponding to the channel and adjacent floodplains of watercourses draining from the Site.

10.1.40 Mapped fluvial flood risk is constrained to the immediate watercourse channel within the Burn of Corrichie, similarly mapped fluvial and surface water flood risk immediately outwith the Site is confined to the immediate extents of the

watercourse channels. These watercourses flow within relatively steep channels, through well-defined, steep sided valleys, which combined with their small contributing catchment areas will limit flooding extents during high flows to the immediate watercourse corridor. As such it is considered that outwith the immediate vicinity of watercourses and drainage features, no significant risk of surface water or fluvial flooding exists at the Site.

Geology, Soils and Peat

Bedrock Geology

10.1.41 BGS mapping (BGS, 2020) shows that the bedrock geology underlying the majority of the Site is underlain by the Hill of Fare Intrusion Leucogranite. Within the east and west of the site there are small areas underlain by Hill of Fare Microgranite. Bedrock Geology is shown in **Figure 10.3**.

10.1.42 The Hill of Fare Intrusion is bounded to the north by Granodiorites of the Balblair Intrusion, and to the west and east by Granodiorites of the Crathes Pluton. Psammites, semipelites and pelites (metamorphosed sediments) of the Queens Hill Formation are located south of the Hill of Fare intrusion.

Superficial Deposits

10.1.43 BGS mapping (BGS, 2020) shows that peat deposits are present across the majority of the centre and west of the Site. There are large areas in the east of the Site, surrounding Burn of Lythenbauds and at the top of the hillslopes where there are no record of superficial deposits.

10.1.44 Within the valley of the Burn of Corrichie there are deposits of glacial till, alluvium (clay, silt, sand and gravel) and minor areas of glaciofluvial deposits (gravel sand and silt). Superficial geology is shown in **Figure 10.4**.

10.1.45 The Carbon and Peatland map (NatureScot, 2016) identifies 5 classes of soil are present across the Site. Surrounding the Burn of Corrichie and Burn of Lythenbauds class 0 soil is shown to be present, which indicates the presence of mineral based soils. Within the centre and north of the Site class 1 soil is shown to be present, which is comprised of peat soil and peatland vegetation. In the south and north-east of the Site there are small patches of class 3 soil mapped, which indicates the presence of predominantly peaty soil with some peat soil, and peatland vegetation with some heath. To the east of the Site and along the proposed access track, class 4 soil is shown to be present. This comprised of predominantly mineral soil with some peat soil and heathland vegetation. Within the remainder of the Site (west, north and central area) class 5 soil is shown to be present, which is comprised of peat soils with no peatland vegetation.

10.1.46 EnviroCentre conducted peat depth surveys and assessment in order to ground truth the mapped data and inform the Proposed Development design.

- The following peat depth surveys have been undertaken at the Site, with a total of 2,822 locations probed as detailed in section 10.1.18 and 10.1.19.

10.1.47 The peat survey highlighted that where peat is present, the deepest pocket is up to 5 m depth in the vicinity of the Burn of Lythenbauds and southeast of the summit of the Hill of Fare. The peat survey results informed the production of a Peat Landslide Risk Assessment (**Appendix 10.1**) which concluded that the areas of highest risk are present within the vicinity of the Burn of Corrichie and the Burn of Lythenbauds. The assessment process informed the design evolution of the development, with the recommendation that where possible infrastructure avoid areas of peat >1 m in depth. Chapter 3: Design Evolution and Alternatives details how the layout was developed to avoid areas of deep peat and areas of higher peat instability hazard.

10.1.48 Peat depth survey results are shown in **Figure 10.5**: Peat Depth Survey.

Groundwater

10.1.49 BGS 1:625,000 hydrogeological mapping (BGS, 2020) indicates that the bedrock underlying the Site consists of low productivity aquifer with limited groundwater occurring in the near surface weathered zone, secondary fractures and rare springs.

10.1.50 No mapped superficial aquifer is present within the site or immediate vicinity. The hydrology of the peatland is dominated by surface water run-off and near-surface flow through the more fibrous upper peat layer (acrotelm). Low hydraulic conductivity with the more humified lower peat layer (catotelm) results in very little groundwater flow through these deeper layers of peat other than where sub-surface peat pipe networks have developed. This results in very low superficial aquifer productivity.

10.1.51 Minor superficial aquifers are likely to be present within superficial deposits on the northern, western and southern slopes of the Site and contribute to watercourse baseflow and springs.

10.1.52 The Site is underlain by the Aboyne Groundwater Body (SEPA ID: 150665) which has an overall classification of ‘Good’ for 2020 under the RBMP.

10.1.53 Groundwater vulnerability mapping (Ó Dochartaigh et al, 2011) produced by the BGS shows bedrock to belong to groundwater vulnerability Classes 4 and 5 (most

vulnerable to pollutants) due to fractures in upper layers meaning bedrock is vulnerable to those pollutants not readily adsorbed or transformed.

10.1.54 As detailed in section 10.1.64 and Appendix 10.3, groundwater supports a number of Private Water Supplies (PWS) within the vicinity of the Site.

Groundwater Dependent Terrestrial Ecosystems

10.1.55 Saturated ground and areas of peatland vegetation were encountered during the site walkover with potential for GWDTE to be present. GWDTE are protected under the Water Framework Directive and National Vegetation Classification (NVC) data has been assessed for groundwater dependency as part of the EIA.

10.1.56 Potential GWDTEs have been identified within the Site based on the NVC system and SEPA Land Use Planning System Guidance Note 31 (LUPS-GU31). The NVC data was used to inform the Site's layout design and assessment and the survey findings and NVC community definitions can be found in **Chapter 8: Ecology Assessment**, as well as on the JNCC website (JNCC, 2018).

10.1.57 Where a groundwater dependent NVC community was present within a mosaic, it was only included as a GWDTE when it was considered to be a dominant or important factor in that community's hydrological structure and function.

10.1.58 The distribution of potential GWDTEs within the Site is shown in **Figures 10.6** and the NVC communities listed in **Table 10.6**, in accordance with LUPS-GU31 (SEPA, 2017) based on their potential groundwater dependency classification.

Table 10.6: Groundwater Dependent NVC within the Site

NVC Community	Description	Potential for Groundwater Dependency (SEPA LUPS GU31)
M23a	Juncus acutiflorus sub-community Located within the headwaters of the Landerberry Burn and considered to be primarily surface water fed. Downslope of the existing access track (to be upgraded.	High
M21	Narthecium ossifragum - Sphagnum papillosum valley mire Located south of the proposed track between Hill of Corfeidly and Craigrath. Located at the top or near top of the catchments they are located within. No mapped superficial deposits and considered to be primarily surface water fed.	High
M23b	*Juncus effusus* sub-community Located within the headwaters of the Burn of Lythebauds.	High
	Considered to be associated with the headwaters of the Burn of Lythebauds and primarily surface water fed.	

