CONTENTS

7. GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

7.1 Executive Summary

7.1.1 An assessment has been undertaken of the potential impacts the Proposed Development would have on geology, including soils and peat, hydrology and hydrogeology (the water environment).

7.1.2 The assessment considers both the construction and operational phases of the Proposed Development.

7.1.3 This Chapter summarises the existing baseline setting of the Proposed Development, which has been informed by a desk top study, field work and data supplied by Moray Council (MC) and Scottish Environment Protection Agency (SEPA). It has also used information and data presented in assessment for neighbouring developments.

7.1.4 The assessment describes the results of a programme of site work which has been completed to verify the published information sources. The field work has included a peat probing and characterising assessment, and visits to private and licensed water supply sources within the Study Area and which may be in hydraulic continuity with the Proposed Development.

7.1.5 The mitigation included in the project design (embedded mitigation) is detailed, and potential effects of the Proposed Development have then been assessed. It has been shown, subject to this mitigation, and the use of industry standard best practice, that no significant effects are likely on the geology and water environment as a result of the Proposed Development.

7.2 Introduction

7.2.1 This Chapter outlines the baseline conditions of the Proposed Development in respect to soils (including peat), geology and the water environment. It also details the embedded mitigation included in the Proposed Development design and considers the likely potential effects the Proposed Development might have on soils, geology and the water environment.

7.2.2 This Chapter has been prepared by SLR Consulting Ltd (SLR) under the supervision of a Technical Director who has significant experience in the assessment of electricity transmission infrastructure, geology and the water environment.

7.3 Scope of Appraisal

7.3.1 This assessment is based on the description of the Proposed Development as detailed in **Chapter 3: The Proposed Development** and shown on **Figure 3.1**.

Study Area

7.3.2 The study area and features which have been identified as of relevance to the assessment are indicated on **Figures 7.1** to **7.10**. The study area comprises a 500 m corridor to the Proposed Development.

Legislation and Guidance

7.3.3 The assessment has been undertaken with respect to environmental legislation, planning policy and general guidance, including the following which are relevant to geology and the water environment.

Legislation

- European Union (EU) Water Framework Directive (2000/60/European Commission (EC));
- EU Drinking Water Directive (98/83/EC);
- Water Environment and Water Services (WEWS) (Scotland) Act 2003 (WEWS Act);
- The Environment Act 1995;
- Environment Protection Act 1990;

- The Flood Risk Management (Scotland) Act 2009;
- The Water Environment (Controlled Activities) (Scotland) Regulations, 2011 (Controlled Activities Regulations (CAR)) (as amended);
- The Water Supply (Water Quality) (Scotland) Regulations, 2001;
- Private Water Supplies (Scotland) Regulations 2006; and
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017.

Planning Policy

7.3.4 National Planning Framework 4 (NPF4) adopted by the Scottish Government on 13 February 2023 provides planning guidance and polices regarding sustainable development, tackling climate change and achieving net zero. Policyies relevant to this Chapter include:

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

7.3.5 In addition Moray Council's Local Development Plan (27 July 2020) provides planning guidance on the type and location of development that can take place in the region. The plan presents policies of which the following are relevant to this assessment:

- Policy DP9 – Renewable Energy;
- Policy EP1 – Natural Heritage Designations;
- Policy EP12 – Management and Enhancement of the Water Environment;
- Policy EP14 – Pollution, Contamination and Hazards;
- Policy EP16 – Geodiversity and Soil ResourcesT

Guidance

7.3.6 The following guidance is also applicable to the assessment.

7.3.7 Planning Advice Notes (PANs) are published by the Scottish Government. Applicable PANs include:

- PAN 61 Planning and Sustainable Urban Drainage Systems (SUDS); and
- PAN 69 Planning and Building Standards Advice on Flooding.

7.3.8 SEPA and NetRegs Pollution Prevention Guidelines (PPG) and replacement Guidance for Pollution Prevention (GPP):

- GPP01 Understanding your environmental responsibilities – good environmental practices;
- GPP02 Above Ground Oil Storage Tanks;
- GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
- GPP05 Works and Maintenance in or near Water;
- PPG06 Working at Construction and Demolition Sites;
- PPG07 Safe Storage – The Safe Operation of Refuelling Facilities;
- GPP08 Safe Storage and Disposal of Used Oils;
- GPP13 Vehicle Washing and Cleaning; and
- GPP21 Pollution incident response plans

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

- C532 Control of Water Pollution from Construction Sites (2001);
- C648 Control of Water Pollution from Linear Construction Projects – Technical Guidance (2006);

- C741 Environmental Good Practice on Site (2015); and
- C753 The SUDS Manual (2015).

7.3.10 SEPA Publications:

- Engineering in the Water Environment: Good Practice Guide – River Crossings (2010);
- Engineering in the Water Environment: Good Practice Guide – Sediment Management (2010);
- Groundwater Protection Policy for Scotland, Version 3 (2009);
- Land Use Planning System SEPA Guidance Note 31, Version 3 (September 2017); and
- Position Statement – Culverting of Watercourses (2015).

7.3.11 Other Guidance:

- Department of Environment, Food and Rural Affairs (DEFRA) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2011); and
- DEFRA Good Practice Guide for Handling Soils (Ministry of Agriculture, Fisheries and Food (MAFF) 2000).

7.4 Consultation

7.4.1 Data requests were issued to MC and SEPA to obtain information relating to water quality data, groundwater level and flow data, private water supplies, licenced water abstractions and discharges, and landfill sites.

