8. Geology, Hydrology, Hydrogeology and Peat

8.1 Introduction

8.1.1 This chapter assesses the potential impacts of the Proposed Development on hydrological, hydrogeological, and geological resources, including peat. This includes potential impacts on surface watercourses, groundwater, water abstractions, designated receptors and flood risk within the local area.

8.1.2 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; and
- assess the residual effects remaining following the implementation of mitigation measures.

8.1.3 All staff contributing to this chapter have undergraduate and/or postgraduate degrees in relevant subjects, have extensive professional geological and hydrological impact assessment experience, and hold professional membership of the Geological Society or Chartered Institute of Water and Environmental Management.

8.1.4 This chapter is supported by the following figures and Technical Appendices:

- **Figure 8.1**: Site and Study Area;
- **Figure 8.2**: Hydrological Features;
- **Figure 8.3**: Superficial Geology;
- **Figure 8.4**: Peat Classification;
- **Figure 8.5**: Peat Depth;
- **Figure 8.6**: Bedrock Geology;
- **Figure 8.7**: Hydrogeological Features;
- **Figure 8.8**: Watercourse Crossings;
- **Figure 8.9**: Private Water Supplies;
- **Figure 8.10**: Groundwater Dependent Terrestrial Ecosystems (GWDTE);
- **Technical Appendix 8.1**: Peat Probing and Coring;
- **Technical Appendix 8.2**: Outline Peat Management Plan (PMP);
- **Technical Appendix 8.3**: Peat Landslide Hazard and Risk Assessment (PLHRA);
- **Technical Appendix 8.4**: Borrow Pit Appraisal (BPA).
- **Technical Appendix 8.5**: Watercourse Crossing Schedule (WCS);

- **Technical Appendix 8.6**: Private Water Supply Risk Assessment (PWSRA);
- **Technical Appendix 8.7**: Groundwater Dependent Terrestrial Ecosystems Risk Assessment (GWDTERA); and
- **Technical Appendix 8.8**: Mining Stability Report Including Past Mining Risk Assessment.

8.2 Legislation, Policy & Guidance

8.2.1 Relevant legislation and guidance documents have been reviewed and taken into account as part of this assessment.

Legislation

8.2.2 The European Union (EU) Water Framework Directive (WFD) has been implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003. The act introduced a regulatory system with the Scottish Environment Protection Agency (SEPA) as the lead authority, to establish a framework for co-ordinated controls on activities with the potential to negatively impact the water environment. Water monitoring and classification systems are maintained by SEPA to provide the data to support the aim of the WFD.

8.2.3 The European Parliament and of the Council (EC) Groundwater Directive (GWD) is implemented in Scotland through the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) (as amended).

8.2.4 Other relevant legislation includes:

- The Water Environment (Controlled Activities) (Scotland) Amended 2021;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Water Resources (Scotland) Act 2013;
- The Private Water Supplies (Scotland) Regulations 2006, amended 2015;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- Flood Risk Management (Scotland) Act 2009;
- The Conservation (Natural Habitats, & c.) Amendment (Scotland) Regulations 2019;
- Environmental Protection Act 1990;
- Environment Act 1995; (EU Exit) (Scotland) (Amendment etc.) Regulations 2019;
- The Contaminated Land (Scotland) Regulations 2000 (as amended 2005); and
- The Conservation (Natural Habitats, & c.) Regulations 1994, (as amended in Scotland 2019).

Planning Policy

8.2.5 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to the EIA.

8.2.6 Local strategies are considered within the East Ayrshire Local Development Plan 2 (EALDP2), which sets out policies on development and land use within respective council areas.

8.2.7 This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes (PAN), and EALDP2, and other relevant guidance. Of relevance to the geology, hydrology and peat assessment presented within this chapter are the following policies and advice notes:

- NPF4: Policy 5 Soils;
- NPF4: Policy 22 Flood Risk and Water Management ;
- NPF4: Policy 33 Minerals
- PAN 51: Planning, Environmental Protection and Regulation (Scottish Executive, 2006);
- PAN 79: Water and Drainage (Scottish Executive, 2006); and
- Flood Risk: Planning Advice (Scottish Government, 2015).
- EALDP2: Policy SS1 Climate Change;
- EALDP2: Policy NE5 Protection of Areas of Nature Conservation Interest;
- EALDP2: Policy NE7 Geodiversity and Geological Interest;
- EALDP2: Policy NE10: Protection of Agricultural Land
- EALDP2: Policy NE11: Soils
- EALDP2: Policy NE12: Water, air, light and noise pollution
- EALDP2: Policy NE13: Contaminated Land
- EALDP2: Policy RE1: Renewable Energy
- EALDP2: Policy MIN7: Borrow pits
- EALDP2: Policy CR1: Flood Risk Management

Guidance

8.2.8 Guidance for Pollution Prevention (GPPs) series provide guidance on responsibilities and good practice to prevent pollution from a range of development activities. SEPA's environmental regulatory guidance applies to Scotland. Recognisance has been taken of the following best practice guidelines/guidance etc:

- GPP1: Understanding your environmental responsibilities – good environmental practices (2021);
- GPP2: Above ground oil storage tanks (2021);
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (2021);

- GPP5: Works and maintenance in or near water (2018);
- GPP6: Working at construction and demolition Sites (2023)
- GPP8: Safe storage and disposal of used oils (2021);
- GPP13: Vehicle washing and cleaning (2021);
- GPP21: Pollution incident response planning (2021); and
- GPP22: Dealing with spills (2018).

8.2.9 The following relevant guidance from SEPA has been considered as part of the assessment of geology, peat, hydrology and hydrogeology:

- Land Use Planning System Guidance Note 4 (LUPS-GU4) Planning guidance on on-shore windfarm developments (SEPA, 2017);
- Land Use Planning System Guidance Note 31 (LUPS-GU31) Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA, 2017);
- Land Use Planning System Guidance Note 2a (LUPS-DM-GU2a) Development Management Guidance on Flood Risk (SEPA, 2018);
- Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems (SEPA, 2024);
- Guidance on Assessing the Impacts of Developments on Groundwater Abstractions (SEPA, 2024);
- Supporting Guidance (WAT-SG-75) Sector Specific Guidance: Water Run-Off from Construction Sites (SEPA, 2021);
- Technical Flood Risk Guidance for Stakeholders, Version 13 (SEPA, 2022);
- Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017);
- Guidance on Developments on Peatland (Scottish Government, SNH and SEPA, 2017);
- Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012); and
- Groundwater Protection Policy for Scotland, Version 3 (SEPA, 2009).

8.2.10 The following relevant guidance has also been considered:

- CIRIA C532: ‘Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors’ (CIRIA, 2001);
- CIRIA C811: Environmental Good Practice on Site guide (fifth edition) (CIRIA 2021)
- Good Practice During Wind Farm Construction, Fifth edition (NatureScot, 2024);
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (ECU Scottish Government, 2017);
- The Scottish Soil Framework (Scottish Government, 2009);

- Advising on Peatland, Carbon-Rich Soils and Priority Peatland Habitats in Development Management (NatureScot, 2023); and
- BS 5930:2015+A1:2020 Code of practice for ground investigations (British Standards Institute, 2020).

8.3 Consultation

8.3.1 **Table 8.1** provides details of consultations undertaken with regulatory bodies, together with action undertaken by the Applicant in response to consultation feedback.

Table 8.1: Consultation Responses

Consultee	Consultation Response	Applicant Action
Scottish Water Scoping Response 15/05/2024	A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity.	A review of desk-based resources was undertaken to identify any Drinking Water Protected Areas (DWPAs), and as noted by Scottish Water none were recorded. Details regarding public water supplies are outlined in **Section 8.6**.
East Ayrshire Council Scoping Response 22/05/2024	In terms of Private Water Supplies (PWS) if it is found that any such PWS are located within the study area or likely to be drawing from the same catchment as proposed infrastructure is located, then these PWS will require to be risk assessed. It is expected that the PWS Risk Assessment be undertaken and not only the PWS source should be identified, but also the pathway from source to receptor / PWS user should be mapped as this is the only way of ensuring that a full understanding of any potential impacts of proposed infrastructure / construction activity can be ascertained. Details of any mitigation and/or contingency measures that may be required should be detailed within the EIA Report. The Council's Environmental Health Service should be contacted to assist in the identification of any PWS in and around the site, though site investigations will also be required to address any risk where a PWS exists which is not up to date on the Council's record.	A FOI request was submitted to EAC for records of PWS located within a study area of 2 km from the Site. Following this a desk-based review of AddressBase data and OS maps was undertaken to identify any additional properties that may not be on the council record. Identified properties were scoped into consultation with residents to confirm PWS supply type and location. This is outlined within Private Water Supply Risk Assessment (PWSRA) **Technical Appendix 8.6**. Following consultation, eleven PWS were identified and confirmed, as shown in **Figure 8.9**. Of these, one was scoped into further risk assessment, which will include a detailed assessment of any potential impacts from the Proposed Development.
	For the avoidance of doubt, the full report generated from the Scottish Government's Carbon calculation, accounting for carbon emissions and losses through construction and savings over the lifetime of the development, should be submitted as part of the EIA Report.	Noted, the full report for carbon calculation will be included in **Technical Appendix 1.1**.

Consultee	Consultation Response	Applicant Action
	In terms of any borrow pits, if these are taken forward as part of the proposed development, the EIA Report should include information on the location, size and nature of these borrow pits, including details of the depth of the borrow pit floor and an indicative borrow pit final reinstated profile. The impact of such features (including dust, blasting and impacts on hydrology and GWDTEs) should be appraised as part of the overall impact of the proposal. Information on the proposed depth of excavations compared to the actual topography, the proposed restoration profile, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement should be included within the EIA Report. The Council's EALDP2 includes a policy on borrow pits and information to address the requirements set out within that policy should form part of the EIA Report.	The Borrow Pit Appraisal (**Technical Appendix 8.4**) includes an overview of mining and quarrying close to the Site, aggregate requirements and quality for all potential borrow pits, including an overview of borrow pit design and suitable environmental management during excavation and restoration of borrow pits. Review of the East Ayrshire Councils EALDP2 has been undertaken, including Policy MIN7 regarding borrow pits.
	In terms of flood risk, any potential for the release of water from peat excavation should be considered as a potential cause of flooding. There is some flood risk in various locations throughout the site based on SEPA's flood mapping, though the nature of this is likely to be capable of being avoided through appropriate siting and design. There is some flood risk in various locations throughout the site based on SEPA's flood mapping, though the nature of this is likely to be capable of being avoided through appropriate siting and design, however on the basis there are flood risks it is not considered flooding can be fully scoped out.	**Section 8.10** provides information on best practice measures for design and management of surface water drainage. The CEMP, to be produced prior to the commencement of construction, will include best practice measures with regards to peat and soil management, including excavating, rewetting and stockpiling. Specific measures relating to peat excavation are also outlined within the outline Peat Management Plan (PMP) (**Technical Appendix 8.2**). Information on the limited flood risk found on-site is detailed in **Section 8.6**.
	The relevant fisheries boards should be consulted to discuss their expectations and requirements regarding the extent of hydrological assessment required to inform the assessment of hydrological impacts, including water quality impacts / monitoring, which also links to the potential ecological impacts on aquatic life.	A response to Scoping from Fisheries Management Scotland (FMS) was received in May 2024. The assessment has been undertaken in line with FMS and MSS guidance, and consultation will be undertaken with Ayr District Salmon Fishery Board prior to construction to confirm approach to any required monitoring.
	The application sites feature areas identified within the Coal Authority Mining Risk Assessment, including both low and high risk areas, and the Coal Authority should be consulted to ascertain the scope of methodology and assessment required to address any potential risks for reporting in the EIA Report. The Planning Authority would also rely on detailed	Consultation has been undertaken with the Mining Remediation (Coal Mining) Authority as part of Scoping. Mining stability onsite has been assessed by JWH Ross in Mining Stability Report