10.1.59 Given the geology and groundwater potential within the Site and the location of habitats within the headwaters of watercourses and at the top of catchments, it is considered that many of these habitats are likely to be ombotrophic (fed by rainfall) or very near subsurface groundwater within the peat deposits and soils. It is therefore considered that the groundwater component supporting these habitats is minor, with a surface water (or near subsurface) regime from local and shallow rain-fed catchments more likely for the majority of GWDTEs at the Site.

Private Water Supplies

10.1.60 Information on PWS was collected from Aberdeenshire Council, Dunecht Estate and through open consultation with members of the public in the surrounding area. Details on PWS within 3 km of the site were requested from Aberdeenshire Council, Dunecht Estate provided all relevant available information on PWS, and open consultation with the public provided further PWS details with no limit on distance from the site. The results of consultation are presented within **Appendix 10.3** and **Figure 10.7**.

10.1.61 PWS sources surrounding Hill of Fare consist of surface watercourses, wells intercepting near surface water/springs, as well as boreholes intercepting groundwater within bedrock. The bedrock geology within the Proposed Development site at Hill of Fare comprises granite (leucogranite and microgranite) from the Hill of Fare Intrusion, where groundwater can be present within fractures and the near surface weathered zone. The fracture network is considered to be highly heterogenous with limited wider connectivity within the bedrock mass. Presence of superficial deposits is limited to peat in flatter areas, and glacial till on lower and gentler slopes. Surrounding the Hill of Fare Intrusion are a number of other bedrock units, including other igneous bedrock (microgranodiorite, granodiorite, tonalite and quartz-diorite) and metamorphic bedrock to the south (semipelite, pelite and psammite). These various bedrock units will have distinct groundwater character from, and limited connectivity with, the Hill of Fare Intrusion.

10.1.62 SEPA guidance on assessing the impacts of development proposals on groundwater abstractions and GWDTE (SEPA, 2017) requires that abstractions within 100 m of excavations <1 m in depth and within <250 m of excavations >1 m in depth should be identified and assessed.

10.1.63 PWS sources up to 2 km from the site have been assessed as detailed in this chapter and Technical Appendix 10.3. It is considered that 2 km is an appropriate assessment distance as a result of the limited connectivity within groundwater, and the effects of attenuation and dilution within watercourses at this distance which make impacts at a distance of 2 km unlikely.

10.1.64 Of the PWS sources identified only the Dunecht Estate collection Tanks are located within 100 m buffer of construction activities <1 m depth advised by SEPA. Sandyhillock PWS is located 250 m from proposed track upgrades however is not located within the catchment of any construction works. Similarly, Wester Tillyshogle Croft is located within the Site but is not hydrologically connected to proposed construction works.

Abstractions and Public Water Supplies

10.1.65 SEPA provided a list of Controlled Activities Regulations (CAR) Licenced sites within 2 km of the Proposed Development. These licences primarily comprised sewage discharges and other activities which do not have the potential to be impacted by the Proposed Development, however one abstraction was noted for drinking water supply. This licence is for the Dunecht Estate PWS and has been considered as a PWS.

10.1.66 Scottish Water advised that the Proposed Development lies within the catchment of a Scottish Water abstraction at Inchgarth, which supplies Manofield Water Treatment Works which is located on the River Dee approximately 16 km east of the Proposed Development. Due to the distance between the Proposed Development and the Inchgarth abstraction, as well as the considerable size of the River Dee catchment and the dilution provided by the associated flows, the Inchgarth abstraction has not been considered further.

Future Baseline

10.1.67 Under a 'do-nothing' scenario the Site would likely stay in its current moorland form with any changes dependent on estate land management practices.

10.1.68 The UK government has published a range of climate projection reports and data for use in the assessment of climate change risks to help plan how to adapt to a changing climate. The latest set of comprehensive reports produced by UK Climate Projections (UKCP18) was published in 2018 and provides future climate projections for land and marine regions for the UK.

10.1.69 The UKCP18 (MetOffice, n.d.) projections are presented for a range of different scenarios or Representative Concentration Pathways (RCPs). RCPs are a method for capturing assumptions required on future economic, social and physical changes to our environment that will influence climate change. The increase in in global mean surface temperature (°C) by 2081 – 2100 for the different RCP's is outlined below:

- RCP2.6 = 1.6°C (0.9 – 2.3°C)
- RCP4.5 = 2.4°C (1.7 – 3.2°C)
- RCP6.0 = 2.8°C (2.0 – 3.7°C)
- RCP8.5 = 4.3°C (3.2 – 5.4°C)

10.1.70 SEPA climate change allowances for rainfall intensity to the year 2080, recommend an uplift of 37% for the north-east of Scotland[1](SEPA 2023b).

10.1.71 Review of UKCP18 rainfall projections highlights that increases in annual rainfall by 2080 of up to 10% for 50th percentile scenarios, and up to 20% for 90th percentile scenarios, are projected across all RCP's. However, when these projections are viewed seasonally rainfall is projected to decrease during summer months by between 10 to 30%, depending on RCP, under 50th percentile scenarios, whilst winter rainfall is projected to increase, by between 10 – 40%, depending on RCP, under 50th percentile scenarios. More extreme seasonal rainfall changes are projected under 90th percentile scenarios.

Potential Receptors

10.1.72 On the basis of the baseline assessment the sensitive receptors to potential impacts on the water environment and have been identified as surface watercourses, groundwater, PWS, GWDTE and peat.

[1] SEPA 2023. Climate change allowances for flood risk assessment in land use planning. Version 3.

Table 10.7: Sensitivity of Receptors

Receptor	Comment	Sensitivity
Surface watercourses	Watercourses have 'good' and 'moderate' overall condition where classified under the RBMP and drain to the River Dee SAC.	Medium
Groundwater	Receptor is within Groundwater Vulnerability Classes 4 and 5 (most vulnerable to pollutants) due to fractures in upper layer(s) and has 'Good' WFD overall status and water quality status. Receptor is a low productivity aquifer, however, through the presence of fractures it may have some water-bearing capacity.	Medium
PWS (up to 2 km from proposed infrastructure)	A number of PWS have been identified with potential hydrological connectivity to Proposed Development infrastructure.	High
GWDTE	Water source for identified GWDTEs not considered to be predominantly groundwater.	Low
Peat	Receptor contains class 1 priority peatland, however it is not intact unmodified blanket bog, and has been subject to degradation by land management practices.	Medium

Assessment of Potential Effects

10.1.73 Likely potential significant effects, **without mitigation**, as a result of the Proposed Development upon the scoped in receptors are identified below.

- Alterations to surface water flows, sediment discharges and contaminant discharges have the potential to have an effect on surface water receptors including surface watercourses and waterbodies and PWS.
- Contaminant discharges and changes in groundwater levels have the potential to have an effect on predominately groundwater derived receptors including groundwater, GWDTEs and PWS; and
- Peat instability and soil loss, erosion and compaction have the potential to have an effect on peat and soils and surface watercourses and waterbodies.

10.1.74 The following assessment addresses these potential effects for each stage of construction, operation and decommissioning of the Proposed Development. Section 10.12 details the mitigation specific to each identified effect.