7.4.2 The screening opinion received from the ECU in July 2022 determined that the Proposed Development does not constitute an EIA development and does not require a full EIA assessment. **Table 7.1** summarises the key points relevant to geology, hydrology and hydrogeology raised through the screening process.

Table 7.1: Summary of Consultation

Consultee	Consultee Response	Applicant Action
Energy Consents Unit (ECU)	The route selection has sought to avoid as many environmental designations. Where it crosses the River Spey, there will be interaction with SSSI and SAC designations. The use of overhead lines will see no direct impacts on the river and is anticipated that best practice in terms of construction of any nearby wooden poles will have to be adopted during any construction phase.	Assessment of potential impacts on water environment is included in this Chapter.
	Given the scale and nature of the development for the majority of the overhead powerlines, there will be little impediment to the regeneration and agricultural use of land beneath the development. The development should have no significant effects on soil, land, water and biodiversity.	Assessment of potential impacts on the water environment is included in this Chapter. PWS risk assessment is included in Confidential **Appendix 7.1**.
	As the overhead line crosses the River Spey and its flood plain, there may be some impact, and care needs to be taken about the construction phase, haul roads, temporary construction compounds within flood risk areas. Beyond the construction phase, there should be little impact put riparian areas from the overhead lines. It is not anticipated that any major watercourses would affected by the two sections of undergrounded cable at either end of the proposed development.	Assessment of potential impacts on geology, peat and soils is included in this Chapter. This has included peat probing and characterisation. Measures to safeguard soils and peat are presented in this Chapter. Measures to safeguard against pollution and erosion at proposed watercourse crossings are detailed in this Chapter. A summary of the potential sources of flooding and a review of the potential risks posed by each source is presented in Section 7.6 and flood risk safeguards are discussed in Section 7.8 of this Chapter.
	ECU had no direct comments relating to peat.	Assessment of potential impacts on geology, peat and soils is included in this Chapter. This has included peat probing and characterisation. Measures to safeguard soils and peat are presented in this Chapter.

7.4.3 In addition, and as part of this assessment a number of public consultation events were held and the view and feedback provided by attendees has been considered in this assessment. This has included meeting with the owners of private water supplies, and also the owners of Glenrothes and Auchroisk distilleries.

7.5 Methodology

7.5.1 This section outlines the assessment methodology used for the assessment of potential effects on soils, geology and the water environment.

Desk Study

7.5.2 An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information on soils, geology, hydrology and hydrogeology. The following sources of information have been consulted in order to characterise the baseline conditions of the study area:

- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping data;
- Natural England Magic Map[1];
- NatureScot Sitelink Online Information Service[2];
- James Hutton Institute, National Soil Map of Scotland (1:250,000)[3];
- Scottish Natural Heritage (now NatureScot) Carbon and Peatland 2016 Map[4];
- British Geological Survey (BGS) Onshore Geoindex[5];
- BGS Hydrogeological Maps of Scotland[6];
- SEPA flood maps[7];
- SEPA environmental data[8]; and
- Data requests to SEPA (January 2020) and MC (May 2019).

Field Survey

7.5.3 Site surveys were carried out in April and June 2021, May, June and September 2022, and January 2023 to verify the information that was collected during the desk study, allow an appreciation of the study area, gather peat depth and condition data and assess the location and characteristics of private water supplies. This information was used to inform the emerging project design and to complete this assessment.

Assessment of Effects

7.5.4 The assessment of receptors identified by the baseline and field studies has been undertaken considering best practice and safeguards incorporated included in the project design.

7.6 Baseline Conditions

7.6.1 This section outlines the baseline soils (including peat), geology and water environment conditions within the study area.

7.6.2 The Proposed Development is situated in a largely rural area near the towns of Rothes and Keith, Moray, between the consented Rothes III Wind Farm (comprising 28 turbines, with approximate capacity of 99 MW) located approximately 4 km west of Rothes in Moray and the existing Blackhillock substation.

Designations

7.6.3 Review of the Magic Map[1] and NatureScot Sitelink[2] confirms one designated site is within the 500 m study area of the Proposed Development (see **Figure 7.1a – 7.1d**):

- River Spey Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) which is located within the centre of the study area along the banks of the river. The SAC and SSSI are designated for Atlantic salmon,

[1] Natural England, Magic Map, available at http://magic.defra.gov.uk/MagicMap.aspx, accessed November 2022
[2] Nature Scot, Sitelink, available at https://sitelink.nature.scot/home, accessed November 2022
[3] The James Hutton, National Soil map of Scotland, available at https://soils.environment.gov.scot/ accessed November 2022
[4] Scottish Natural Heritage (now NatureScot), Carbon and Peatland 2016 map, available at https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/, accessed November 2022
[5] British Geological Survey, Onshore Geoindex, available at https://mapapps2.bgs.ac.uk/geoindex/home.html, accessed November 2022
[6] British Geological Survey, Hydrogeological maps of Scotland, available at https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/, accessed November 2022
[7] Scottish Environment Protection Agency, flood maps available at https://www.sepa.org.uk/environment/water/flooding/flood-maps/ and http://map.sepa.org.uk/reservoirsfloodmap/Map.htm, accessed November 2022
[8] Scottish Environment Protection Agency, Environmental Data available at https://www.sepa.org.uk/environment/environmental-data/, accessed November 2022

freshwater pearl mussel, otter and sea lamprey which are recognised as particularly sensitive to changes in water quality and therefore considered further in this assessment.