Consultee	Consultation Response	Applicant Action
	comments on such matters from NatureScot, SEPA and the Scottish Government's advisors on peat, Ironside Farrar Ltd. These bodies would be able to advise further on the appropriateness of the methodologies reported.	Including Past Mining Risk Assessment (**Technical Appendix 8.8**). Areas of the site identified as being at risk from subsidence have been avoided.
Mining Remediation Authority (Coal Mining Authority) Scoping Response 29/05/2024	Our records indicate that there are two mine entries (adits) within the Site and areas of past surface mining activity. These features may pose a potential risk to surface stability and public safety. It is noted that Section 8.4.2 of the Scoping Report, dated 14/05/24, covers coal mining and confirms that a Coal Mining Risk Assessment (CMRA) has been prepared by JWH Ross (Mining Stability Report Including Past Mining Risk Assessment, September 2023) which will be included as an appendix within the EIAR. They also note that the results of the CMRA will inform the design of the Proposed Development. The Coal Authority is of the opinion that building over the top of, or in close proximity to, mine entries should be avoided wherever possible, even after they have been capped, in line with our adopted policy: https://www.gov.uk/government/publications/building-on-or-within-the-influencing-distance-of-mine-entries. We are pleased to see that the risks posed by past coal mining activity will be assessed and the findings of this used to inform the design of the development. We look forward to reviewing the document in due course.	As outlined within the Scoping Report, risks posed by past mining activities have been assessed in a report prepared by JWH Ross (Mining Stability Report Including Past Mining Risk Assessment, September 2023) in **Technical Appendix 8.8**. This assessment and location of identified mine entries informed the design of the Proposed Development and have been avoided.
Fisheries Management Scotland Scoping Response 30/05/2024	The Proposed Development straddles the catchments relating to the Nith DSFB, Doon DSFB, Ayrshire Rivers Trust and Nith Catchment Fisheries Trust. It is important that the proposals are conducted in full consultation with the trust. We have also copied this response to these organisations. Due to the potential for such developments to impact on migratory fish species and the fisheries they support, FMS have developed, in conjunction with Marine Scotland Science, advice for DSFBs and Trusts in dealing with planning applications. We would strongly recommend that these guidelines are fully considered throughout the planning, construction and monitoring phases of the proposed development.	The assessment of potential impacts to water quality and quantity is undertaken in Section 8.9. An assessment of hydrologically connected designated sites, which have potential to be impacted has also been included, which include fish as designated features. A detailed ecological assessment of fish is undertaken in **Chapter 6**: **Ecology**. Prior to construction, in accordance with FMS and MSS guidance, the requirement for electrofishing and macroinvertebrate monitoring for the pre-construction, construction and post-construction phases of the Proposed Development will be confirmed with Ayr District Salmon Fishery Board,

Consultee	Consultation Response	Applicant Action
		Ayrshire Rivers Trust and Nith Catchment Fisheries Trust.
NatureScot Scoping Response 06/06/2024	We note that Phase 1 peat probing has been undertaken in 2020 for some part of the Site, and the remaining areas will be assessed in 2024. Our detailed peatland advice for applicants is contained in our revised guidance on Advising on peatland, carbon-rich soils and priority peatland habitats in development management[10] (November 2023). Our onshore wind pre-application guidance (February 2024) also highlights key guidance in relation to peatland assessment, recommendations on peatland restoration, and the level of information to be submitted with the application.	Phase 2 peat probing was carried out by MacArthur Green in December 2024 as outlined in **Section 8.6**. As outlined in **Section 8.3**, NatureScot specific guidance has been used to inform this assessment.
	We agree with the designated sites to be scoped out, as they are not hydrologically connected.	Noted. A summary of designated sites within the study area is outlined in **Section 8.6.**
SEPA Scoping Response 24/06/2024	In this case, where much of the site is on peat, we expect the application to be supported by a comprehensive site-specific peat management plan (PMP). There is potential for a significant impact on peat (a carbon-rich soil). At this stage, the plans suggest that several turbines (1, 5, 9, 10, 11, 16 and 17) would be located in peat deeper than 1 m. Ideally these would be relocated to areas of 'peaty soil' rather than deep peat. Turbines 3, 4, 6, 8, 13, 14, 19 and 25 are very close to peat over 1m in depth, so final placement (following further peat probing) should microsite the deepest excavations away from the deeper peat. Although much of the site is covered in commercial forestry plantation which may have degraded some of the peat, such degradation may be reversed, if these areas are cleared and allowed to recover or there is active restoration. Floating tracks should be used over peat as much as possible (always when crossing deep peat) to minimise excavation.	Noted, an outline Peat Management Plan is included in **Technical Appendix 8.2**. Following phase 2 peat depth surveys, further design iterations have sited the Proposed Development outwith areas of peat as far as practicable, while also considering other constraints. As outlined in **Section 8.6**, peat condition surveys onsite found the peatland to be in a modified or drained condition. The oPMP will outline best practice mitigation measures, including restoration of all excavated peat on-site.
	Sufficient buffer zones should be provided between infrastructure and watercourses to minimise risk to the water environment. Turbines 4 and 16 are proposed to be near to (and between) tributaries. Others (12, 19 and 24) would also be close to buffe limits, so care will be needed to avoid encroachment on watercourse buffer zones when planning the layout of crane pads and associated tracks.	**Section 8.7** of this EIAR details embedded mitigation, which includes a 50 m buffer which has been maintained around all surface watercourses and waterbodies identified, except where tracks are required to cross watercourses, as shown in **Figure 8.2**. Further consultation was undertaken with SEPA where it is proposed to utilise existing tracks sited within 50 m buffers of artificial surface waterbodies.

Consultee	Consultation Response	Applicant Action
	The hydrogeology map (Fig 8.7) provided at this stage indicates that there is some moderately productive aquifer across the site. Given the number and proposed density of turbines, it is possible that some of the infrastructure will be on or have an impact on, a groundwater dependent ecosystem (GWDTE). The applicant should follow the relevant guidance (LUPS-GU31) to ensure that sensitive habitats are not affected, or provide strong evidence that they are not present.	A detailed risk assessment of GWDTEs has been undertaken in **Technical Appendix 8.7**. The assessment follows relevant guidance including LUPS-GU31, and updated Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems.
	SEPA agree with the developer's proposal that a Coal Mining Risk Assessment needs to be included in the EIA. If the developer is proposing to disturb any mine wastes and/or contaminated soils on the site, a detailed intrusive site investigation including soil and leachate analysis should be undertaken to determine any potential risks to water environment receptors.	Risks posed by past coal mining activities have been assessed in a Mining Stability Report Including Past Mining Risk Assessment by JWH Ross (**Technical Appendix 8.8**) and the Proposed Development design has avoided risk locations associated with historical mining activities. A geotechnical investigation and assessment of backfilled areas at the opencast site would be undertaken prior to construction.
	Given the history of mining on the site, water management will be important and ideally, there would be a monitoring plan as part of the EIA, to help minimise risks to the water environment from mine waste, surface mine backfill and mine pit loch.	Prior to construction a detailed drainage plan including a Surface Water Management Plan would be included within the CEMP. As outlined in **Section 8.9**, a Water Quality Monitoring Plan will also be undertaken.
	Although stabilisation of mine workings by grouting is not mentioned in the Scoping Report, the applicant should refer to the information (in Appendix 2) about grouting of mine workings, if grouting is necessary.	Noted. An assessment of effects to mine workings is included in **Technical Appendix 8.8** and outlined in Section 8.6.
	We have no additional comments at this stage about the risk to private water supplies (PWS), as the developer states they will be identified and assessed in accordance with SEPA's LUPS-GU31 and that this information will be included in the EIA.	Noted, an assessment of PWS is outlined in T**echnical Appendix 8.6.** The methodology for assessing risk to PWS is in accordance with SEPA's LUPS-GU31, and updated Guidance on Assessing the Impacts of Developments on Groundwater Abstractions.

Consultee	Consultation Response	Applicant Action
	The proposals should demonstrate how impacts on local hydrology have been minimised and the site layout designed to minimise watercourse crossings and avoid other direct impacts on water features. Measures should be put in place to protect any downstream sensitive receptors. The submission must include a set of drawings showing: a) All proposed temporary or permanent infrastructure overlain with all lochs and watercourses; b) A minimum buffer of 50m around each loch or watercourse. If this minimum buffer cannot be achieved each breach must be numbered on a plan with an associated photograph of the location, dimensions of the loch or watercourse and drawings of what is proposed in terms of engineering works; c) A map showing the location, size, depths and dimensions of all borrow pits overlain with all lochs and watercourses within 250m and showing a site-specific buffer around each loch or watercourse proportionate to the depth of excavations. The information provided needs to demonstrate that a site-specific proportionate buffer can be achieved.	Noted, an assessment of effects to identified hydrological receptors is outlined in **Section 8.8**. All surface watercourse and waterbodies on-site with a minimum 50 m buffer are shown in **Figure 8.2**. There is no encroachment of this buffer, other than at proposed watercourse crossing locations, and excepting where an existing track is utilised as discussed with SEPA during further consultation. An assessment of borrow pits is included within the outline Borrow Pit Assessment (**Technical Appendix 8.4**). All proposed borrow pits are sited outwith 50 m from surface watercourses and waterbodies.
	Crossings must be designed to accommodate the 0.5% annual exceedance probability flows (with an appropriate allowance for climate change), or information provided to justify smaller structures. If it is considered the development could result in an increased risk of flooding to a nearby receptor, then a flood risk assessment (FRA) must be submitted.	The WCS (**Technical Appendix 8.5**) outlines proposed watercourse crossing locations, crossing types and photographs of watercourses. Watercourse crossings have been designed to maintain hydrological connectivity following relevant guidance. At detailed design stages these crossing types will be confirmed and designed to accommodate 0.5% AEP flows. Information on the limited flood risk found on-site is detailed in **Section 8.6**.
	Where proposals are on peatland or carbon rich soils (CRS), the following should be submitted to address SEPA's requirements in relation to NPF4 Policy 5. The submission should include a series of layout drawings at a usable scale showing all permanent and temporary infrastructure, with extent of excavation required. These plans should be overlaid on the following: a) Peat depth survey showing peat probe locations, colour coded using distinct colours for each depth category. This must include adequate peat probing information to inform the site layout in accordance with the mitigation hierarchy in NPF4 b) Peat depth survey showing interpolated peat depths;	Noted, a review of desk-based information and peat depth surveys was undertaken to determine areas of peat and deep peat in accordance with NPF4 guidance. The required plans are shown in **Figure 8.4** and **Figure 8.5**, which show peatland classification and peat depth survey data respectively. Peat has been avoided where practicable through the iterative design process. Best practice mitigation for volumes