Construction Effects

10.1.75 The most significant phase in terms of potential environmental impacts is the construction period. This will involve the following key activities that have the potential to affect the water environment and soils:

- Earthworks and stockpiling of excavated soils;
- Construction of new on-site access tracks (within the Site), including upgrading of sections of the existing on-site track within the Site;
- Construction of a new watercourse crossing;
- Construction of temporary site compounds, including office and toilet facilities, and temporary construction compounds;
- Construction of Battery Storage, control building, substation and hardstanding;
- Construction of turbine bases (with associated crane hardstandings and turning points) and erection of turbines, including large plant and vehicle movements;
- Concrete pouring;
- Site cabling;
- Oil, fuel and site vehicle storage; and
- Excavation of material from borrow pits.

Surface Water Flow and Level Alterations and Flood Risk

10.1.76 During construction there is potential for increased runoff due to the introduction of impermeable and semi-permeable surfaces arising from the compaction of soils and construction of site compounds, access tracks and other hardstandings. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential environmental effect of this is to increase flow rates, potentially leading to increases in channel erosion, sediment transport and downstream flood risk. The footprint of the Proposed Development within the Site will be approximately 23.6 ha compared to an area of 1,384 ha (1.7% of the total area within the Site).

10.1.77 Tracks have the potential to locally affect flows, for example by focusing flow, acting as channels and thereby increasing erosion. Roadside drainage and cut-off ditches could also affect drainage patterns if not designed appropriately.

10.1.78 The voids associated with excavated borrow pits also have the potential to influence local surface water drainage patterns. The total borrow pit search area is 4.1 ha, with the final dimensions to be determined following ground investigation (**Chapter 2: Project Description**).

10.1.79 Watercourse crossings have the potential to restrict flow in the stream channel and reduce hydraulic capacity, leading to localised flooding and erosion. One watercourse crossing will be required, which will be an upgrade to an existing

crossing. Upgrades should be conducted with reference to SEPA's CAR: A Practical Guide[2].

10.1.80 The potential environmental impacts of surface water flow alterations and increased run-off on surface watercourses and waterbodies would be of a **negligible** magnitude prior to mitigation measures given that the catchments will be subjected to minor disturbances associated with the construction of the tracks, a singular watercourse crossing, and other hardstanding, which will directly impact a very small percentage of the Site (1.7%). Negligible magnitude impacts on surface water (Medium sensitivity) would give rise to potential effects of **negligible** significance prior to mitigation.

10.1.81 This is also considered to be the case for private water supplies (High sensitivity) with an impact which would also be of a **negligible** magnitude prior to mitigation measures giving rise to **negligible** significance.

Groundwater Flow and Level Alterations

10.1.82 Groundwater flows can be altered by the construction of concrete foundations, tracks and other on-site infrastructure, and cable trenches can form a preferential flow path for sub-surface flows.

10.1.83 Excavations below the groundwater level (e.g. at turbine foundations and borrow pits) could lead to a localised groundwater drawdown. Open excavations that cannot be drained by gravity may require dewatering which would involve creating a sump and intermittent pumping. The bedrock aquifer properties however (**Paragraph 10.1.49**) indicate that dewatering of significant volumes of groundwater is not likely to be required.

10.1.84 The magnitude of the potential impact of the Proposed Development on groundwater (medium sensitivity) is considered to be of **low** magnitude giving rise to effects of **minor** significance.

10.1.85 There are no PWS abstractions from groundwater within 250 m of the proposed excavations >1 m in depth, including the borrow pits. The closest identified source (Strath PWS) is located 650 m to the nearest infrastructure (T5). Only the Dunecht Estate PWS collection tanks are located 40 m from excavations <1 m in depth (proposed track upgrades) as shown within **Figure 10.7**. These collection chambers are considered to target surface and near surface water within the headwaters of the Landerberry Burn. The magnitude of the potential impact of upgrades to the existing track (including proposed riparian planting within the vicinity of the Landerberry Burn) on groundwater flow and levels is considered to be **low** magnitude on the Dunecht Estate PWS (High sensitivity) giving rise to potential effects of **moderate** significance.

10.1.86 Given the nature of the bedrock underlying the Site, and the limited depth and extent of superficial cover, it is considered that any impacts on groundwater resulting from the Proposed Development would be limited, and spatially restricted to the footprint of the development infrastructure and immediate surrounds. As such, PWS outwith the relevant SEPA buffers are not considered likely to be impacted by the Proposed Development.

10.1.87 SEPA guidance (SEPA, 2017) requires an assessment where excavations for proposed infrastructure greater than 1m in depth are within 250 m of GWDTEs (which would be turbine and substation foundations, and borrow pits for the Proposed Development) or where excavations for proposed infrastructure less than 1 m in depth are within 100 m of GWDTEs (all remaining infrastructure), and this is shown within **Table 10.8**.

[2] SEPA, 2022. The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide

Table 10.8: Impacts on GWDTE within the Site

NVC Community	Description	Infrastructure	Magnitude of Impact
M23a	Juncus acutiflorus sub-community Located within the headwaters of the Landerberry Burn and considered to be primarily surface water fed. Downslope of the existing access track (to be upgraded).	17 m downslope of proposed upgraded tracks.	Low
M21	Narthecium ossifragum - Sphagnum papillosum valley mire Located south of the proposed track between Hill of Corfeidly and Craigrath. Located at the top or near top of the catchments they are located within. No mapped superficial deposits and considered to be primarily surface water fed.	Eastern section located 80 m upslope of T9. Western part located 40 m downslope of associated track.	Low
M23b	*Juncus effusus* sub-community Located within the headwaters of the Burn of Lythebauds. Considered to be associated with the headwaters of the Burn of Lythebauds and underlain by low permeability peat. Rain generated runoff and precipitation are likely to act as the predominant water sources.	35 – 45m downslope of T1 and associated track 210 m downslope of T13	Low

10.1.88 The assessment is summarised by wetland typology in **Table 10.8** for ease of interpretation. No direct loss of GWDTE habitat is anticipated and therefore the assessment focuses only on effects due to disruption to the hydrogeological supporting conditions. The potential magnitude impacts on GWDTE (low sensitivity) is considered to be **low**, giving rise to effects of **Minor** significance.

Sediment Discharges

10.1.89 There is the potential for the increased release of sediments into watercourses as a consequence of the following activities:

- Soil stripping to construct tracks, crane hardstandings, sub-surface cabling, turbine foundations and other infrastructure, and at borrow pits;
- Run-off and erosion from soil stockpiles (prior to reinstatement);
- Construction and upgrading of the watercourse crossings;
- Dewatering of excavations e.g. at turbine foundations and borrow pits; and
- Erosion from increased flows as a result of the Proposed Development (infrastructure drainage).

10.1.90 Increased sediment loading to watercourses can degrade water quality of the receiving waters and change the substrate characteristics. Such effects may result in changes in the flora and fauna of the receiving watercourse and adversely affect fish populations downstream of the Site. Sedimentation of watercourses can also have a detrimental effect on flow conveyance.