Soils and Geology

Soils

7.6.4 An extract of the 1:250,000 National Soil Map of Scotland is presented as **Figure 7.2**. Review of **Figure 7.2** indicates that the Proposed Development is underlain principally by mineral gleys and mineral podzols. Alluvial soils are shown to bound the larger watercourses, such as the River Spey. Discrete areas of peat and peaty podzols are noted within the western extent and centre of the study area.

Superficial Deposits (including Peat)

7.6.5 An extract of BGS superficial deposit mapping is presented as **Figure 7.3**.

7.6.6 Superficial geology mapping shows that the majority of the preferred alignment is underlain by glacial till deposits on higher ground and alluvium and glacio-fluvial sand and gravel deposits at lower elevations near the larger watercourses. Small isolated areas of peat are recorded within the study area.

7.6.7 Published priority peatland mapping (see **Figure 7.4**) indicates peatland to be generally absent within the study area. A small, isolated area of Class 1 priority peatland (nationally important carbon-rich soils, deep peat and priority peatland habitat, likely to be of high conservation value) is shown to be located within the western extent of the Proposed Development. This area extends to approximately 650 m in length within the headwaters of the Burn of Rothes. It is bound to the north and west by existing commercial forestry.

7.6.8 The area of potential Class 1 peatland is surrounded by areas of Class 4 and Class 5 peatland which underlies the western extent of the study area including the proposed Rothes III Wind Farm substation (subject to a separate application). Another small area of Class 5 peatland is noted adjacent to the Proposed Development , near the Burn of Tauchers. Class 4 and 5 peatland habitats are considered to contain mineral or peaty soils and are not considered to be of high conservation value.

7.6.9 As part of the baseline assessment a peat probing and characterisation exercise has been undertaken in areas where soils or peatland classification mapping suggests peat forming soils may be present. Peat / soil depths were taken at over 400 locations with the recorded peat depths shown on **Figure 7.5a – 7.5c** and **Figure 7.6a – 7.6c**.

7.6.10 Review of **Figures 7.5a – Figure 7.5c** and **Figure 7.6a – Figure 7.6c** confirms that:

- 56% of all probes recorded no peat and / or peaty soils (less than or equal to 0.5 m deep) and 78% of all probes recorded peat depths of less than 1 m deep;
- areas of peat >0.5 m (**Figure 7.6a - Figure 7.6c**) are mainly recorded where the Class 1 priority peatland is mapped, but it is evident that areas of deeper peat are limited in extent and do not cover large areas; and
- deep organic soils were recorded near to Arden House (see **Figure 7.5c**) however, following inspection of the soils at this location it was confirmed that these deposits are not peat but rather organic soils and silts and limited in extent.

Peat Landslide Hazard Risk Assessment

7.6.11 Peat landslide hazard risk has been assessed notwithstanding that the potential risk is deemed to be minimal due to the limited extent of peat proven along the alignment of the Proposed Development.

7.6.12 The peat depth data has been combined with slope data and observations of underlying substrate condition to complete an assessment of peat slide risk. The resultant peat slide risk plans are shown as **Figures 7.7a – Figure 7.7c** which illustrate the majority of Proposed Development assessed is at negligible to low peat slide risk. Within the western extent of the Proposed Development, near the area designated as Class 1 peatland, this increases to low to medium peat slide

risk as a result of steeper slopes noted within this area. These do not pose a significant risk to the Proposed Development as peat landslide hazard risk can be mitigated as part of the detail design stage of the project.

Peat Management Plan

7.6.13 The requirement to manage peat along the Proposed Development will be minimal due to the limited extent of peat present. There are no areas of extensive deep peat and therefore a detailed peat management plan is not required. Where peat is excavated locally it can be managed using the CEMP which will include procedures and method statements for the management and safeguarding of soils and peat where encountered (see Section 7.7, Good Practice and Embedded Mitigation by Design, and Section 7.8, Assessment of Potential Effects, which includes principles for the management of peat and soils that will ensure their integrity).

Bedrock Geology

7.6.14 An extract of BGS bedrock and linear features geology mapping is presented as **Figure 7.8**.

7.6.15 The bedrock geology is characterised mainly by low grade metamorphics of quartzites, psammites and semipelites with some minor igneous intrusions. The bedrock units are generally separated by inferred faults, several of which cross the Proposed Development.

7.6.16 The western extent of the Proposed Development is underlain by the Spey Conglomerate Formation of the Inverness Sandstone Group which comprises conglomerates.

7.6.17 Neither the superficial nor solid geology is considered rare.

Hydrogeology

Groundwater Levels and Flow

7.6.18 SEPA has confirmed that no groundwater level monitoring is undertaken within the study area.

7.6.19 An extract of the BGS 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets and 1:625,000 scale Hydrogeological Map of Scotland are presented in **Figure 7.9** and **Figure 7.10** respectively.

7.6.20 The Aquifer Productivity and Groundwater Vulnerability dataset classifies the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable.

7.6.21 Review of **Figure 7.9** indicates that the glacial superficial deposits within the study area are classified as low productivity aquifer whereby groundwater flow predominately occurs by intergranular flow. The alluvial deposits are considered to be a high productivity aquifer also with intergranular flow. The groundwater within these deposits is likely to be in hydraulic conductivity with the neighbouring watercourses.