Consultee	Consultation Response	Applicant Action
	c) Peatland condition mapping. The detailed series of layout drawings above should clearly demonstrate that development proposals avoid any near natural peatland and that all proposed excavation is on peat less than 1 m deep. On other sites where complete avoidance of peat and carbon rich soils is not possible then it should be clearly demonstrated that the deepest areas of peat have been avoided and the volumes of peat excavated have been reduced as much as possible, first through layout and then by design making use of techniques such as floating tracks.	of peat excavated is included within the outline Peat Management Plan (PMP) (**Technical Appendix 8.2**).
	The Outline Peat Management Plan (PMP) must include: a) A table setting out the volumes of acrotelmic, catotelmic and amorphous peat to be excavated. These should include a contingency factor to consider variables such as bulking and uncertainties in the estimation of peat volumes; b) A table clearly setting out the volumes of acrotelmic, catotelmic and amorphous excavated peat:1) used in making good site-specific areas disturbed by development. 2) used in on and off-site peatland restoration, and 3) disposed of, and the proposed means of disposal. c) Details of proposals for temporary storage and handling of peat. d) Suitable evidence that the use of peat in making good areas disturbed by development, including borrow pits, is genuine and not a waste disposal operation, including evidence on the suitability of the peat and evidence that the quantity used matches and does not exceed the requirement of the proposed use. e) Use of excavated peat in areas not disturbed by the development itself is now not a matter SEPA provides planning advice on. Please refer to Advising on peatland, carbon-rich soils and priority peatland habitats in development management | NatureScot 2023, and the Peatland ACTION – Technical Compendium which provides more detailed advice on peatland restoration techniques.	The outline PMP (**Technical Appendix 8.2**) details an assessment of impact on peat and carbon rich soils and includes excavation volumes, temporary storage and re-use methods. As outlined it is anticipated that all peat excavated can be reused on-site.
	A National Vegetation Classification (NVC) survey should be submitted which includes the following information: a) A set of drawings demonstrating all GWDTE and existing groundwater abstractions are outwith a 100 m radius of all excavations shallower than 1 m and outwith 250 m of all excavations deeper than 1 m and proposed groundwater abstractions. b) If the minimum buffers cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required.	A detailed NVC survey was completed as outlined in **Chapter 6: Ecology** and **Technical Appendix 6.1**. Following this, all potential GWDTE identified were assessed using a combination of desk-based assessment and hydrological surveys to determine groundwater dependency and potential impact. **Technical Appendix 8.7** and, additionally, **Figure 8.10** detail all GWDTEs

Consultee	Consultation Response	Applicant Action
		scoped into the assessment overlain with the Proposed Development and relevant excavation buffers.
	If forestry is present on the Site, the Site layout should be designed to avoid large scale felling, as this can result in large amounts of waste material and a peak in release of nutrients which can affect local water quality.	Design iterations have utilised existing infrastructure where practicable, such as forestry access tracks, to minimise impact on forestry to avoid the need for felling. The site is located within an area of commercial forestry with felling being undertaken as part of the future baseline. Assessment of potential impacts to water quality from felling is undertaken in **Section 8.8**.
	The submission must include a schedule of mitigation, which includes reference to best practice pollution prevention and construction techniques (for example, limiting the maximum area to be stripped of soils and peat at any one time) and regulatory requirements. Please refer to the Guidance for Pollution Prevention (GPPs) and our water run-off from construction sites webpage for more information.	See **Chapter 15: Schedule of Mitigation**. Prior to the commencement of construction, a CEMP will be produced which will detail all best practice guidance and mitigation measures that will be employed on-site to protect sensitive receptors. This will include reference to GPPs. The CEMP will summarise a proposed programme of water quality monitoring and works that will be inspected by the on-site Environmental Clerk of Works (EnvCoW).
	If stabilisation works are identified as being required to facilitate the development, then an appropriate risk assessment for the proposed stabilisation of mine workings with PFA grout should be produced prior to this activity being undertaken on site.	Noted, through design iterations the Proposed Development will avoid high risk areas as outlined in **Technical Appendix 8.8**. If stabilisation works are required following intrusive investigative works then an appropriate risk assessment will be produced.
SEPA Further Consultation 13/09/2024	SEPA has no objection to use of the existing route, as shown on the map provided. If it continues to be used and upgraded, the applicant should note that care should be taken to comply with General Binding Rule (GBR) 10A, which emphasizes that all reasonable steps must be taken to ensure that any run-off caused by the use or modification of the track does not result in pollution of the water environment (such pollution could be a breach of the Controlled Activities Regulations – CAR).	Noted. General Binding Rules will be followed with regards to pollution of the water environment, including where utilising the existing track within 50 m buffer of surface waterbodies. Prior to the commencement of construction, a CEMP will be produced which will detail all best practice guidance and mitigation measures that will

Consultee	Consultation Response	Applicant Action
	If the applicant decides instead to create a new track, it may be easier to comply with GBR 10A, but in this case SEPA has no objection to use of the existing track.	be employed on-site to protect sensitive receptors. The CEMP will summarise a proposed programme of water quality monitoring and works that will be inspected by the on-site Environmental Clerk of Works (EnvCoW).

8.4 Assessment Methods & Significance Criteria

Study Area

8.4.1 The study area for assessment of hydrological and hydrogeological receptors, including designated sites with hydrological reasons for designation (Figure 8.1), incorporates the area within the Site and up to 10 km from the Site. Potential effects to PWS are considered within 2 km from the Site. The study area for assessment of geological receptors is the Site itself.

8.4.2 These study areas are based on professional judgement and experience assessing similar developments, with due consideration of relevant guidance on hydrological and geological assessment. It is considered that in excess of these distances due to attenuation and dilution, the Proposed Development is unlikely to have an effect.

Desk Study

8.4.3 Baseline conditions have been established primarily through desk-based assessment which has included:

- Consultation with relevant bodies and collation of data.
- Identification of surface watercourses and waterbodies, including WFD classifications.
- Identification of hydrogeological receptors, including aquifers.
- Identification of underlying bedrock and superficial geology, including assessment of peat depth contours.
- Assessment of topography, land use and climate conditions to inform drainage patterns.
- Identification of any PWS and DWPAs.
- Identification of potential GWDTEs, including review of NVC survey data; and
- Assessment of flood risk.

8.4.4 The following information sources have been reviewed to inform the desk study:

- The Ordnance Survey (OS) Mapping (1:50,000 and 1:25,000);
- British Geological Survey (BGS) GeoIndex Online Map Viewer;
- BGS Geological Survey of Scotland 14E Cummock 1976 Solid Map (1:50,000);

- BGS Geological Survey of Scotland 14E Cummock 1980 Drift Map (1:50,000);
- National Soils Map of Scotland;
- The James Hutton Institute Soil Classification;
- NatureScot Carbon and Peatland 2016 Map;
- NVC survey data and report (refer to Technical Appendix 6.1);
- SEPA Online Flood Maps;
- SEPA Waste Site and Capacity Data Tool;
- Scotland's Environment Map;
- SEPA and BGS Open Report 'Scotland's aquifers and groundwater bodies';
- National River Flow Archive (NRFA); and
- Meteorological Office Rainfall Data.

Site Visit

Peat Surveys

8.4.5 Phase I peat depth surveys were carried out by MacArthur Green in July 2020 and May/June 2021 for the Proposed Development. Peat depths were measured on a 100 m grid across the Site, where this was not possible due to accessibility issues probes were collected along forestry rides to achieve suitable coverage. The survey was carried out following best practice guidance for development on peatland. This data was used to inform the iterative design process.

8.4.6 A detailed phase 2 survey was carried out by MacArthur Green in December 2024 and January 2025 and March 2025. The phase 2 survey probed proposed turbines and ancillary infrastructure areas of the Proposed Development using the following pattern:

- Probe turbine centre and every 10 m to the north, east, south, and west, out to 50 m from the centre;
- Probe points every 50 m along the proposed access tracks, with staggered, offset probes 10 m either side of the access track centre line, and at turning heads (allowing for coverage of any micrositing allowance); and
- Other infrastructure locations were probed to an approximate 25 m grid.

Hydrological Walkover

8.4.7 A hydrological walkover of the Site was undertaken in December 2024. Site observations included topography, habitats, ground conditions and features of watercourses and waterbodies. The walkover also allowed ground-truthing of

receptors identified during the desk study and identification of further hydrological receptors.

8.4.8 A visit to residents as part of the PWS assessment was undertaken in December 2024 to confirm the source locations and source type.

8.4.9 Habitat survey work, including mapping of NVC communities, was undertaken by MacArthur Green ecologists in June 2020, and March and April 2021. This included the identification of habitats which had the potential to be GWDTE. Further details of this are provided in **Chapter 6: Ecology** and **Technical Appendix 6.1**. Review of the GWDTEs was undertaken on-site as part of the hydrological walkover to determine whether any potential GWDTEs are likely to be dependent on groundwater.

Assessment of Significance

Sensitivity of Receptors

8.4.10 The sensitivity characteristics of geological, peat, hydrological and hydrogeological resources have been guided by the matrix presented in **Table 8.2** below. These criteria for sensitivity have been developed based on a hierarchy of factors, following experience and professional judgement and in line with appropriate guidance, legislation and best practice.

Table 8.2: Sensitivity of Receptors Criteria

Sensitivity	Description
High	• Highly sensitive land use including raised or blanket bog, carbon-rich or peat soils (Class 1 or 2 priority peatland). • Highly permeable superficial deposits, allowing storage and transport of contaminants. • Designated receptor present protected under national or international legislation, including National Parks, SSSIs, SACs and SPA. • A waterbody with a SEPA WFD Overall or Ecological classification of 'High' or 'Good'. • An aquifer, classified by BGS as a 'highly productive aquifer' or 'moderately productive aquifer', or that is of regional importance. • Extensive areas of 'High Likelihood' or 'Moderate Likelihood' of river, surface water or coastal flooding which acts as an active floodplain. • Public Water Supplies or PWS that abstract from a hydrological receptor underlying or connected to the site. • Potential GWDTE identified through NVC survey classified as groundwater dependent with minimal degradation, that are found to have site-specific groundwater dependency and are not ombrotrophic.
Medium	• Moderately sensitive land use including carbon-rich or peat soils (Class 3 or 4 priority peatland). • Moderately permeable superficial deposits, allowing limited storage and transport of contaminants. • Designated Receptors of regional importance, including Regionally Important Geological and Geomorphological Sites (RIGS), or receptors of local importance.