10.1.91 A 50 m buffer from watercourses to all infrastructure (excluding the watercourse crossing) has been maintained in order to mitigate the risk of sediment discharges, with the exception of T5 and associated infrastructure which is within 17 m to a watercourse which appears on OS 1:25k mapping. During the site visit the watercourse within the site boundary was investigated and found to comprise a channel which was dry at the time of survey, and is considered likely to have been formed as drainage (the feature does not appear on the OS 1890 map series). This is considered to be an anthropogenic and ephemeral feature.

10.1.92 The impact of the increased release of sediments into surface watercourses located within or in proximity to the Site would be of **medium** magnitude prior to mitigation measures giving rise to potential impacts on surface water (medium sensitivity) of **moderate** significance, prior to the implementation of mitigation measures.

Contaminant Discharges

10.1.93 During construction there is a risk of accidental pollution incidents affecting the water environment (i.e. watercourses, groundwater and GWDTE) and/or soils from the following sources:

- Spillage or leakage of oils and fuels stored on site;
- Spillage or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site;
- Spillage or leakage from on-site toilet facilities; and
- Concrete batching and the use of concrete and cement for the turbine foundations.

10.1.94 The main risk is posed by refuelling activities during the construction phase and by road accidents during all phases of the Proposed Development.

10.1.95 Oil spillages to the water environment would be detrimental to water/soil quality and could affect fauna and flora.

10.1.96 Oils and fuels are hazardous (List 1) substances under the Groundwater and Priority Substances (Scotland) Regulations 2009 and their ingress to groundwater must be prevented. The vulnerability of the groundwater at the Site is high, as the Site is within vulnerability classes 4 and 5. The groundwater vulnerability will increase in

areas where drift deposits are excavated during construction of the Proposed Development (e.g. turbine foundations and borrow pits). Without mitigation contaminants could leak through fractures and cavities in the bedrock and potentially affect groundwater quality.

10.1.97 Concrete (specifically, the cement component) is generally highly alkaline and any spillage to the water environment (including GWDTE) and/or soils would be detrimental to water/soil quality and fauna and flora.

10.1.98 Overall, the impact of oil/fuel spillages and pollution from cement to surface watercourses and waterbodies, groundwater, GWDTE and soils and private water supplies derived from groundwater would range from **minor** to **high** magnitude, dependent on the nature and severity of the spill, giving rise to potential effects of **minor** to **major** significance **prior to mitigation**.

Soil Loss and Compaction

10.1.99 The use of heavy machinery on site poses a risk of compaction and soil erosion, particularly in areas of peat. Changes in natural drainage patterns due to runoff from exposed soil, dewatering and stripping of vegetation may lead to erosion and an overall loss of the soil layer. These impacts would be localised and generally limited to areas affected by construction activities. Increased flow rates due to site drainage can also lead to increased erosion of watercourse bed and banks.

10.1.100 The excavation of peat for borrow pits, turbine foundations, construction of access tracks, drainage channels and cable trenches, or its storage and re-use can lead to drying and oxidation of peat. This can result in irreversible changes in peat structure (e.g. shrinkage and cracking) and increased emissions of carbon dioxide. The volume of peat proposed to be excavated for the Development Site has been calculated as 12,439 m^3. Further details regarding this volume are provided in the **Appendix 10.2**.

10.1.101 The impact of construction on soil loss, erosion and compaction would be of a **medium** magnitude on peat soils giving rise to potential effects of **moderate** significance prior to mitigation.

Peat Instability

10.1.102 The proposed development could lead to an increased risk of peat landslide. Any construction activities which load the peat will generally elevate the baseline risk of a landslide occurring (SEPA, 2010b). This would occur from the stockpiling of equipment, floating road construction (SNH and Forestry Civil Engineering, 2010) or the side casting of excavated spoil. Changes in drainage paths can introduce water to potential failure planes and activities such as blasting can act to trigger a peat landslide. Peat failures may have a significant effect on river water quality and aquatic ecology, due to increased sediment loading.

10.1.103 The proposed infrastructure layout has been designed to avoid areas of deep peat wherever possible. The majority of the access track passes through organic soils or shallow peat with four sections of track traversing pockets of deeper peat. It should be noted that most of these track sections are proposed to be floating tracks. Of the 16 proposed turbines:

- Turbines 10, 13, 14 and 16 are located in areas of soils;
- Turbines 2, 4, 5, 9, 12 and 15 are located in areas of soils and shallow peat (<1 m);
- Turbines 1, 3, 6, 8 and 11 are located in areas of soils or shallow peat (average <1 m) but also contains some areas of deeper peat (1-1.9 m); and
- Turbine 7 is located in areas of soils or shallow peat but also contains areas of deeper peat (1-2.5 m).

10.1.104 Of the remaining infrastructure the majority is located in areas of soils or shallow peat with small sections of the battery storage located within areas of deep peat (maximum of 1.2 m recorded).

10.1.105 As per **Appendix 10.1**, The vast majority of the proposed infrastructure is underlain by negligible and low peat landslide risk zones. Small, isolated sections of the proposed floating track between Turbine 6 and 7 falls within a medium risk zone. The peat landslide risk zones are shown in Drawing 375565-GIS015of **Appendix 10.1**.

10.1.106 Construction activities which load or unload areas of peat will generally elevate the baseline risk of a peat landslide occurring. This could occur from the stockpiling of equipment felling or the side casting of excavated spoil. Changes in drainage paths can introduce water to potential failure planes and activities such as blasting can act to trigger a peat landslide. Peat failures may also have a significant effect on river water quality and aquatic ecology.

10.1.107 The impact of construction on peat instability (**medium** sensitivity) would be of **medium** magnitude prior to mitigation measures giving rise to potential effects of **moderate** significance.

Operational Effects

10.1.108 The infrastructure which will be retained during operation comprises turbines, turbine bases, access tracks and cabling, control building, substation, battery

storage and the road upgrades including car park. Site activities will typically consist of maintenance works.

Surface Water Flow Alterations

10.1.109 As during construction, there is potential for increased runoff due to the presence of impermeable and semi-permeable surfaces such as access tracks and turbine bases. Surface water flow alterations are assumed to be similar to those observed during the construction phase and will be subject to the same mitigation measures, which may require maintenance during the operational phase. The impact of surface water flow alterations on surface water (medium sensitivity) and increased runoff would be of a **negligible** magnitude assuming the ongoing maintenance of the mitigation measures, giving rise to potential effects of **negligible** significance.

Groundwater Flow Alterations

10.1.110 The interception of groundwater/interflow by tracks and excavated areas associated with borrow pits could disrupt the natural drainage regime of the Site, potentially concentrating flows and diverting flows from one catchment to another. A prolonged alteration of these flows may lead to the drying out of GWDTEs. Groundwater flow alterations are assumed to be similar to those observed during the construction phase and will be subject to the same mitigation measures, which may require maintenance during the operational phase. Such impacts are considered to be of a **low** magnitude on groundwater and GWDTE (medium and low sensitivity) assuming the ongoing maintenance of the mitigation measures giving rise to effects of **minor** significance on groundwater and GWDTE.