7.6.22 The bedrock aquifer is considered to be a low to very low productivity aquifer generally without groundwater except at shallow depth with flow almost entirely through fractures and other discontinuities.

7.6.23 The Spey Conglomerate Formation within the western extent of the study area is classified as a locally important aquifer with high productivity in which flow is dominantly through intergranular and fracture flow mechanisms.

7.6.24 The Proposed Development is shown to be underlain by groundwater vulnerability Classes 4a - d. The highest vulnerability is noted on the hilltops locally where no or shallow superficial deposits are recorded, and thus little attenuation of potential pollutants prior to entry to groundwater.

7.6.25 **Figure 7.10** confirms that the Proposed Development is generally underlain by rocks classified as a low productivity aquifer whereby small amounts of groundwater are expected in near surface weathered zones and secondary fractures. The Spey Conglomerate Formation is considered to be a moderately productive aquifer which locally yield small amounts of groundwater. **Figure 7.10** also confirms that presence of groundwater in the larger valleys.

Groundwater Quality

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

7.6.27 SEPA has identified that the Proposed Development is underlain by several groundwater bodies which have been classified in 2020 (last reporting cycle), as summarised in **Table 7.2**.

Table 7.2: SEPA Groundwater Classifications (2020)

Groundwater Body (SEPA ID)	Overall Status	Pressures
Aberlour (ID: 150666)	Good	None
Middle Spey Sand and Gravel (ID: 150798)	Good	None
Dufftown (ID: 150504)	Good	None
Keith (ID: 150656)	Good	None

7.6.28 SEPA has confirmed that they do not hold any specific groundwater water quality data within the study area.

7.6.29 SEPA have provided groundwater quality monitoring data for 2016-2018 from an abstraction at a spring near Cardnach Farm for Knockando (Cardhu) Distillery, which is located at National Grid Reference NJ 19490 42340, some 6 km south of the western extent of the Proposed Development. A summary of the monitoring data is shown in **Table 7.3**. This confirms good quality with the only exceedances of the Scottish Water Quality Standards or UK Drinking Water Standards being aluminium on five occasions and iron on four occasions out of eleven sampling events.

Table 7.3: Groundwater Quality at Cardnach Farm (2016 – 2018)

Determinand	Minimum	Maximum	Limit
Aluminium (µg/l)	98.5	479	200
Arsenic (µg/l)	2	2	10
Cadmium (µg/l)	0.222	0.414	5
Chromium (µg/l)	1.03	5.84	50
Copper (µg/l)	6.31	38.1	2000
Iron (mg/l)	0.061	0.578	0.2
Manganese (mg/l)	0.01	0.022	0.05
Nickel (µg/l)	6.27	10.6	20
Nitrate as N (mg/l)	4.4	8.64	50
Nitrite as N (mg/l)	0.005	0.005	0.5
Lead (µg/l)	0.35	2.64	10

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

7.6.30 The potential effects on GWDTEs have been considered in Chapter 5: Ecology. It has been shown above that the superficial and solid geology has little capacity to store or allow the movement of groundwater.

Hydrology

Local Hydrology

7.6.31 The local hydrology is shown on **Figure 7.1a – Figure 7.1d**.

7.6.32 The majority of the Proposed Development is located within the River Spey surface water catchment. The River Spey flows through the centre of the study area and flows generally northward before discharging to Spey Bay some 14 km north of the Proposed Development. The study area is drained by the following sub catchments of the River Spey (from west to east):

- Burn of Rothes which drains the western end of the Proposed Development. The burn flows generally eastwards before discharging into the River Spey to the north-east of Rothes, approximately 700 m south of the Proposed Development at its closest extent;
- Broad Burn, a tributary of the Burn of Rothes, which drains part of the western extent of the Proposed Development and flows generally south eastwards before discharging into the Burn of Rothes to the north of Rothes, approximately 600 m south of the Proposed Development at its closest extent; and
- Burn of Mulben which drains part of the centre of the Proposed Development and flows generally westwards before discharging into the River Spey near Tor Hill, approximately 250 m north of the Proposed Development at its closest extent.

7.6.33 The eastern extent of the Proposed Development is located within the River Isla surface water catchment which flows generally north eastward near Keith, before turning eastwards to the north of Keith and discharging into the River Deveron some 10 km east of the existing Blackhillock substation.

7.6.34 Both the River Spey and the River Isla catchments have been designated as Drinking Water Protected Areas (DWPA), as shown on **Figure 7.1a – Figure 7.1d**. The River Spey catchment designated as a DWPA extends from Craigellachie to Spey Bay (not including the various sub catchments described above) and serves the water treatment works (WTW) at Badentinan which supplies Elgin, Rothes and the surrounding coastal and rural communities. The Badentinan WTW is located approximately 6 km north of the Proposed Development. The River Isla catchment designated as a DWPA extends from Keith to Milltown of Auchindoun and serves the Herrick WTW which supplies Keith and its surrounding area. The Herrick WTW is located approximately 3 km north-east of the existing Blackhillock substation.

Rainfall and Surface Water Flow

7.6.35 The Met Office maintains a rain gauge at Keith. Review of the previous 30 years data (1991 – 2020) indicates an average annual rainfall of 888.8 mm.

7.6.36 SEPA has provided precipitation data for Torwinny rainfall gauge (station number 234326). Review of the last 4 years data (January 2018 – December 2021) indicates an average annual rainfall of 917 mm.