Sensitivity	Description
	• A waterbody with a SEPA WFD Overall or Ecological classification of 'Moderate' or 'Poor'. • An aquifer, classified by BGS as a 'low productivity aquifer' that does not support abstractions. • Isolated areas of 'High Likelihood' or 'Moderate Likelihood' of surface water flooding or river or coastal flooding that is confined to waterbody extents and is not an active floodplain. • Potential GWDTE identified through NVC survey classified by SEPA to be 'highly groundwater dependent' with extensive degradation, that are found to have site specific groundwater dependency and are not ombrotrophic. • Potential GWDTE identified through NVC survey classified as groundwater dependent which have become degraded, that are found to have site-specific groundwater dependency and are not ombrotrophic.
Low	• Low sensitive land use that does not include carbon-rich or peat soils (Class 5 or 0). • Geological or hydrological features not currently protected and not considered worthy of protection. • Low permeability superficial deposits likely to inhibit the transport of contaminants. • A waterbody with a SEPA WFD Overall or Ecological classification of 'Bad', or no classification. • A non-aquifer, classified by BGS as a 'Rocks with essentially no groundwater'. • Areas of 'Low Likelihood' of surface water, river or coastal flooding. • Public Water Supplies or PWS are not supported by hydrological receptor underlying or connected to the site. • Potential GWDTE identified through NVC survey classified as groundwater dependent, that are found to not have site-specific groundwater dependency and are instead ombrotrophic.

Magnitude of Change

8.4.11 The magnitude of change criteria that apply to the baseline sensitivities of the identified receptors are set out in **Table 8.3**. Similar to criteria for sensitivity, these have been developed based professional judgement and appropriate guidance, legislation and best practice.

Table 8.3: Magnitude of Change Criteria

Sensitivity	Description
High	Total loss of, or alteration to key features of the baseline resource such that post development characteristics or quality would be fundamentally and irreversibly changed, for example, extensive excavation of peatland or watercourse realignment.
Medium	Loss of, or alteration to key features of the baseline resource such that post development characteristics or quality would be partially changed, for example, in-stream permanent bridge supports or partial excavation of peatland.

Sensitivity	Description
Low	Small changes to the baseline resource, which are detectable, but the underlying characteristics or quality of the baseline situation would be similar to pre-development conditions e.g., culverting of very small watercourses/drains.

Significance of Effect

8.4.12 The significance of the predicted effects has been assessed in relation to the sensitivities of the baseline resource. A matrix of significance, based on the combination of magnitude of change and sensitivity of the receptor, was developed to provide a consistent framework for evaluation, shown in **Table 8.4** below.

Table 8.4: Significance of Effects

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

8.4.13 The guideline criteria for the categories of significance of effect are provided in **Table 8.5** below.

Table 8.5: Significance of Effect Criteria

Sensitivity	Definition	Guidance Criteria
Major	A fundamental change to the environment	Changes in water quality or quantity affecting widespread catchments or groundwater reserves of strategic significance, or changes resulting in substantial loss of conservation value to geological or aquatic habitats and designations.
Moderate	A large, but non-fundamental change to the environment	Changes in water quality or quantity affecting part of a catchment or groundwaters of moderate vulnerability, or changes resulting in loss of conservation values to geological or aquatic habitats or designated areas.
Minor	A small but detectable change to the environment	Localised changes resulting in minor and/or reversible effects on soils, surface and groundwater quality or habitats.
Negligible	No detectable change to the environment	Essentially no effects on geological resources, drainage patterns, surface and groundwater quality or aquatic habitats.

8.4.14 In the above classification, fundamental changes are those which are permanent, either adverse or beneficial, and would result in widespread change to the baseline

environment. For the purposes of this assessment, those effects identified as being major or moderate have been evaluated as significant environmental effects.

8.4.15 These matrices have been used to guide the assessment, though they have been applied with a degree of flexibility, since the evaluation of effects will always be subject to location-specific characteristics which must be considered. For this reason, the evaluation of the significance of effects will not always correlate exactly with the cells in the relevant matrix, especially where professional judgement and knowledge of local conditions may result in a slightly different interpretation of the impact concerned.

Requirements for Mitigation

8.4.16 Depending on the potential impact predicted to sensitive receptors, embedded and additional mitigation measures are presented within this chapter. Wherever possible, mitigation has been embedded and incorporated into the design of the Proposed Development. Additional mitigation has been outlined in **Section 8.9** of this chapter and those to be implemented during the construction phase will be included within a CEMP.

Assessment of Residual Effect Significance

8.4.17 An assessment of any predicted significant residual effects on sensitive geological, hydrological or hydrogeological receptors is presented within this chapter (**Section 8.10**). The assessment considers effects throughout the construction, operational and decommissioning phases of the Proposed Development.

Assessment of Cumulative Effects

8.4.18 An assessment of any predicted cumulative effects on sensitive geological, hydrological or hydrogeological receptors is presented within this chapter (**Section 8.11**). This section details predicted effects from proposed or consented developments within 10 km of the Site with potential cumulative effects identified.

Limitations, Difficulties and Uncertainties

8.4.19 Other than peat depth survey work, no water quality monitoring or intrusive investigations have been undertaken. This is not considered to represent a significant limitation to the assessment of effects, as detailed intrusive site investigation works and water quality monitoring would be undertaken prior to and

during construction to inform detailed engineering design, micro-siting and environmental protection and control measures to be implemented.

8.5 Baseline

Current Baseline

Topography and Land Cover

8.5.1 The Proposed Development is located within the East Ayrshire Council area approximately 13 km south-east of Ayr, 8.5 km south-west of Cumnock and 4.5 km north of Dalmellington. The location of the Proposed Development is shown on **Figure 8.1**. The approximate centre is at British National Grid (BNG) 248092 612583.

8.5.2 The Proposed Development is set primarily within commercial forestry with small areas of open moorland. Historic land use onsite includes opencast mining, with artificial modified surface waterbodies present. The elevation on-site slopes from 420 m Above Ordnance Datum (AOD) in the south of the Site to 220 m AOD in the north-west.

Climate

8.5.3 The nearest National River Flow Archive (NRFA) monitoring station to the Site which rainfall is recorded for is Lugar Water at Langholm (ID 83004) approximately 7.2 km north of the Proposed Development. It records an average annual rainfall in the standard period (1961 – 1990) of 1,254 mm.

8.5.4 The closest Meteorological Office climate station is Prestwick, Gannet, which records an annual average rainfall in the climate period (1991 – 2020) of 980.80 mm.

Bedrock Geology

8.5.5 BGS GeoIndex Onshore Mapping identified that the Site is predominantly underlain by the Scottish Lower Coal Measures Formation and Scottish Middle Coal Measures Formation of the Scottish Coal Measures Groups, as shown in Figure 8.6. There are inferred coal seams mapped within the Scottish Lower Coal Measures Formation in the north-west and south-east of the Site.

8.5.6 Olivine-Microgabbro and Analcime-Gabbro intrusions of the Midland Valley Carboniferous to Early Permian Alkaline Basic Sill Suite underlie the south-west

and centre of the Site. Small, isolated areas of Ayrshire Basanitic and Foiditic Plugs and Vents are mapped in the east of the Site.

8.5.7 Four east to west trending inferred faults transect the centre of the Site. In the north of the Site there is a small north-west to south-east trending fault. There is no faulting mapped in the south of the Site.

Superficial Geology

8.5.8 BGS GeoIndex Onshore Mapping shows the Site to be primarily underlain by peat deposits, as shown in Figure 8.3. Devensian till deposits are also mapped on-site, largely in the west and north-west of the Site. Alluvium deposits are present along the Water of Coyle in the centre of the Site. A small, localised area of glaciofluvial deposits comprising gravel, sand and silt is located in the north-west of the Site.

Soils

8.5.9 The National Soil Map of Scotland indicates the Site to be largely underlain by peaty gleys with dystrophic blanket peat, which are derived from Carboniferous sediments and basic igneous rocks. Peaty gleys are described as wet soils with an organic (peaty) surface layer, often found in depressions and foothills with gentle slopes. Dystrophic blanket peat is an organic soil which is largely rain fed and mineral poor.

8.5.10 In the south and centre of the Site there are areas of peaty gleyed podzols, which are drifts derived from basaltic rocks present on hills and valley sides. Peaty gleyed podzols are acid soils with a wet peaty surface layer overlying a wet, greyish subsoil.

8.5.11 In the lowlands in the north-west of the Site, noncalcareous gleys are present. Non-calcareous gleys are defined as a mineral topsoil over a thin weakly developed subsoil or on to bedrock with no free calcium within mineral topsoil.

Peat

8.5.12 Published priority peatland mapping by NatureScot, Carbon and Peatland Map 2016, indicates that the Site primarily comprises Class 4 and Class 5 peatland. Mapping indicates the north-west of the Site comprises of Class 3 peatland and mineral soil. There is a small area of Class 1 (priority) peatland located in the south-east of the Site, as shown in Figure 8.4.

8.5.13 Class 5 peatlands are defined as areas with no peatland habitats recorded but may include areas of bare soil, carbon-rich soils and deep peat. Class 4 peatlands defined as an area unlikely to be support peatland habitats or carbon-rich soils. Class 3 peatlands are defined as areas without dominant peatland vegetation cover with some areas of deep peat. Class 1 peatlands are considered to be '*nationally important carbon-rich soils, deep peat and priority peatland habitat'*.

8.5.14 Phase I and phase II peat surveys were undertaken by MacArthur Green in July 2020, December 2024, January 2025 and March 2025 as described in Section 8.5, with results of the peat depth survey shown in Figure 8.5. Detailed peat depth surveys found extensive deposits of peat across the Site, which have, where possible, been avoided through design iterations. The peat depth probing found an

average depth across the site of 1.0 m, with 60.2% of probe depths <1.0 m, which is not classified as deep peat. The deepest probe reached a depth of 4.4 m in the north-east of the Site.

8.5.15 An outline assessment of peat condition was undertaken via aerial imagery and validated during peat and habitat surveys, showing the majority of the peatland on-site to be in a modified or drained condition, heavily impacted by current (commercial forestry plantation) and historical land practices (opencast coal mining).

8.5.16 Peat coring was undertaken at six locations across the Site, as outlined in **Technical Appendix 8.1** and shown in **Figure 8.1**.