Sediment Discharges

10.1.111 During the operational phase there is unlikely to be any significant ground works or bare exposed ground and therefore levels of erosion and sedimentation will be much lower than during construction. Some erosion and sedimentation is still possible on the tracks, hardstandings and drainage ditches as a result of rutting by site traffic and scouring during extreme rainfall events. These impacts on surface water (medium sensitivity) would be of a **low** magnitude prior to the mitigation measures giving rise to effects of **moderate** significance.

Contaminant Discharges

10.1.112 The potential risk of pollution is substantially lower during the operational phase because of the decreased levels of activity. However, there is potential for leaks of fuel and hydraulic oil from maintenance vehicles and machinery and from battery storage. . Such impacts would be of **minor** to **high** magnitude on groundwater, surface water, GWDTE and PWS **prior to mitigation** measures giving rise to effects of **moderate** to major **significance.**

Decommissioning Effects

10.1.113 Decommissioning will involve the following key activities that have the potential to give rise to effects on the water environment and soils:

- Removal of the crane hardstandings and control building and substation, and land reinstatement;
- Removal of internal access tracks (if not required by the landowner) and land reinstatement; and
- Dismantling of turbines, with turbine foundations left in-situ and top-soil reinstated.

Surface Water Flow Alterations

10.1.114 Decommissioning will involve the removal of impermeable surfaces and reinstatement of the top-soil. The land will be restored to the former land-use and topography. This will have a positive affect by reducing the rate of runoff from previously impermeable areas and shift the hydrological regime towards pre-development conditions. The impact on surface water flow alterations (medium sensitivity) would therefore be of low to **negligible** magnitude.

Groundwater Flow Alterations

10.1.115 Tracks and associated drainage will be restored, if not required by the landowner subject to agreement with Aberdeenshire Council, with turbine foundations and cable trenches remaining in-situ. There will however be no excavations and associated dewatering during the decommissioning phase. The impact on groundwater flow (medium sensitivity) would therefore be of **low** to **negligible** magnitude.

Soil Loss, Erosion and Peat Disturbance

10.1.116 Use of heavy machinery during the decommissioning process poses a risk of compaction and erosion. However, top-soil will be reinstated during this phase and the potential soil loss and peat disturbance will be minimised by retaining the turbine foundations and cable trenches in-situ. These impacts would therefore be of

low magnitude on peat (medium sensitivity) giving rise to effects of **Minor** significance.

Sediment and Contaminant Discharges

10.1.117 The potential effects associated with increased sediment and contaminant discharges during the decommissioning phase will be similar to those in the construction phase, due to the presence of construction vehicles and machinery at the site and soil stockpiles and exposed soil prior to land reinstatement. The impact on the local watercourses, groundwater and soils (medium sensitivities) would be of a **medium** magnitude prior to the mitigation giving rise to effects of **moderate** significance.

Mitigation

Construction Phase

Infrastructure Layout

10.1.118 The infrastructure layout avoids hydrologically sensitive areas where possible and provides appropriate buffer zones between construction elements and watercourses to minimise the risk of water pollution and increased sediment loading.

10.1.119 The layout has been designed iteratively to avoid areas of peat where possible (as detailed in **Chapter 3**, **Technical Appendix 10.1** and **Technical Appendix 10.2**).

10.1.120 Where access track is located in areas of peat greater than 1 m depth, these areas will be floated. Other areas of infrastructure will be microsited away from areas of deep peat where possible. The practicalities of this will be considered further in the pre-construction design phase.

General Management

10.1.121 A Construction Environmental Management Plan (CEMP), including surface water management and pollution prevention measures (e.g. Pollution Prevention Plan), will be produced. The CEMP will remain a live document and will be continually updated as the work progresses. Mitigation measures will be incorporated into the CEMP, which will include a Construction Method Statement (CMS). The CEMP will be submitted prior to commencement of the Proposed Development for approval by Aberdeenshire Council, in consultation with SEPA and other agencies such as NatureScot.

10.1.122 An Environmental Clerk of Works (EnvCoW) or suitably experienced Ecological Clerk of Works (ECoW) will supervise the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.

10.1.123 A pollution incident response plan will be set out in the CEMP relating to the construction of the wind farm, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.

10.1.124 It is anticipated that a monitoring plan will be implemented. The aim of this will be to characterise the baseline conditions prior to construction works commencing and to continue throughout the construction phase to confirm that the mitigation measures are performing as expected. The monitoring plan will be established and implemented with the agreement of SEPA and will be incorporated into the CEMP.

10.1.125 The following elements would be included within the agreed monitoring programme:

- Regular visual inspection of watercourses, more frequent during periods of high rainfall, in order to establish that levels of suspended solids have not been significantly increased by on-site activities.
- Regular visual inspection of surface water management features such as silt traps, settlement ponds, swales, culverts etc. to check for appropriate performance, blockages and to establish whether there are increased levels of suspended sediment, erosion or deposition.
- Regular visual inspection of active areas, particularly where vegetation has been stripped and soil storage areas to establish whether there are increased levels of erosion.
- Water quality monitoring: A monitoring plan, covering baseline, construction and post-construction will be agreed with SEPA.
- Monitoring of Dunecht Estate PWS prior to (baseline monitoring) and during (construction monitoring) construction activities.
- Monitoring as required as a condition of any discharge licence(s) or other environmental legislation.
- Monitoring following any pollution incidents.
- On-going liaison with SEPA as required during construction and decommissioning.

10.1.126 All activities with potential to affect the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended. The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. These activities could include construction drainage, dewatering and watercourse crossings along tracks and cable routes.

Abstraction

10.1.127 The water source for the concrete batching will be confirmed prior to construction commencing. If an on-site abstraction is proposed, this will managed through the appropriate level of CAR authorisation. Groundwater abstraction (including dewatering) will be covered under General Binding Rule (GBR) GBR2 if it does not exceed 10 m^3/day. A CAR authorisation will be required if this threshold is exceeded. Abstractions will not be taken for the purposes of the Proposed Development from within the catchments of groundwater derived private water supplies. If proposed to do so, additional assessment in line with SEPA LUPS-GU31 will be undertaken.

Surface Water Management

10.1.128 Where possible a buffer zone of 50 m will be maintained between site infrastructure and watercourses. However, as a minimum no construction activities (including stockpiles and SuDS features) will be placed within the 50 m watercourse buffer zones. The vast majority of proposed infrastructure is a minimum of 50 m from the permanent watercourses identified at the site. The only exceptions are T5 and associated infrastructure within the T5 spur are located within the 50 m buffer to a watercourse mapped on OS 1:25K (but not 1:50K mapping), and proposed track upgrades parallel to the Landerberry Burn.

10.1.129 Surface water drainage arrangements for construction elements will be in line with the principles of sustainable drainage systems (SuDS), incorporating appropriate attenuation and treatment prior to discharge to the water environment in accordance with GBR10 and GBR11. It is proposed to replicate natural drainage around construction areas and to use source control to deal with rainwater in proximity to where it hits the ground. This approach is in line with the Guidance on Applying the SuDS Manual (C753) published by CIRIA and relevant SEPA guidance.