7.6.37 The National Flow Archive[9] records stream flow data for gauges at the following locations:

- River Spey at Boat o' Brig (located at NGR NJ 318 517). The National Flow Archive indicates a mean flow of 65.7 m^3/s; and
- River Isla at Grange (located at NGR NJ 493 506). The National Flow Archive indicates a mean flow of 2.83 m^3/s.

Surface Water Quality

7.6.38 SEPA monitor and classify five waterbodies in immediate proximity to the Proposed Development. The most recent published classification details (2020) are summarised in **Table 7.4**.

[9] UK Centre for Ecology and Hydrology, National River Flow Archive, available at https://nrfa.ceh.ac.uk/, accessed November 2022

Table 7.4: SEPA Surface water Classifications (2020)

Waterbody (SEPA ID)	Overall Status	Overall Ecology	Biological Elements	Hydromorphology	Pressures
Rothes Burn (ID: 23071)	Poor	Poor	Poor	Poor	Barriers to fish migration and water abstractions
Broad Burn (ID: 23070)	Good	Good	High	Good	Barriers to fish migration
River Spey – River Fiddich to tidal limit (ID: 23065)	Good	Good	Good	Good	None
Mulben Burn (ID: 23069)	Good	Good	High	Good	None
Crooksmill Burn / Haughs Burn (ID: 23180)	Moderate ecological potential	Bad	Moderate	Bad	Modification to bed banks and shores, water abstraction and water storage
River Isla – source to Keith (ID: 23181)	Poor ecological potential	Poor	Poor	Poor	None
River Isla – Keith to Shiel Burn (ID: 23179)	Moderate ecological potential	Poor	Good	Bad	Modification to bed banks and shores

Flood Risk

7.6.39 SEPA has developed national flood maps[7] that present modelled flood extents for river, coastal, surface water and groundwater flooding which were developed using a consistent methodology to produce outputs for the whole of Scotland, supplemented with more detailed, local assessments where available and suitable for use. Flood extents are presented in three likelihoods: High, Medium, and Low.

- High likelihood: a flood event is likely to occur in the defined area on average more than once in every ten years (1:10), or a 10% chance of happening in any one year;
- Medium likelihood: a flood event is likely to occur in the defined area on average more than once in every two hundred years (1:200), or a 0.5% chance of happening in any one year; and
- Low likelihood: a flood event is likely to occur in the defined area on average more than once in every thousand years (1:1000), or a 0.1% chance of happening in any one year.

7.6.40 A summary of the potential sources of flooding and a review of the potential risks posed by each source is presented in **Table 7.5**. The river floodplain extents are shown on **Figure 7.1a - Figure 7.1d.**

Table 7.5: Potential Flooding Sources

Potential Source	Potential Flood Risk to Application	Justification
Coastal Flooding	No	The Proposed Development is not near the coast
River Flooding	Yes	SEPA river flood mapping highlights that there is low to high likelihood of flooding along the larger rivers near the preferred alignment. The majority of the areas denoted to be at risk of flooding are generally confined to the watercourse channel, with the exception of the River Spey. A wider extent of flood risk is associated with the River Spey. There is an area near Boat o'Brig where the Proposed Development is located within the mapped floodplain for approximately 700 m.
Surface Water Flooding	Yes (minor)	SEPA record several small, isolated areas at risk of surface water flood risk within the study area. It is noted that the flood extents are minor and localised, never forming large, linked areas or flow paths, unless along watercourse corridors. Surface water flooding is not considered to present a development constraint and potential effects can be mitigated by good design.
Groundwater Flooding	No	SEPA groundwater flood mapping highlights the study area is not at risk of groundwater flooding. Additionally, review of the baseline geology and hydrogeology confirms that the geology at and near much of the preferred alignment (with the exception of the alluvial and river valley gravels) is unlikely to contain significant quantities of groundwater.
Flooding due to dam or reservoir failure	No	SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act 1975. Review of the SEPA Inundation Mapping highlights that the preferred alignment is not at risk from any potential breach scenarios.
Flood Defence Breach (failure)	No	A Flood Protection Scheme is noted in Rothes, however, the preferred alignment does not cross with the flood defences.
Flooding from artificial drainage systems	No	No significant drainage systems are present near to the preferred alignment.

Watercourse crossings

7.6.41 The Proposed Development will cross several watercourses including the River Spey and River Isla and their tributaries, including an area designated as DWPA.

7.6.42 The length of proposed new permanent access track has been minimised and there is only one location where new permanent watercourse crossing will be required and one location where the existing watercourse crossing may need to be upgraded (see **Figure 7.1a – Figure 7.1d**). Details are provided in **Table 7.6**.

Table 7.6: Watercourse Crossings

Location (see Figure 7.1a – 7.1d)	Details
WX01	New permanent watercourse crossing. Watercourse at this location is a small meandering watercourse which is 0.2 m wide and 0.5 m deep. The watercourse is located in a wider floodplain, up to 5 m wide.
WX02	An existing track crossing which may need to be upgraded. Watercourse at this location is a small field ditch which is 0.3m wide and 0.1 m deep. The watercourse passes through a 0.2 m diameter plastic circular culvert under the existing track. Culvert appeared to be unblocked during the site visit although the entrance / exit was largely obstructed by vegetation.