8.5.17 Of the potential peat deposits that may be excavated as a result of the Proposed Development, all of it can be reused within the Site, or within land adjacent (North Kyle Energy Project) under the control of the applicant, as detailed in the Outline PMP in **Technical Appendix 8.2**. **Technical Appendix 8.3** details the PLHRA for the Site, with no areas found to be at medium or high likelihood of a peat landslide occurring deemed to be present on-site.

Borrow Pit Search Areas

8.5.18 There are three potential locations for borrow pits that have been identified and are indicated in **Figure 1.2**. SLR visited the borrow pit search areas in December 2024. The proposed borrow pit search areas have been predominantly selected due to their location, where mapping indicates bedrock is likely to occur close to surface. Other factors included environmental impacts, morphology, orientation and proximity to existing and proposed infrastructure. Limited superficial soils are expected at these locations. The borrow pit locations are located a minimum of 50 m from watercourses.

8.5.19 An approximate volume of excavated materials has been calculated for the proposed borrow pit locations, this volume is based on initial calculations and assumptions that would be verified by detailed intrusive investigation post-consent. Further information is provided within the outline Borrow Pit Appraisal (**Technical Appendix 8.4**).

Contaminated Land

8.5.20 According to BGS GeoIndex Onshore, there is no artificial or worked ground recorded on-site.

8.5.21 A review of the SEPA Waste Site and Capacity Tool was undertaken, and no landfill or waste sites are recorded on-site. Two landfill sites are recorded within the 10 km study area.

8.5.22 Garlaff Landfill operated by Barr Environmental Limited, (PPC/W/0020019) is located approx. 5.2 km north of the Site. The landfill is currently operational and licensed for non-hazardous waste. Old Toll Garage Landfill for inert waste is operated by John Wilison & Son (Coyton) Limited (WML/W/0000241) is located

approx. 4.7 km north-west of the Site. The landfill permit was issued in 1991 and its operation is not currently authorised by SEPA.

8.5.23 In accordance with the Scottish Pollutant Release Inventory (SPRI) by SEPA, all pollutant releases identified are located downslope of the Site. Pollutant releases in the surrounding area are largely to air from the mineral industry or waste and waste-water management.

Mining

8.5.24 A review of the Mining Remediation Authority (formerly Coal Authority) map shows that the Site is located within a Coal Mining Reporting Area, with the Site partly located within a Development High Risk Area. In their scoping response the Mining Remediation Authority (formerly Coal Authority) indicated that "there are two mine entries (adits) within the Site and areas of past surface mining activity" and that "building over the top of, or in close proximity to, mine entries should be avoided wherever possible." The results of this risk assessment have been reviewed to inform the design of the Proposed Development.

8.5.25 A Mining Stability Report Including Past Mining Risk Assessment prepared by JWH Ross is provided in **Technical Appendix 8.8**. Within the report the Site is divided into Area 1 to the south, and Area 2 to the north. Within Area 2 there are no mining plans of underground extraction found, and it is considered unlikely that unrecorded workings would have occurred, therefore Area 2 is considered to be of negligible mineral stability risk. Due to lack of underground workings Area 1 is also considered to be of negligible mineral stability risk, excepting an area in the south-east of the Site, south of Gibson's Hill and artificial surface waterbodies. Areas of opencast workings in Area 1 are considered to be geotechnical and therefore the nature or suitability of backfill materials has not been commented on. The area at higher risk within Area 1 in the south-west of Site is associated with two identified mine entries. The location of these adits have been obtained from Coal Authority Mine Entry Data Sheets.

Hydrogeology

8.5.26 The centre and south of the Site is underlain by Carboniferous to Permian intrusive igneous rocks of the Western Midland Valley Sills bedrock aquifer. The centre and north of the Site is underlain Scottish Coal Measures Group bedrock aquifer, as shown in **Figure 8.7**. The Scottish Environment Web Map defines the Carboniferous to Permian intrusive igneous rocks bedrock aquifer as low productivity Class 2C aquifers. The Scottish Coal Measures Group bedrock aquifer is classified as a moderately productive Class 2B aquifer. Groundwater flow within both aquifers is defined as having 'virtually all flow occurs through fractures and discontinuities'.

8.5.27 In accordance with BGS and SEPA Open Report (OR/15/028), intrusive igneous bedrock aquifers typically form low productivity aquifers with groundwater flow largely through fractures or sometimes where weathering increases intergranular

porosity and permeability. Groundwater flow paths largely follow local surface water catchments.

8.5.28 The Scottish Coal Measures, Carboniferous sedimentary aquifer is generally moderate productivity, however, mine voids can artificially increase local aquifer storage. Where the bedrock is not mined, groundwater flow occurs preferentially along natural layers present. Flow is largely through fractures with minor intergranular present.

8.5.29 The SEPA Water Classification Hub shows the bedrock aquifers on-site to be within the Cumnock groundwater body (ID 150646). The groundwater body is noted to have an overall status and water quality of 'Poor' in 2023. Its poor water quality is noted to be due to pollution from legacy mining and quarrying.

8.5.30 Groundwater in the entirety of Scotland is protected as a Drinking Water Protected Areas (DWPA) (Ground). The groundwater underlying the Site is also therefore a DWPA (Ground).

Hydrology

8.5.31 The Site is largely within the catchment of the Water of Coyle, with the Burnock Water catchment located in the north-east of the Site, as shown in **Figure 8.2**. These catchments are part of the wider surface water catchment of the River Ayr (ID: 10420) which lies to the north-west of the Site.

8.5.32 The Water of Coyle (ID: 10423) rises in the south-east of the Site, flowing north-east, before flowing north-west through the centre of the Site. Its tributary Shield Burn rises in the south of the Site flowing north to confluence with the Water of Coyle at BNG 247281, 612658. The Hawford Burn rises on the slopes of Kilmein Hill to the south of the Site, flowing north along the west Site boundary, before it confluences with the Water of Coyle to the west of the Site. The Drumbowie Burn rises in the north of the Site on the slopes of Green Hill and Stannery Knowe. The Drumbowie Burn flows north then west, where it confluences with the Water of Coyle at BNG 244970, 616139, 2.5 km north-west of the Site

8.5.33 The north-east of the Site is located within the Burnock Water catchment. The north-east of the Site is drained by unnamed tributaries of the Burnock Water (ID 10434) which is located approx. 1.9 km immediately north-east of the Site.

8.5.34 In accordance with the SEPA Classification Hub the Water of Coyle and Burnock Water are classified as having 'Poor' overall status.

8.5.35 A Watercourse Crossing Survey was carried out in December 2024, with the watercourse observations detailed in **Technical Appendix 8.5**. Of the 15 crossings identified, three are new crossings, while 12 are existing crossings.

Flooding

8.5.36 A review of the SEPA Flood Maps showed that there is a high likelihood of river flooding (10% annual probability of flooding) within the Site along the Water of Coyle. The extent of river flooding is largely confined to the watercourse channel

and is not widespread across the Site. There is a high likelihood of river flooding along the Drumbowie Burn and Burnock Water to the north-east of the Site. These watercourses are not located on-site.

8.5.37 SEPA Flood Maps show small, highly localised areas at high risk of surface water and small watercourses flooding on-site, however, these are largely found along the banks of surface watercourses and forestry drains. There is no risk of coastal flooding on-site.

Public Water Supply

8.5.38 Following a desk-based review it was found that there is one Drinking Water Protected Area (DWPA) located within the 10 km study area. Loch Finlas DWPA is located 9.9 km from the Site, and is hydrologically disconnected from the Site by River Doon and Loch Doon.

8.5.39 In their scoping response, Scottish Water indicated that "there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas (DWPA) under the Water Framework Directive, in the area that may be affected by the proposed activity".

Private Water Supply

8.5.40 A review of Scotland's Environment online map was undertaken to confirm the nature of CAR authorisations within 2 km of the Site. CAR authorisations regulate activities which may affect Scotland's water environment and are intended to control impacts on the water environment, including mitigating the effects on other water users.

8.5.41 A review of online data confirmed there are 17 CAR Authorised Sites (registration or simple) within 2 km. The CAR Authorised Sites identified were for activities which include primarily private sewage, and also sheep dip, bridging culvert and sewage treatment. No water abstraction licences were recorded within 2 km of the Site.

8.5.42 Consultation was undertaken with EAC Environmental Health Office (EHO) to identify all PWS registered within the 2 km PWS study area. A desk-based review of these sources was then undertaken, with consideration to potential hydrological and hydrogeological connectivity to the Site. Additional properties were scoped in from a review of AddressBase and OS maps where considered to be potentially supplied by PWS. From this, 17 properties potentially supplied by PWS were contacted for initial consultation, to confirm source type and location.

8.5.43 Following responses received, a Site visit to the PWS was undertaken to confirm source type, details and location with residents. From this, the location of four PWS sources were confirmed. Additionally, five properties were confirmed to be supplied by mains, and the supplies of four properties were unconfirmed.

8.5.44 A detailed assessment of these sources is included in **Technical Appendix 8.6**. The PWSRA includes each source location, potential source catchments, and

proximity to the Proposed Development to determine any potential effects and recommended additional mitigation measures where required.

8.5.45 Following the detailed assessment of these PWS, the source of PWS02 Ravenscroft Farm is considered to be potentially at risk from effects from the Proposed Development and is included in **Section 8.8**.

Designated Sites

8.5.46 Designated sites within the 10 km study area have been identified within **Table 8.6**.

Table 8.6 Designated Sites

Site	Distance to Proposed Development	Features	Connected to Proposed Development?
Benbeoch, SSSI	2.2 km south-east	Carboniferous - Permian Igneous (Unfavourable No change)	No, disconnected by topography and River Doon catchment, located upstream of Proposed Development within Burnock Water catchment
Dunaskin Glen, SSSI	2.4 km south	Palaeozoic Palaeobotany, Upper Carboniferous (Favourable Maintained).	No, disconnected by topography and located within River Doon catchment
Barlosh Moss, SSSI	3.6 km north	Hydromorphological mire range, Raised bog (Unfavourable Declining).	No, located upslope of Burnock Burn, disconnected by Drumbowie Burn.
Dalmellington Moss, SSSI	4.3 km south	Raised bog (Unfavourable Recovering)	No, disconnected by topography, located upstream within River Doon catchment
Bogton Loch, SSSI	5.0 km south	Breeding bird assemblage (Favourable Maintained), Open water transition fen (Unfavourable Recovering)	No, disconnected by topography, located upstream within River Doon catchment
Martnaham Loch and Wood, SSSI	7.6 km north-west	Mesotrophic loch (Unfavourable No change), Upland oak woodland (Unfavourable No change).	No, located in disconnected Purclewan Burn catchment.
Ness Glen, SSSI	8.0 km south	Atlantic woodland bryophyte assemblage (Condition Not Assessed), Upland mixed ash woodland (Unfavourable Declining)	No, located upstream within River Doon catchment
Loch Doon, SSSI	9.1 km south	Arctic charr (Unfavourable Declining)	No, located upstream within River Doon catchment
Stairhill, SSSI	9.8 km north	Palaeozoic Palaeobotany (Favourable Maintained)	No, located on River Ayr upstream of tributaries of connected sub-catchments.
Nith Bridge, SSSI	10.3 km east	Quaternary of Scotland (Favourable Maintained)	No, disconnected by catchment of Burnock Water.