10.1.130 A construction SuDS will be put in place in advance of any removal of vegetation cover and earthworks on site.

10.1.131 The implementation of construction and permanent SuDS measures will be dependent upon more detailed site and hydrological investigations. Detailed surface water drainage and silt attenuation proposals and methodology will be included within the CEMP and will be submitted to SEPA's operations team for agreement post planning consent and at least two months prior to works commencing. The surface water drainage will be designed to ensure that there are no untreated surface water discharges directly to surrounding watercourses, ditches or GWDTEs. The construction SuDS features will be installed prior to the main construction activities. Suitable prevention measures will be in place at all times to prevent the release of pollutants including sediment to the water environment, including adjacent watercourses, ditches, groundwater and GWDTEs.

10.1.132 The construction SuDS measures will be temporary (e.g. turbine construction, site compound, borrow pits) and natural drainage will be reinstated as soon as practicable as these areas are restored.

10.1.133 Swales will be used to hold water temporarily and to encourage infiltration/discharge into the ground local to where the rain falls.

10.1.134 Check dams and silt traps will be placed along the swales or ditches to settle out fine sediment and reduce flow velocities along with subsequent erosion potential.

10.1.135 Silt fencing will be used for erosion protection and silt attenuation, and protection of the water environment, where required.

10.1.136 Silt ponds and basins will be used to attenuate silt content in runoff from larger construction areas (e.g. turbine foundations, borrow pits).

10.1.137 Exposed soils will be restored as soon as possible using vegetated turves (from construction areas), hydro-seeding/seeding (with suitable seed mixes) and other erosion protection measures such as bio-matting, as required.

10.1.138 Track construction will include the installation and maintenance of existing drainage paths with suitable cross drains installed where necessary to prevent the collection of surface water. These will be regularly inspected and maintained to ensure optimal performance. Sediment control measures will be incorporated into all site drainage systems.

Peat Management

10.1.139 A Peat Management Plan has been produced as **Technical Appendix 10.2**, which calculates an excavated volume of 11,527 m^3 of acrotelmic peat, 912 m^3 of catotelmic peat and 33,438 m^3 of organic soils.

10.1.140 The outline PMP proposed that this excavated material will be reused for the reinstatement of the working area around the turbine foundations, reinstatement of the construction compounds, of the cable trenches and borrow pits, and use in verges to reinstate the slopes and edges of the hardstandings and access tracks. These verges will provide a suitable visual tie-in with the surrounding ground and will be kept to a minimum size.

10.1.141 The proposed reuses of peat and organic soils are in line with the guidance produced by Scottish Renewables and SEPA (Scottish Renewables & SEPA, 2012) and will utilise all the peat and organic soils excavated during construction. Further information regarding the volumes of excavated and reused peat is provided in **Technical Appendix 10.2**.

10.1.142 The Peat Landslide Risk Assessment contained in **Technical Appendix 10.1** outlines good practice and mitigation measures to reduce the likelihood of a peat landslide occurring or to reduce the potential effects associated with a peat landslide, including the use of a live geotechnical risk register during the construction and decommissioning phases under the supervision of an on-site geotechnical engineer.

10.1.143 Suitable, robust drainage and sediment control measures will be installed in advance of construction activities and will be regularly maintained to prevent soil erosion. They will not surcharge into high risk areas, specifically in substantial peat landslide risk areas. Further information regarding mitigation measures is provided in **Technical Appendix 10.1**.

10.1.144 Contingency planning for peat landslide events will be undertaken at an early stage during construction planning and will be incorporated into the CEMP.

Groundworks

10.1.145 The mitigation relating to excavation is similar in nature for all construction elements of the Proposed Development, including borrow pits.

10.1.146 The vegetation and surface layer of soil or peat (top 0.5 m as per **Technical Appendix 10.2** will be stripped and stored separately from the lower layers of soil/peat. Excavated vegetated turves will be kept as intact as possible, by separating from the underlying soil/peat and being rolled/folded back in a carpet. These turves will be watered and maintained during the construction phase, and will be rolled back so that they are 'turf side up' once construction is complete.

10.1.147 The time any excavation is open will be kept to a minimum to avoid ingress of water, dewatering and associated disruption of groundwater levels/flow and to GWDTEs.

10.1.148 Drainage or pumping from excavations will be minimised through appropriate design. Dewatering of excavations will comply with GBR2 and GBR15. If abstraction exceeds 10 m^3 in any one day a CAR registration will be required and if over 50 m^3/day a licence will be required. If a licence or registration is required, this will be obtained prior to the commencement of any abstraction.

10.1.149 Temporary cut-off or interception drains will be installed to prevent clean surface water runoff entering any excavated areas. Runoff and/or any water pumped from excavations will be passed through a SuDS feature located out with the corresponding buffer zone.

10.1.150 Runoff and any water pumped from excavations in proximity to GWDTEs will be discharged in proximity of the excavation (mimicking natural flow patterns) after being passed through a construction SuDS feature. Infiltration of flows will be encouraged (e.g. use of swales). Concentration of flows at the discharge point(s) will be avoided.

10.1.151 Stockpiles of excavated soils will be placed in areas of lower ecological value, minimal risk of peat instability and at least 20 m from permanent watercourses. Areas of peat and higher sensitivity GWDTE's will be avoided for stockpiles. Any runoff from stockpiles will be caught in swales, by silt fencing or blind ditches and clean surface water runoff will be diverted around the stockpiles. Any stockpiles remaining unused/idle for more than a month will be encouraged to re-vegetate with reseeding.

10.1.152 Excavations and areas of exposed soils will be reinstated as soon as practicable once construction works are complete at a certain location (e.g. within one month) and will ensure that suitable hydrological conditions are restored.

10.1.153 All peat will be stored separately from other soil, drift deposit or rock material. Excavated soils and peat will be stored and replaced, where possible, in the location from which it was removed. Where peat is stockpiled in large amounts, piles will be bladed off at the side to minimise the available drying surface area. The stockpiles will be sprayed to prevent desiccation, if necessary. The stockpiles will be checked and assessed for watering and the findings recorded by EnvCoW/ECoW during each visit to the site. During dry weather the stockpiles will be checked more regularly. Large stockpiles of peat are not expected at this site as the volume of excavated peat has been minimised through the site design.

10.1.154 Further details regarding handling and storage of excavated peat are provided in **Technical Appendix 10.2**.

Construction of Tracks

10.1.155 The drainage of all access tracks will aim to preserve the existing flow paths and prevent potential build-up of surface water runoff, minimising disruption of surface and near-surface flow. All tracks will be constructed with a suitable camber and all runoff will be captured in trackside drains. All tracks will have a semi-permeable granular surface. Tracks will be constructed from material of a suitable chemistry i.e. that will not have an adverse impact on the local soil, groundwater chemistry or GWDTEs.

10.1.156 All existing land drainage passing under the tracks will be preserved or reinstated to ensure that the existing drainage regimes are maintained. This is of particular importance in areas of GWDTEs.