Private Water Supplies and Licensed Sites (Abstractions / Discharges / Waste)

7.6.43 Consultation with MC and SEPA has been conducted regarding records of registered and licenced water abstractions and discharges. Recorded private water supplies (PWS) and SEPA Controlled Activity Regulation (CAR) registrations / licences are illustrated on **Figure 7.1a – Figure 7.1d** and are discussed below.

Private Water Supplies

7.6.44 A Private Water Supply (PWS) risk assessment has been completed and is presented in Confidential **Appendix 7.1**. Review of which confirms:

- 7 PWS sources are potentially at risk from the Proposed Development;
- 6 distribution pipes associated with PWS sources are potentially at risk from the Proposed Development;
- 9 PWS sources are not at risk from the Proposed Development;
- 3 PWS sources are unconfirmed; and
- 31 properties are supplied by mains water and do not maintain a PWS.

7.6.45 Measures required to safeguard PWS sources are discussed later in this Chapter and in Confidential **Appendix 7.1**.

Licenced Sites

7.6.46 SEPA has provided recorded of CAR authorisations within the study area, a summary of which are provided below:

- 99 discharges for private sewage and other effluent discharges;
- 13 authorisations for engineering works (dredging, grey bank reinforcement, sediment removal, cable crossing, modification to river crossing);
- 7 water abstractions; and
- 17 authorisations where the activity is not specified.

7.6.47 None of the CAR licences are located within 100 m of the Proposed Development.

7.6.48 The 7 CAR authorisations for water abstractions are discussed in more detail below:

- one authorisation for mobile irrigation plant at Dundurcas Farmhouse (CAR/L/1010262);
- one groundwater abstraction for private water supply at Sionnach (CAR/R/1057856);
- three surface water abstractions for industrial processing at Glen Spey Distillery (CAR/L/1011315), Glen Rothes Distillery (CAR/L/1012063) and Speyburn Distillery (CAR/L/1011939); and
- two groundwater abstractions for industrial processing at Glen Grant Distillery (CAR/L/1011347) and Rothes Distillers Ltd (CAR/L/1011802).

7.6.49 It is noted that the abstraction licence location is attributed to the properties or distilleries that benefit from the abstraction and therefore the exact location of the abstraction is not actually specified in the licence.

7.7 Good Practice and Embedded Mitigation by Design

7.7.1 SSEN Transmission has established best practice construction techniques and procedures that have been agreed with statutory consultees, including SEPA and NatureScot. These are set out within SSEN Transmission's General Environmental Management Plans (GEMPs), included in **Appendix 3.1**.

7.7.2 The Proposed Development would be constructed in accordance with these plans.

7.7.3 A project specific forest hydrology assessment has been prepared (see **Appendix 7.2**). This shows that the felling which is required to establish the Proposed Development is very small in extent when compared to the surface water catchments in which the felling will occur. The area of felling is well below forest best practice felling guidance thresholds and therefore no impact on water quality or rainfall-runoff response, subject to adoption of industry standard best practice, is anticipated.

7.7.4 A contractual management requirement of the successful Principal Contractor would be the development and implementation of a comprehensive and site-specific Construction Environmental Management Plan (CEMP). This document would detail how the successful Principal Contractor would manage the works in accordance with all commitments and mitigation detailed in the Environmental Appraisal, SSEN Transmission's GEMPs, statutory consents and authorisations, and industry best practise and guidance.

7.7.5 The CEMP will also outline measures to ensure that the works minimise the risk to soils, peat, geology, groundwater, surface water and licensed water uses. It will include a project specific drainage plan and materials (soils and peat) management plan. The drainage plan would detail the passive measures that would be deployed to treat both the quality and quantity of water shed from the works area in accordance with Sustainable Drainage Systems (SuDS) techniques. The materials management plan will show how soils and peat arisings will be safeguarded, managed and used in restoration on site.

7.7.6 It is expected that the following will be included within the CEMP and would ensure the works are undertaken in accordance with good practice guidance, as detailed in Section 7.3:

- during construction there would be heavy plant and machinery required and as a result it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in Pollution Prevention Guidance (GPP01);
- in accordance with GPP02 any above ground on-site fuel and chemical storage would be bunded;
- emergency spill response kits would be maintained during the construction works (GPP21);
- a vehicle management system would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision (GPP21);
- suitable access routes would be chosen which minimise the potential requirement for either new temporary access tracks or for tracking across open land which could contribute to the generation of suspended solids;
- a speed limit would be used to reduce the likelihood and significance of any collisions;
- plant nappies would be placed under stationary vehicles which could potentially leak fuel / oils;
- any temporary construction / storage compounds required would be located remote from any sensitive surface water receptors and will be constructed to manage surface water runoff in accordance with best practice;
- any water contaminated with silt or chemicals would not be discharged directly or indirectly to a watercourse without prior treatment;
- water for temporary site welfare facilities would either be brought to site or a local surface water or groundwater abstraction would be identified. Any water abstraction would be made in accordance with the

General Binding Rule or an authorisation would be obtained from SEPA in accordance with the Controlled Activity Regulations (CAR); and

- foul water would either be collected in a tank and collected for offsite disposal at an appropriately licensed facility or discharge will be to a septic tank or soakaway in accordance with the CAR.

7.7.7 The implementation of the CEMP would be managed on site by a suitably qualified and experienced Environmental Clerk of Works (ECoW), with support from other environmental professionals as required. The ECoW would have authority to stop any works that are or have potential to impair soils, geology or the water environment.