8.5.47 There are four Geological Conservation Receptor (GCR) sites that have been identified within the study area, Nith Bridge, Stairhill, Benbeoch, and Dunaskin Glen.

As these geological receptors are not located within the Site, they will not be impacted by the Proposed Development and are therefore scoped out of further assessment.

8.5.48 There are nine designated sites identified within the study area none of which are hydrologically connected to the Proposed Development. As outlined within their Scoping Opinion response, NatureScot agreed that all designated site identified are hydrologically disconnected and can be scoped out of further assessment.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

8.5.49 A detailed NVC survey was completed, as outlined in **Chapter 6: Ecology** and reported in **Technical Appendix 6.1**. The survey methodology for this is outlined in **Chapter 6: Ecology**. From the NVC survey data, communities have been identified that have the potential to be groundwater dependent in accordance with SEPA Guidance Note, Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems.

8.5.50 The following potential GWDTE communities were identified as being potentially groundwater dependent, as shown in **Figure 8.10**:

- M4;
- M6;
- M23;
- M28
- MG9;
- MG10;
- U6;
- U16;
- W4; and
- W7.

8.5.51 A review of the baseline features including topography, underlying geology and surface water features, was undertaken to determine the groundwater dependency. This is outlined in the GWDTE Risk Assessment (Technical Appendix 8.7) where further assessment of GWDTEs was undertaken. All of the communities noted in Figure 8.10 were assessed as being not groundwater dependent.

8.5.52 Identified potential GWDTE areas were assessed to be not groundwater dependent based on characteristics that disconnect them from underlying groundwater or show the habitat to be likely dependent on surface water or ombrogenous. The underlying bedrock aquifers are largely noted for groundwater flow within secondary fractures and the near-surface weathered zone. Disconnection from groundwater in the underlying bedrock aquifers would occur from an impermeable superficial deposit, either till or peat. These have been identified from BGS GeoIndex mapping and results of peat probing to be present across the Site. Areas which are potentially fed by surface water have also been identified, these include areas around surface

watercourses, or downslope of ombrogenous habitats such as blanket bog and wet modified bog where high surface water runoff and collection is likely. Most potential GWDTEs were identified downslope of ombrogenous habitats, along watercourses or overlying impermeable peat. The habitats and local hydrology on-site have additionally been heavily modified by artificial drainage of plantation forestry and grazing.

Future Baseline

8.5.53 The future baseline characterisation of the Site under a 'do nothing' scenario would be impacted by different current activities occurring across the Site, including pastoral farming, plantation forestry and felling.

Surface Water

8.5.54 There is current potential impact to surface water quality from felling of plantation forestry within the catchment, resulting in soil erosion, releasing nutrients, acidification and affecting surface water quality. The future forestry baseline between 2025 and 2034 includes future felling and is discussed in Chapter 9.

Flooding

8.5.55 There is flooding risk identified on-site, present along watercourse channels, including Water of Coyle and its tributaries. Downstream of the Site flood risk is mapped along the Water of Coyle and Burnock Water. Future flooding will be affected by on-site artificial forestry drainage, decreasing lag times in overland flow within plantation forestry areas and existing trackside drainage. Existing watercourse crossings are present on-site, including across Shield Burn and Water of Coyle.

8.5.56 A review of SEPA Future Flood maps was undertaken, due to the increased likelihood of flooding with climate change. For medium risk of river flooding, predictions were based on 'By the 2080s, each year this area may have a 0.5% chance of flooding'. Low variability was noted for river flooding between current and future risk on-site.

8.5.57 For medium likelihood of surface water and small watercourses flooding, predictions were based on 'By the 2070s, each year this area may have a 0.5% chance of flooding'. Increased likelihood and higher variability was noted, with increased flooding extent and sensitivity to climate change.

Peat

8.5.58 The significant areas of deep peat on-site would continue to be impacted by forestry planting and felling within the Site. Felling requires excavation and disturbance of peaty areas. Additionally, the creation of brash and nutrient loading of surface water

run-off, in addition to artificial drainage for plantation forestry may impact surrounding peatland.

Private Water Supply

8.5.59 PWS which are potentially hydrologically connected to the Site may have impacts to their supply water quality and quantity as a result of felling and pastoral farming within their source catchments. The PWS would also continue to be affected by climate with prolonged dry weather leading to seasonal reductions in water quantity.

8.6 Scope of the Assessment

Spatial Scope

8.6.1 The assessment includes hydrological, hydrogeological, geological and peat receptors located within the Site boundary with the potential to be impacted by the Proposed Development. Additionally, hydrological and hydrogeological receptors have been assessed up to 10 km from the Site, excluding the existing track within North Kyle, within a wider study area. Assessment of PWS is undertaken within a 2 km study area, excluding the existing track within North Kyle. The existing track within North Kyle has not been assessed as there are no construction works required, and therefore no potential effects to hydrological, hydrogeological, geological and peat receptors.

8.6.2 These study areas are based on professional judgement and experience assessing similar developments, with due consideration of relevant guidance on hydrological and geological assessment. It is considered that in excess of these distances due to attenuation and dilution, the Proposed Development is unlikely to have an effect.

Temporal Scope

8.6.3 An assessment of any potential significant effects on hydrological, hydrogeological, geological and peat receptors is presented within **Section 8.8**. The assessment considers effects throughout the construction, operational and decommissioning phases of the Proposed Development.

Receptors Requiring Assessment

8.6.4 A summary of receptors being carried forward for assessment is outlined in **Table 8.7.** Receptors with a High or Medium sensitivity have been brought forward for assessment. Those with a Low sensitivity will not require further assessment following the application of the embedded mitigation.

Table 8.7: Receptors Scoped into Assessment

Receptor	Description	Sensitivity
Superficial Geology	Moderately permeable superficial deposits, allowing limited storage and transport of contaminants.	Medium
Peat	Sensitive land use including areas of Class 3, 4 and 5 peatland present. Isolated area of Class 1 peatland present.	High

Receptor	Description	Sensitivity
Groundwater	Underlying bedrock aquifers are noted as being low and moderately productive. The underlying groundwater body is noted to be of 'Poor' classification.	Medium
Surface Water	WFD watercourse Water of Coyle and Burnock Water with 'Poor' classification.	Medium
Private Water Supplies	PWS source located within 250 m of Site and within same surface water catchment.	High

8.6.5 The following receptors have been scoped out of further assessment:

- Potential GWDTEs, as on-site these are found to not be groundwater dependent.
- GCRs are not present on-site, therefore there will be no direct or indirect impacts to protected geological receptors.
- Likelihood of flooding is highly localised on-site and largely restricted to watercourse channels, with these areas avoided through implementation of watercourse buffers.
- Designated sites within 10 km study area are hydrologically disconnected from the Site, therefore there will be no direct or indirect impacts.
- Public water supplies, as Scottish Water confirmed no DWPAs or assets are located on-site.

Environmental Measures Embedded into the Development Proposals

8.6.6 Embedded mitigation proposals are those mitigation measures that are inherent to the Proposed Development. Embedded mitigation includes all mitigation usually assumed to be in place during construction, operation and decommissioning, and is generally regarded as industry standard or Best Practice. Construction and environmental management plans are introduced in **Chapter 2: Proposed Development**..

8.6.7 The following considerations have been taken into account in the iterative design of the Proposed Development, considered as embedded mitigation.

- Existing tracks are being used where possible and as far as practicable in order to reduce the footprint of the Proposed Development and to limit the number of new watercourse crossings as far as practicable.
- A 50 m buffer has been maintained around all surface watercourses and waterbodies identified in OS 1:10k mapping and a 20 m buffer maintained around artificial waterbodies, except where tracks are required to cross watercourses and where it was proved unavoidable through design iterations due to constraints. The buffer around the artificial waterbodies in the south-east of the Site is intruded by the existing access track, which connects to the south of the Site.
- The presence of extensive deep peat deposits across the Site has heavily constrained the Proposed Development. Following several design iterations, as far as practicable the Proposed Development infrastructure has mostly kept outwith areas of deep peat. The average peat depth is greater than 1.0 m (therefore defined as deep peat) at four turbine and permanent hardstand

locations (T14 (1.46 m), T15 (1.25 m), T16 (1.53 m) and T17 (1.19 m)), and the temporary hardstanding areas associated with five turbines (T12 (1.0 m), T14 (1.6 m), T15 (1.38 m), T16 (1.97 m) and T17 (1.48 m)). To note that the temporary hardstanding area will be for temporary laydown, to be reinstated after construction. This was unavoidable due to the extent of peat present and in consideration of other constraints such as: aviation, topography; sensitive habitat; and watercourse buffers (refer to **Chapter 3: Design Evolution and Alternatives** for more detail). Proposed new tracks are to be floated across areas of peat where topographical conditions allow. Existing access roads have been reused as far as practicable.

- As no areas of medium or high likelihood of peat landslide risk are present on-site, all Proposed Development infrastructure has been sited outwith areas of increased likelihood of peat landslide risk, as outlined within **Technical Appendix 8.3**.

8.6.8 In undertaking the assessment of potential effects from the Proposed Development, good practice measures to be implemented as part of the CEMP and other proposed management plans will be considered as embedded mitigation.

Pre-Construction

8.6.9 Prior to construction being undertaken, relevant detailed Site investigations would be conducted. This could include investigations of underlying deposits, in particular where Proposed Development infrastructure is sited, to inform detailed design and suitable micrositing of the turbines and associated infrastructure.

8.6.10 If there are assessed to be potential effects to surface watercourses or groundwater, baseline water quality monitoring will be undertaken as required. A Water Quality Monitoring (WQM) Plan will be prepared and agreed with EAC, in consultation with SEPA, prior to commencement of construction. It is anticipated that this will include a programme of pre-construction monitoring, over a period to be set out in the plan. The plan will take into consideration the historic mining on-site. Such a WQM Plan would form part of the CEMP.

Construction

8.6.11 Following review of best practice outlined in relevant guidance and legislation a CEMP will be compiled which will be based on the Schedule of Mitigation (see **Chapter 15**), as well as any environmental planning and licensing conditions, including a borrow pit management plan. The EPC Contractor will develop the detailed CEMP and will implement measures set out in the CEMP, to be agreed with relevant consultees. This would also include a construction method statement, which would account for best practice measures to prevent sedimentation pollution and erosion, including:

- All earthworks would be carried out in accordance with BSI Code of Practice for Earth Works BS6031:2009.
- Stockpiles will be placed at least 50 m from watercourses. The height and maximum slope angle will be in accordance with BSI guidance. Where there are stockpiles of peat, re-wetting will occur to prevent peat drying out. Sediment pollution mitigation measures, including drains will be implemented at the base of stockpiles.