10.1.157 Trackside drainage will include a lateral drainage channel cut along the uphill side of the track to intercept the natural runoff and will be drained under the track at regular intervals through cross drains. Trackside drains will be broad and shallow with moderate gradients to prevent scouring. Flows from this drainage will be treated before discharge.

10.1.158 Where the tracks run downhill, transverse drains ('grips') will be constructed where appropriate in the surface of the tracks to convey runoff from the track into the drainage ditch, preventing the tracks themselves acting as channels.

10.1.159 Track verges will be low and landscaped to permit surface water to drain off the track. Under-track drainage will be provided as required with associated sumps and check dams. Where the tracks run across the fall of the slope, the drainage will balance flows across the track.

Watercourse Crossings

10.1.160 The track layout has been designed to minimise the number of new watercourse crossings where possible. There is one proposed watercourse crossing, which is an upgrade of an existing forestry track crossing. The proposed watercourse crossing is shown in **Figure 10.1** and an indicative diagram is presented in **Figure 2.6.**

10.1.161 For watercourse crossings, bottomless box or arch culverts will be used, where possible, as an alternative to buried box culverts or full culverts in accordance with current SEPA policy and best practice guidance, to minimise working within watercourses. The construction of the watercourse crossings will be carried out in accordance with NatureScot and SEPA guidance and final construction details will be approved by SEPA in accordance with the CAR regulations post planning consent.

10.1.162 Measures will be taken to minimise potential erosion. Exposed soil will be artificially re-vegetated if natural regeneration is slow. If any of the existing watercourse crossings need replacing, bottomless culverts will be used that will maintain the natural bed substrate, which in many cases would provide an improvement to the existing arrangements. Crossings will be of sufficient size not to restrict or concentrate flows downstream and to convey flows during periods of heavy rainfall. Where the infrastructure crosses artificial drains, these existing flow paths will be maintained by the installation of cross-drains and measures to minimise potential erosion will be implemented.

Site Compounds

10.1.163 A closed loop wheel wash facility will be provided to minimise the transport of contaminants off site. Runoff from the compounds will be captured and passed through construction SuDS features prior to discharge.

10.1.164 The temporary construction compounds will be bunded to contain any accidental spillages within the area of hardstanding to minimise the risk of water pollution. Foul drainage will be contained in a closed system and disposed of at a suitable off-site facility.

Concrete

10.1.165 Concrete batching is proposed on Site in case a suitable local source cannot be used. The following mitigation measures will be implemented to minimise the potential impact of concrete batching on the water environment in line with GPP 6:

- Concrete batching will take place on an impermeable designated area and at least 10 m from any watercourses.
- Equipment and vehicles will be washed out in a designated area that has been specifically designed to contain wet concrete/ wash water.
- A closed loop system will be used for wash waters. Wash waters will be stored in a contained lined pond for settlement before being reused (e.g. for mixing and washing).
- No discharge of wash waters will occur on-site. All excess wash water that cannot be reused will be disposed of off-site.

10.1.166 The following mitigation is proposed for concrete handling and placement:

- Pouring of concrete for turbine bases will take place within well shuttered pours to prevent egress of concrete from the pour area.
- Pouring of concrete during adverse weather conditions will be avoided.
- The CEMP will include a pollution incident response plan, and drivers of vehicles carrying concrete will be informed so as to raise awareness of

potential effects of concrete and of the procedures for clean-up of any accidental spills.

- Concrete acidity (pH) will be as close to neutral (or site-specific pH) as practicable as a further precaution against spills or leakage affecting groundwater pH.

Oil, Fuel, Batteries and Site Vehicle Use and Storage

10.1.167 The risk of oil contamination will be minimised by good site working practice (further described below) but should a higher risk of oil contamination be identified then an oil separator will be considered.

10.1.168 The storage of oil is considered a Controlled Activity which comply with the Regulations and GBR26, GBR27 and GBR28, where applicable, and mitigation measures included as part of the Proposed Developments CEMP.

10.1.169 The mitigation measures to minimise any risk of contaminant release are in line with SEPA PPG and GPP documents and include the following:

10.1.170 Storage:

- Storage for oil and fuels on site will be designed to be compliant with GPP 2 and GPP 8.
- The storage and use of loose drums of fuel on site will be not permitted.
- The bund will provide storage of at least 110 % of the tank's maximum capacity.

10.1.171 Refuelling and maintenance:

- Fuelling and maintenance of vehicles and machinery, and cleaning of tools, will be carried out in a designated area where possible in line with PPG 7.
- Multiple spill kits will be kept on-site.
- Drip trays will be used while refuelling.
- Regular inspection and maintenance of vehicles, tanks and bunds will be undertaken.
- Emergency procedure: The Pollution Incident Response Plan will include measures to deal with accidental spillages.

10.1.172 Battery storage:

- Batteries will be containerised with appropriate compound design and fire suppression adopted to mitigate the risk of fluid loss and contamination.
- Regular inspection and maintenance of batteries will be undertaken in line with manufacturers guidelines.
- Emergency procedure: The Pollution Incident Response Plan will include measures to deal with accidental spillages.

10.1.173 These mitigation measures also apply to the operational and decommissioning phases.

Site Cabling

10.1.174 All power and control cabling on Site will be buried underground in trenches which will be partially backfilled with excavated soil, including peat where the trench passes through peat. Excavated material will be laid on the uphill slope to reduce the likelihood of runoff entering the excavations, and used to reinstate the trench to the original ground level immediately after the cables have been installed.

10.1.175 Cable runs will be installed alongside tracks where practicable to minimise the disturbance of ground to minimise the risk of sediment wash out. On steep slopes and across GWDTE low permeability plugs will be used at frequent intervals to prevent the trench acting as a preferential flow channel.

10.1.176 The length and time for which excavated trenches remain open will be kept to a minimum.

Operational Phase

10.1.177 The CEMP will remain in place as a working document throughout the operational phase to control maintenance and any repair works, as well as ongoing monitoring in the agreed monitoring plan (see **Section 10.1.125**).

10.1.178 Drains associated with tracks (trackside, undertrack and transverse) and the permanent SuDS features will be inspected periodically, including after any heavy rainfall event, and maintained as necessary. Tracks will be maintained to have an adequate cross-camber and prevent the formation of wheel ruts to minimise consequential erosion of track surface materials.

10.1.179 Cuttings and embankments associated with tracks will be managed as required to ensure stability of vegetation cover and regularly inspected for erosion and gullying.

10.1.180 During the operational phase there should be no requirement for any significant groundworks. However, should groundworks be required, mitigation highlighted in the construction sections above will be adopted as appropriate.

10.1.181 The risk of polluting the water environment or soils from operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks. Volumes of oil and fuels

stored on site will be minimised. Oil or fuel spills will be dealt with according to documented site emergency procedures.

Decommissioning Phase

10.1.182 Appropriate mitigation, environmental management and monitoring measures will be adopted as during the construction phase, subject to advances in approach and changes in legislation at the time of decommissioning.