7.7.8 In general, construction access would be taken via the existing public road network and would make use of existing forest and estate tracks as far as practicable, as well as temporary access routes. For temporary watercourse crossings less than 2 m wide, CAR General Binding Rules will be adhered to. Bog mats, or similar, would be positioned across the watercourse to enable access, where necessary, side rails will be installed with silt mitigation at either end and across if required to ensure that silt impacts from vehicles crossing are controlled at all times. Crossings will be cleaned at the end of the day if required. All proposed crossing locations and methodologies would be reviewed and approved by the ECoW, prior to any works being undertaken.

7.8 Potential Impacts

7.8.1 The following have the potential to impair the soils, geology, local hydrology (surface water) and hydrogeology (groundwater):

- tracking and use of machinery has the potential to damage soils and/or peat by compaction or indirectly by draining water from discrete areas of peat;
- soil compaction from vehicular movement may cause an increase of local flood risk;
- excavation of soils, peat and shallow geology has the potential to induce local ground instability;
- the use of and tracking of machinery has the potential to generate suspended solids in site runoff;
- the use of machinery has the potential to introduce oils or hydrocarbons; and
- new temporary access tracks may change surface drainage paths which might increase flood risk and / or impair water supplies.

Peat Resources and Peat Slide Risk

7.8.2 A programme of peat depth probing has been undertaken as part of the baseline assessment, ensuring that the areas of deepest peat are avoided by the proposed development, although extensive deep peat was not recorded. A limit of deviation (LoD) is also proposed to allow for micrositing of the Proposed Development and associated access tracks, so that at the time of construction, works can be micro-sited to avoid deep peat. Further site investigation would be undertaken as part of the detailed project design and additional peat depth data collected and used to update the peat depth plan, peat management proposals and ensure works are not undertaken in areas of potential high peat slide hazard risk. It is envisaged that this would be secured by a pre-commencement planning condition and form part of the site-specific CEMP.

7.8.3 Earthworks would be localised and minimised as far as practicable, and the following best practice measures will be detailed in the site CEMP in order to safeguard peat:

- peat excavation to form access tracks to pole locations would be minimised, utilising existing roads where appropriate, low loading bearing access vehicles would be used, and where required temporary portable tracking would be deployed, to safeguard peat below the access routes;
- works would be undertaken in accordance with SSEN Transmission's GEMPs which will ensure peat stripping, excavation and storage is kept to an absolute minimum; and

- any temporary peat storage will be located so that peat slide risk is not increased and safeguards will be deployed in accordance with SSEN Transmission's GEMP, for example, to ensure existing hydrological conditions are maintained and drying of the peat does not occur.

7.8.4 Specific industry standard best practice methods would be used for cable and pole construction. A large section of turf will be removed to a depth of approximately 300 mm and carefully laid to the side for re-use. The turves would be replaced on the backfilled excavations once the pole or cable is installed (see below).

7.8.5 Once the turf is removed the excavator operator would then commence excavating the soils to the required depth. The soil is removed in roughly even layers down the excavation depth with different soil types stored separately.

7.8.6 With the pole or cable installed, backfilling of the excavation would take place with the soils replaced in reverse order whilst being compacted with the excavator bucket in approximately 300 mm layers. At this time it may be necessary to add imported backfill around the pole foundation blocks to ensure stability.

7.8.7 Backfilling would continue until normal ground level is reached. The turfs would then be replaced – using the excavator and deliberately left slightly proud of the surrounding ground level. This is for two reasons; the subsoils would naturally settle following excavation as a consequence of 'bulking up'– despite being compacted as they are replaced and in time would form a 'hollow' around the structure. The second reason is that with the replaced turf being kept slightly higher it would prevent the excavated materials deteriorating below the turf and aid quicker healing of the turf.

7.8.8 Generally within 12 months of reinstatement the excavated area would return to natural ground levels and no evidence of the excavation itself would be visible.

7.8.9 Soils and turves would be handled sensitively to avoid cross contamination between distinct horizons and to ensure re-use potential is maximised. Any excess peat from excavation works, that cannot be used in reinstatement, would be used locally for peat habitat enhancement and restoration under the direction of the site ECoW.

7.8.10 It has been shown that the Proposed Development and LoD is mostly underlain by areas of negligible and low peat slide risk. The peat slide risk assessment would be revised prior to construction and incorporate the results of additional site investigation. The risk assessment would also consider the proposed access routes and track design. Micro-siting would be used to locate the proposed infrastructure in areas of least peat slide risk and mitigation measures to prevent a peat slide would be identified, if required. The updated peat slide risk assessment would form part of the CEMP that would be prepared by the Principal Contractor and be agreed with SEPA and MC prior to construction commencing.

7.8.11 It is expected that the following controls would form part of the final peat slide risk assessment:

- careful micrositing of proposed excavations to avoid drainage channels;
- development of detailed construction access plans, including siting of roads, pads and other associated infrastructure;
- maintaining flow within existing watercourses and drainage features; and
- careful placement of excavation spoil and imported materials to avoid excess surcharging near excavations or on slopes.

7.8.12 If required, a geotechnical risk register would form part of the updated peat slide risk assessment and part of the CEMP.