- Sediment pollution mitigation measures will be emplaced across the Proposed Development, this may include: drainage; silt fencing; settlement lagoons; and check dams.
- Plant movements will be minimised through management measures. Measures to prevent sediment on public roads may include wheel washing or road sweeping at the site entrance.
- Any CAR licences required for site discharges or watercourse crossings will be applied to from SEPA prior to construction.
- A 'wet weather policy' will be in place where the Principal Contractor would reduce or suspend works during periods of significant rainfall at the site. The policy will include that site management checks local weather forecast daily, regularly checks and maintains pollution control system and suspends work during adverse conditions.
- Where topography dictates that working platforms are needed, these would be formed to ensure that surface water drains away from watercourses.
- To avoid unnecessary compaction and disturbance to soils, working areas and corridors would be established and demarcated, with construction operatives appropriately inducted and trained to avoid work outside the designated work areas.

8.6.12 Best practice measures to prevent chemical pollution include:

- Sufficient and continued dewatering at the turbine foundation excavation until the concrete is cured, to prevent leaching.
- Dewatering at the turbine will be minimised through careful management and reducing the time the excavation is open, including concrete pouring.
- A method statement to address the transport, transfer, handling and pouring of liquid concrete at foundations will be undertaken by the Principal Contractor.
- Cement, grout and unset concrete will not be allowed to enter the water environment. No operations involving concrete transfer will take place within 50 m of watercourses.
- There will be no washing out of vehicles used for concrete delivery or washing of vehicles within 50 m of watercourses.
- Fuel and chemicals will be stored in impermeable bunded containers at least 110% of the volume stored. All fuelling on-Site will occur in a designated location, at least 50 m from watercourses.
- Spill kits will be stored across the site and within all vehicles and plant. On-site toolbox talks with construction staff will include to report all on-site spills and the correct implementation of spill kits.
- All vehicles and plant will be checked regularly with regular maintenance undertaken as required.

8.6.13 Best practice measures to enable surface water drainage management include:

- A suitable surface water drainage strategy with detailed drainage design will be prepared and agreed prior to construction, but the following outline measures will be included.

- Identified watercourse crossings in **Technical Appendix 8.5** will be designed to convey flows of 0.5%AEP (1:200yr) plus climate change, to prevent exacerbating downstream flood risk.
- Trackside drainage ditches will be designed to ensure separation of clean water drainage from potentially contaminated drainage.
- Check dams will be employed to slow down the flow of water and decrease erosion within drainage ditches.
- Sumps and settlement lagoons will be used to treat and slow down the flow of water during periods of high rainfall. This will be employed at drainage outlets prior to reaching watercourses.
- Areas of excavation and earthworks will have drainage designed to drain to a sump to prevent pollution and increase surface water run-off.
- Hydrological connectivity between upslope and downslope will be maintained through cross-drainage and culverts.

8.7 Assessment of Potential Effects

Construction Effects

Impacts on Surface Water Quality

8.7.1 Surface water runoff containing silt and other sediments, particularly during and after rainfall events, has the potential to enter the watercourses and field drains on and adjacent to the Site. Silt and sediment-laden surface water runoff is predicted to arise from excavations, exposed ground, and any temporary stockpiles. This has the potential to temporarily impact on the water quality and hydrological and ecological function of the receiving watercourse at and downstream of the works in the absence of any mitigation. Additionally, if appropriate controls are not enacted, pollutants such as oils, fuel, legacy mine waste and cement may be mobilised through mechanical leaks or spillage and carried in surface drainage.

8.7.2 As noted previously, a minimum buffer of 50 m around all watercourses and a 20 m buffer around artificial waterbodies has been embedded as part of the design of the Proposed Development, excepting areas where watercourse crossings are required. In a few locations, due to the design being heavily constrained by slope, ecology constraints, and peat, infrastructure has been sited within watercourse buffers. The watercourse buffer is intruded by the access tracks to T14 and the south construction compound. In these areas, best practice mitigation measures for during construction will be set out within the CEMP and fully implemented to minimise the risk of pollution to surface watercourses.

8.7.3 Additionally, the 20 m buffer around artificial waterbodies associated with historic mining in the south-east of the Site has been intruded. This is to utilise an existing access track present, in line with embedded mitigation. Consultation was undertaken with SEPA regarding this and SEPA advised there to be no objection

with any works required undertaken in accordance with General Binding Rule (GBR) 10A.

8.7.4 Taking account of embedded and best practice mitigation, the magnitude of impact is low, on a medium sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of Minor Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts on Surface Water Flow

8.7.5 The access tracks and turbine hardstands could result in an increased rate of surface water run-off from the Site. This could potentially increase sedimentation and erosion in watercourses and risk of flooding downstream. It can also result in the diversion of surface water flows.

8.7.6 Runoff from permanent infrastructure will be controlled through suitable construction drainage provision, the outline principles of which are noted in **Section 8.7** and would be captured in the CEMP to be produced prior to the commencement of construction, with the detailed design to be developed and agreed with EAC and SEPA prior to construction. Hydrological connectivity and maintenance of existing drainage pathways will be undertaken through installation of trackside and cross drainage.

8.7.7 As outlined in the WCS (**Technical Appendix 8.5**), there are 15 watercourse crossings required across the Site (of which thirteen are existing crossings, and two are new), the outline solutions of which include culverts (bottomless arch or closed). Measures outlined within the WCS will prevent constricting and increase in flow. Prior to construction there will be further detailed design of the watercourse crossings. Where CAR authorisation is applicable, all necessary registration or licences would be sought prior to commencement of construction on-site.

8.7.8 The magnitude of impact is therefore considered to be low, on a medium sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of Minor Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts on Groundwater Quality

8.7.9 As previously outlined, the bedrock aquifers underlying the Proposed Development are within the Cumnock groundwater body, which is noted for its 'Poor' status, due to pollution from legacy mining and quarrying. Groundwater flow paths within the bedrock aquifers is noted to be primarily through fracture flow and the near-surface weathered zone, with increased yields in areas of historic mining.

8.7.10 The installation of the turbine foundations on-site has the potential to impact groundwater quality because of alkaline leachate from concrete foundations. The spatial impact of any alkaline leachate is likely to be limited to the localised area at the turbine foundation, with areas of historic mining and increased groundwater flow avoided. Other forms of chemical pollution that may occur across the Site include

spills of fuels and chemicals stored on-site at temporary construction compounds or from vehicle and plant spills.

8.7.11 Embedded mitigation measures will be included within the CEMP to secure sufficient and continued dewatering at the turbine foundation excavation until the concrete is cured, to prevent leaching. To prevent pollution to groundwater, the CEMP will detail mitigation which includes appropriate management measures for transfer of concrete and minimising the duration of concrete pouring. Other measures will include appropriate storage of fuels and chemicals, refuelling of plant and vehicles at designated locations and distributing spill kits throughout the Site and within all plant and vehicles.

8.7.12 The magnitude of impact is therefore considered to be negligible, on a medium sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of Negligible Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts on Groundwater Flow

8.7.13 The installation of turbine foundations and permanent access tracks can result in the diversion of groundwater flows within underlying geology by creating a barrier. If dewatering occurs at turbine foundations during construction, this could locally reduce groundwater quantity.

8.7.14 As outlined in **Section 8.6**, superficial deposits are present across much of the Proposed Development, which primarily consists of peat and till deposits. Peat and till are typically of lower permeability, while the underlying bedrock underlying most of the Site is described as having groundwater flow largely within the near-surface weathered zone and secondary fractures. Areas of higher flow and yields are associated with historic mining.

8.7.15 The spatial impacts of drawdown from dewatering will be a localised area at each turbine foundation. It is also considered to be a short-term impact with localised groundwater levels anticipated to restore relatively quickly following the cessation of dewatering activities due to relatively high and frequent average rainfall. Mitigation measures will be implemented as part of the CEMP to prevent impacts to groundwater, which will include completing excavation and dewatering as quickly as practicable. Any water from dewatering will be discharged to ground in the area surrounding the turbine foundation to promote recharge.

8.7.16 The magnitude of impact is considered to be negligible on a medium sensitivity receptor. Therefore, there is potential for a direct, temporary, short-term effect of Negligible Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Removal and Impacts on Peat

8.7.17 As discussed, there are extensive peat deposits present on-site. As outlined in embedded mitigation measures and in **Chapter 3: Design Evolution and Alternatives**, proposed turbines and infrastructure have been sited to minimise the

excavation of peat as far as practicable, taking account of other constraints, including, watercourse buffers, slope and ecological constraints.

8.7.18 Approximately 240,262 m3 of peat and peaty soils are proposed to be excavated as part of the Proposed Development. All peat can be appropriately reused on-site, or within restoration of land under the control of the applicant, in the adjacent North Kyle Energy Project, with no surplus materials (waste) generated. Further information is included within the outline PMP (**Technical Appendix 8.2**) and Biodiversity Enhancement Management Plan (**Technical Appendix 6.6**).

8.7.19 Good practice mitigation measures outlined in this EIA Report will be implemented by the Principal Contractor, to reduce the potential effects on peat during construction. Residual peat storage measures, to prevent drying out of peat in stockpiles and enable the peat to be successfully restored, where practicable, will be included in the CEMP prior to the commencement of construction.

8.7.20 The presence of turbine foundations, hardstands and other infrastructure elements have the potential to interrupt groundwater flow by acting as barriers to flow, leading to drying out of surrounding peat deposits. There may be impacts to peat immediately surrounding areas excavated during construction for hardstand and foundations, however, as it is considered that these are likely to be localised to the immediate areas around excavations, they are unlikely to produce long-term effects and water levels are likely to rebound quickly following construction.

8.7.21 The magnitude of impact is considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, long-term effect of Minor Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Peat Landslide Impact on Watercourses

8.7.22 Construction on peat soils can result in destabilisation of peat deposits on slopes and lead to slope failure. This can result in peat and debris reaching watercourses, potentially resulting in sedimentation and changes to flow and fluvial geomorphology. Peat landslides can also pose a threat to life in certain circumstances.

8.7.23 A detailed assessment of peat landslide risk has been undertaken as presented in **Technical Appendix 8.3**. This has identified the risk of peat landslides at the proposed turbines, hardstand and other infrastructure, to downslope receptors. Mitigation measures proposed include avoiding construction in areas of increased likelihood, embedded measures including best practice construction methods. During construction a geotechnical risk register would be implemented by the geotechnical engineer to monitor any areas identified as a risk.

8.7.24 Based on the findings of **Technical Appendix 8.3** the potential magnitude of impact from peat landslides is assessed to be negligible on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures,

there is potential for an indirect, temporary, short-term effect of Minor Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Compaction of Soils

8.7.25 As part of the Proposed Development there will be a requirement for construction of permanent access tracks and hardstand. During construction there will also be movement of vehicles and plant. There is therefore potential for this to result in soil compaction, leading to reduced permeability, increasing the potential for surface water runoff. Reduced permeability could also reduce the flood storage capacity within the Site and could potentially lead to localised flooding incidents.