10.1.183 A decommissioning plan will be submitted and agreed with Aberdeenshire Council prior to the commencement of decommissioning. This plan will reflect current best practice at the time.

10.1.184 Turbine foundations will be removed to a depth of 1 m below ground level, and soil and vegetation reinstated above the foundation.

Assessment of Residual Effects

10.1.185 This chapter has considered the potential effects on the geology, hydrology and hydrogeology features present at the Site associated with the construction, operation and decommissioning of the Proposed Development. **Table 10.22** below summarises the significance of effect for each receptor and the residual significance after mitigation measures in **Section 10.11** are considered.

Assessment of Cumulative Effects

10.1.186 There is the potential for cumulative effects on the water environment and soils where there is the potential for flow levels and/or water quality to be impacted downstream due to cumulative construction activities, especially if construction phases overlapped between developments.

10.1.187 Cumulative developments within 20 km of the Proposed Development have been identified and are detailed in **Chapter 2, Table 2.1.** Only 1 wind farm is located within 2 km of the Site (Auchmore Wind Farm - 2 turbines), Auchmore Wind Farm is an operational site and is considered to form part of the baseline environment.

10.1.188 Only 2 non-operational wind farms, with the potential for overlapping construction activities, have been identified in the surrounding area, noted as either consented or under construction (Craigneil 13.9 km from the Site and Fetteresso 17.4 km from the Site). All other identified cumulative developments are operational and considered part of the baseline conditions. Neither Craigneil or Fettereso Wind Farm are hydrologically connected to the development site. As such it is considered that there is no potential for cumulative effects arising from the Development.

Summary

10.1.189 This chapter has considered the potential effects on the peat, hydrology and hydrogeology features present at the Site associated with the construction, operation and decommissioning of the Proposed Development. Table 10.9 below summarises the significance of effect for each receptor and the residual significance after mitigation measures are considered.

10.1.190 Overall, the effects of the Proposed Development on geology, hydrology and hydrogeology receptors are not significant under the terms of the EIA Regulations

Table 10.9: Summary of Residual Effects

Likely Significant Effect	Receptor (Sensitivity)	Mitigation	Means of Implementation	Residual Effect
Construction Effects				
Surface Water Flow and Level Alterations	Surface Water (medium)	Drainage in line with SuDS principles Watercourse crossings to be appropriately sized	CEMP PPP SEPA PPGs and GPPs CAR (including GBRs) Water Quality Monitoring Monitoring by EnvCoW / ECoW	Negligible
Groundwater Flow and Level Alterations	Groundwater (medium)	Excavations requiring dewatering to be kept open for minimum time possible.	CEMP SEPA PPGs and GPPs CAR (including GBRs)	Negligible
	PWS (high)	Excavations to be kept open for minimum time possible. Design developed to maximise distance to PWS. Existing drainage to be maintained where possible.	CEMP Water Quality Monitoring Monitoring by EnvCoW / ECoW	Minor
	GWDTE (low)	Excavations to be kept open for minimum time possible. Design developed to avoid direct impact on GWDTE. Existing drainage to be maintained where possible.	CEMP Monitoring by EnvCoW / ECoW	Negligible
Sediment Discharges	Surface Water (medium)	Appropriate SuDS principles and pollution control measures	PPP SEPA PPGs and GPPs CAR (including GBRs) Monitoring by EnvCoW / ECoW	Minor
Contaminant Discharges	Groundwater (medium)	Concrete batching to take place in line with GPP6 Storage of fuels and oils in line with GPP2 and GPP8	CEMP PPP SEPA PPGs and GPPs CAR (including GBRs) Monitoring by EnvCoW / ECoW	Negligible
	PWS (high)			Negligible
	GWDTE (low)			Negligible
	Soils (medium)			Negligible
Soil Loss and Compaction	Peat (medium)	Appropriate handling, storage, reuse and reinstatement of peat.	PMP Monitoring by EnvCoW / ECoW	Minor
Peat Instability	Peat (medium)	Design developed to avoid areas of peat landslide risk. See Appendix 10.1 for full list.	PLRA	Minor
Operational Effects				
Surface Water Flow and Level Alterations	Surface Water (medium)	Drainage in line with SuDS principles Watercourse crossings to be appropriately sized	CEMP PPP	Negligible

Likely Significant Effect	Receptor (Sensitivity)	Mitigation	Means of Implementation	Residual Effect
			SEPA PPGs and GPPs CAR (including GBRs)	
Groundwater Flow and Level Alterations	Groundwater (medium)	Design developed to maximise distance to PWS. Existing drainage to be maintained where possible.	CEMP Water Quality Monitoring	Negligible
	PWS (high)			Minor
	GWDTE (low)			Negligible
Sediment Discharges	Surface Water (medium)	Track drainage to be adequately maintained	CEMP PPP SEPA PPGs and GPPs	Minor
Contaminant Discharges	Groundwater	Storage of fuels and oils in line with GPP2 and GPP8 Vehicles to carry spill kits	CEMP PPP SEPA PPGs and GPPs	Negligible
	PWS			Negligible
	GWDTE			Negligible
	Soils			Negligible
Peat Instability	Peat (medium)	Design developed to avoid areas of peat landslide risk. See Appendix 10.1 for full list.	PLRA	Minor
Decommissioning Effects				
Surface Water Flow and Level Alterations	Surface Water (medium)	Drainage in line with SuDS principles Watercourse crossings to be appropriately sized	CEMP PPP SEPA PPGs and GPPs CAR (including GBRs) Monitoring by EnvCoW / ECoW	Negligible
Groundwater Flow and Level Alterations	Groundwater (medium)	Excavations requiring dewatering to be kept open for minimum time possible.	CEMP SEPA PPGs and GPPs CAR (including GBRs)	Negligible
	PWS (high)	Excavations to be kept open for minimum time possible. Existing drainage to be maintained where possible.	CEMP Water Quality Monitoring	Minor
	GWDTE (low)	Excavations to be kept open for minimum time possible. Existing drainage to be maintained where possible.	CEMP Monitoring by EnvCoW / ECoW	Negligible
Sediment Discharges	Surface Water (medium)	Appropriate SuDS principles and pollution control measures	PPP SEPA PPGs and GPPs CAR (including GBRs) Monitoring by EnvCoW / ECoW	Minor
Contaminant Discharges	Groundwater (medium)	Storage of fuels and oils in line with GPP2 and GPP8	CEMP PPP	Negligible
	PWS (high)			Negligible

Likely Significant Effect	Receptor (Sensitivity)	Mitigation	Means of Implementation	Residual Effect
	GWDTE (low)		SEPA PPGs and GPPs CAR (including GBRs) Monitoring by EnvCoW / ECoW	Negligible
Soil Loss and Compaction	Peat (medium)	Appropriate handling, storage, reuse and reinstatement of peat.	PMP Monitoring by EnvCoW / ECoW	Minor
Peat Instability	Peat (medium)	Design developed to avoid areas of peat landslide risk. See Appendix 10.1 for full list.	PLRA	Minor

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