7.8.13 Given these safeguards the peat resources at site would not be degraded nor is peat slide considered a risk.

Soils and Geology

7.8.14 The following best practice measures would be detailed in the site CEMP in order to safeguard soils:

- any soils temporary stockpiled would be managed in accordance with best practice so that their value is not degraded;

- works would be scheduled to avoid, when possible, periods of heavy rain and vehicular movement shall be planned to avoid saturated ground conditions;
- soils would be protected from temporary heavy vehicular movement through placement of ground protection mats or above ground tracks (underlain by a geotextile);
- stationary plant left for long periods would be parked on formal track / compounds so as to avoid potential of soil compaction;
- all temporary tracks would be removed upon completion of works; and
- localised measures including silt fencing would be used to manage runoff shed from areas where soils are disrupted so as not to locally impair water resources and protect sensitive receptors.

7.8.15 With careful management of soils and adoption of the above best practice, their value would not be impaired as a result of the Proposed Development.

7.8.16 The local geology is not considered sensitive, and with the safeguards proposed the geology at site would not be impaired.

Surface Water and Groundwater Quality

7.8.17 As stated above the works would be undertaken in accordance with the SSEN Transmission's GEMPs and relevant technical guidance, PPG / GPPs and other codes of best practice, to limit the potential for contamination of both ground and surface waters. In addition, a site-specific CEMP would be prepared by the Principal Contractor and include a surface and groundwater quality management plan.

7.8.18 The above measures would significantly reduce the likelihood of pollutants, including suspended solids, being discharged to nearby watercourses or groundwater (including River Spey SSSI and SAC, River Spey DWPA and River Isla DWPA).

7.8.19 It is proposed that water required for the site welfare facilities during the construction phase would be provided by water bowser or tanker. Water from site welfare facilities would be discharged to a sealed tank which would be routinely emptied and disposed of at an appropriately licensed off-site facility.

7.8.20 Should a need for water abstraction / discharge arise during works (e.g. vehicular / wheel washing), this would be dealt with through a registration with SEPA as required under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

7.8.21 With these safeguards surface and groundwater quality would not be impaired.

Flood Risk

7.8.22 As part of the detailed project design the Principal Contractor will identify locations for construction compounds, access routes and prepare a detailed method statement all of which will have regard to areas of known and potential flood risk.

7.8.23 Only one new watercourse crossing is proposed. In accordance with best practice CAR authorisation will be obtained for these by the Principal Contractor. The crossings will be designed to pass a design flood event agreed with SEPA and of a design agreed with SEPA. If the existing crossing on the existing track which will be upgraded needs to be replaced then its design will also be agreed and authorisation obtained from SEPA.

7.8.24 During construction the efficacy of existing track side drains would be subject to routine inspection and as required blockages that might impede water flow, and increase flood risk, would be removed.

7.8.25 A project specific construction method statement will be developed which will identify works which will occur in the published floodplain. The method statement will specify that no stockpiling of materials will occur in these extents and

will provide a procedure for checking SEPAs flood warning system so that all works can cease and contractors and their equipment removed from the floodplain before a flood event occurs.

7.8.26 With these safeguards flood risk to the Proposed Development and downstream of the project can be mitigated.

Surface and Groundwater Flow

7.8.27 The works and protection measures for soils would ensure there were no significant differences to the existing hydrological characteristics at site. There would, therefore, be no effect on surface water flows or flood risk as there would be no permanent change to ground conditions. No alteration of the water contribution to the River Spey SSSI and SAC, River Spey DWPA and River Isla DWPA would occur.

7.8.28 Surface water flow paths to areas identified as potential GWDTE would be maintained.

Private Water Supplies, Licenced Abstractions and DWPA

7.8.29 A number of PWS and licenced abstractions have been recorded downstream and in hydraulic connectivity to the Proposed Development (see Confidential **Appendix 7.1**). The Proposed Development is also upstream of the River Spey and River Isla DWPA.

7.8.30 Site specific measures will be adopted to ensure that the quality and quantity of water to the water supplies is not impaired. For example, use of existing and temporary tracks upstream of the PWS and licenced abstractions locations would be kept to a minimum and no fuel storage or welfare facilities would be located upstream of the abstractions. A detailed description of the safeguards would be given in the site CEMP which would be prepared by the Principal Contractor and agreed with SEPA and MC prior to construction commencing.

7.8.31 It is proposed that confirmatory water quality sampling of the PWS and principal watercourses is undertaken prior to, during and for a period following construction to confirm that Proposed Development has had no effect on the water supplies. Details of the monitoring suite and monitoring frequency, assessment levels and contingency measures that would be adopted in the unlikely event that the water supply is impaired, would also be specified in the CEMP.

7.8.32 An example water monitoring programme is given in Confidential **Appendix 7.1**. Locations are also identified where it is recommended that motoring is undertaken..

7.8.33 In addition, prior to any works being undertaken, and as part of the detailed project design, if any PWS supplies and licenced abstractions which have not been identified as part of this assessment are discovered, then appropriate safeguards would be applied to ensure the integrity of any such abstractions, if required.

7.8.34 With these safeguards, potential impacts on PWS and licenced abstractions, and DWPA can be controlled and mitigated.

7.9 Mitigation

7.9.1 Other than the good practice measures, described above, that SSEN Transmission implement as standard, no specific mitigation is required.

7.10 Summary

7.10.1 Existing geological, hydrogeological and hydrological conditions have been identified and used to assess the potential effects the Proposed Development may have on geology and the water environment.

7.10.2 Best practice construction techniques that would safeguard geology and the water environment and would be incorporated in the detailed design of the works and during the construction works have been identified. Subject to the adoption of the best practice, peat resources, geology and the water environment can be safeguarded during and following development.