8.7.26 As discussed previously, superficial deposits that are present across the Site are lower permeability. There is unlikely to be a significant change in flood storage capacity between low permeability till and peat superficial deposits to low permeability hardstand. In addition, the area of hardstand of the Proposed Development has been minimised as far as practicable, as part of the embedded design measures.

8.7.27 The magnitude of impact is considered to be negligible, on a medium sensitivity receptor. Therefore, there is potential for a direct, temporary, short-term effect of Negligible Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts to PWS

8.7.28 Construction of the Proposed Development has the potential to affect the quality and quantity of PWS02, where the source is identified within 250 m of the Site and within the same surface water catchment as Proposed Development infrastructure. As outlined within the PWSRA (**Technical Appendix 8.6**), PWS02 was scoped into further detailed assessment.

8.7.29 As shown in **Figure 8.9**, PWS02 spring is located outwith SEPA groundwater abstraction 10 m, 100 m and 250 m infrastructure buffers. Due to potential influence from near-surface groundwater, the surrounding catchments were also assessed. The PWS source is located downslope of Auchingee Hill, where Proposed Development infrastructure is situated. An assessment of the PWS source catchment has been undertaking using GIS modelling and professional judgement, with the area shown in **Technical Appendix 8.6 Drawing 5**. There is no Proposed Development infrastructure located within the source catchment of PWS02.

8.7.30 The magnitude of impact prior to any additional mitigation and monitoring of PWS02 is considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for

a direct, temporary, short-term effect of Minor Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Operational Effects

Impacts on Surface Water Flow

8.7.31 The access tracks and turbine hardstand could result in an increased rate of surface water runoff from the Site. This could potentially increase sedimentation and erosion in watercourses and risk of flooding downstream. Permanent hardstand can also alter natural drainage pathways.

8.7.32 The reinstatement of temporary construction areas will reduce exposed ground and hardstand areas during the operational phase as compared to the construction phase. Measures to manage drainage of surface water will be implemented during the construction phase and continue during the operational phase.

8.7.33 The magnitude of impact is considered to be negligible, on a medium sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, long-term effect of Negligible Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts on Fluvial Geomorphology

8.7.34 The Watercourse Crossing Schedule (**Technical Appendix 8.5**) details the 15 watercourse crossings required and suggested crossing types to ensure maintenance of suitable flow and therefore heterogeneity. These crossings should be maintained and kept free of debris from watercourses. Any damage to watercourse crossings during operation should be repaired or replaced as required.

8.7.35 The magnitude of impact on a medium sensitivity receptor is assessed to be negligible. This is considered to be an indirect, long-term effect of Negligible Adverse significance, this is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts on Groundwater Flow and Drying Out of Peat

8.7.36 As outlined previously, hardstand and infrastructure can interrupt existing groundwater flow paths, which can result in drying out of peat downslope. As water levels will likely return to baseline during the operational phase, there is considered to be a limited long-term effect.

8.7.37 Forest-to- bog restoration as part of the Biodiversity Enhancement Management Plan will rewet and revegetate large areas increasing water residence times over the medium to long term, improving peatland resilience to water stress.

8.7.38 As outlined in **Technical Appendix 8.5**, watercourse crossings will be used to maintain hydrological connectivity across the Site. The detailed drainage design will

include measures designed to maintain groundwater connectivity, which will also include regular cross-drainage.

8.7.39 Taking account of embedded mitigation measures, the magnitude of impact is assessed as negligible, on high sensitivity receptors. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for an indirect, temporary, long-term effect of Minor Adverse significance, which is considered to be *Not Significant* in terms of the EIA Regulations.

Impacts on Surface Water and Groundwater Quality from Chemical Pollution and Sedimentation

8.7.40 As outlined during the construction phase, surface water and groundwater quality can be impacted by polluted run-off from the Site. Following the construction phase, there will be less disturbance to sediments during the operational phase. Many of the activities that may have resulted in chemical pollution including refuelling and cement pouring, will not occur during the operational phase.

8.7.41 Activities which may result in chemical pollution during the operational phase would be from fuel spills from on-site vehicles. Best practice measures to mitigate potential chemical pollution including spill kits to be present within each vehicle will continue within the operational phase. Additional best practice measures, to be outlined within an Operational Environmental Management Plan (OEMP), will be implemented to prevent impacts to surface water and groundwater quality from the Proposed Development. A Pollution Prevention Plan (PPP) will also outline mitigation including inspection and maintenance of vehicles, rapid response actions in the event of a spill, and person responsible for implementation.

8.7.42 Battery storage facilities are planned as part of the Proposed Development. In the event of a battery fire at the site, polluted waters can be produced where water is introduced to the system to cool the batteries. This will therefore only become a risk during the operational phase when the battery storage is connected. Mitigation measures to prevent the release of polluted waters to the hydrological receptors will be included within the CEMP. These will include an emergency plan in the event of a fire, consultation with local fire services and appropriate treatment and disposal of the polluted waters.

8.7.43 Impact on surface water and groundwater quality is assessed to be of low magnitude of impact on medium sensitivity receptors. This is assessed to be a direct, temporary, short-term effect of Minor Adverse significance, in the absence of additional mitigation and enhancement measures, and considered to be *Not Significant* in terms of the EIA Regulations.

Decommissioning Effects

8.7.44 The potential effects of the decommissioning phase will be similar to those during construction. Due to reduced site activity, impacts are predicted to be of the same

or lesser magnitude, with resultant effects being the same or lesser significance to construction phase effects.

8.7.45 A Decommissioning Environmental Management Plan (DEMP) will be approved prior to decommissioning and secured by condition.

8.8 Mitigation

8.8.1 As noted above, no significant potential construction, operational or decommissioning phase environmental effects were identified, taking account of embedded design and best practice mitigation. All effects are considered to be of Minor or Negligible significance and are considered to be *Not Significant* in terms of the EIA Regulations.

8.9 Assessment of Residual Effects

Construction

8.9.1 As noted above, no significant potential construction phase environmental effects were identified, taking account of embedded design and best practice mitigation, including implementation of a WQMP.

Operation

8.9.2 As noted above, no significant potential operational-phase environmental effects were identified, taking account of embedded and good practice mitigation.

Decommissioning

8.9.3 The residual effects of the decommissioning phase will be similar to construction, however, due to reduced Site activity, these will be of lesser magnitude. Embedded mitigation will be implemented in accordance with an approved Decommissioning Environmental Management Plan (DEMP).

8.10 Assessment of Cumulative Effects

8.10.1 Cumulative developments have been considered where they are located within the study area of 10 km from the Site, excluding the North Kyle existing access track. These developments are listed below in **Table 8.8**.

8.10.2 Operational developments are scoped out of consideration from cumulative effects. This is due to impacts to receptors being of greatest magnitude during the construction phase. Operational developments within 10 km include:

- Dersalloch Wind Farm; and
- South Kyle Wind Farm.

Table 8.8: Cumulative Development Considered in the Assessment

Development	Phase	Distance from Proposed Development Infrastructure (approx. km)	Surface Water Catchment
North Kyle Energy Project	Under Construction	0.2	Water of Coyle, Burnock Water
Knockkippen Wind Farm	Determination	1.5	River Doon
Overhill Wind Farm	Consented	2.1	Burnock Water, River Nith
Knockshinnoch Wind Farm	Consented	3.3	Water of Coyle
Greenburn Wind Farm	Under Construction	5.5	River Nith, Glaisnock Water
Sclenteuch Wind Farm	Application	6.1	River Doon, Dyrock Burn, Water of Girvan
Enoch Hill Wind Farm	Under Construction	7.8	Lane Burn, River Nith, Pochriegavin Burn
Benbrack Wind Farm	Under Construction	10.5	Water of Deugh

8.10.3 Developments that are located within the same catchments as the Proposed Development with potential cumulative effects to hydrologically connected receptors include:

- North Kyle Energy Project;
- Overhill Wind Farm; and
- Knockshinnoch Wind Farm.

8.10.4 These developments required EIAs, which include assessment of potential impacts to hydrology, hydrogeology, geology and peat receptors. The EIAs for these projects required implementation of mitigation measures to ensure protection of identified receptors. Knockshinnoch Wind Farm outlined that best practice would be included within a Pollution Prevention Plan and construction method statements, with a CEMP submitted as part of discharge of conditions. North Kyle Energy Project identified no cumulative construction or operational effects, and the application included an outline CEMP. As part of discharge of conditions, Overhill Wind Farm is required to submit a CEMP, which includes a WQMP, and a Pollution Prevention and Incident Plan.

8.10.5 North Kyle Energy Project is currently under construction therefore the construction phase of the Proposed Development is unlikely to overlap, which is where potential of cumulative effects is at highest risk. Additionally, Overhill Wind Farm and Knockshinnoch Wind Farm are currently approved. These developments will likely

be constructed at different times to the Proposed Development and the construction phases would be unlikely to overlap.

8.10.6 It is considered that the cumulative effects on surface water and groundwater receptors will be no greater than Minor and therefore *Not Significant* in terms of the EIA Regulations.

8.11 Summary

8.11.1 Significant design iteration and inclusion of embedded design and best practice mitigation measures has resulted in few potentially significant effects on geology, hydrology, hydrogeology and peat receptors identified.

8.11.2 The assessment identified potential construction and operational effects including changes to surface water and groundwater flow and quality, impacts to hydrologically connected receptors including PWS, and impacts from excavation and removal of peat.

8.11.3 A PWS source was scoped into further assessment due to it being located within 250 m of the Site. Following further assessment, and implementation of embedded design and best practice measures, there is considered to be negligible potential risk from the Proposed Development.

8.11.4 A PLHRA has identified that the Proposed Development infrastructure is located in areas of negligible or low likelihood of a peat slide occurring, as outlined in **Technical Appendix 8.3**.

8.11.5 The mitigation measures set out in this chapter will be included within a detailed CEMP prior to commencement of construction activities, based on the measures set out in **Chapter 15: Schedule of Mitigation**. These mitigation measures are considered to be robust and implementable and will reduce the potential impacts on hydrological, hydrogeological and geological receptors. A programme of water quality monitoring would also be implemented.

8.11.6 The significance of residual effects on geology, peat, hydrology and hydrogeology receptors following the implementation of these mitigation measures are considered to range from Minor Adverse (*Not Significant*) to Negligible Adverse (*Not Significant*). Potential effects, mitigation measures and residual effects are summarised in **Table 8.9**.

Table 8.9: Summary

Description of Effect	Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
	Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
During Construction & Decommissioning					
Impacts on Surface Water Quality	Minor	Adverse	Embedded mitigation, including minimum buffers from watercourses. Use of existing infrastructure as far as practicable. Minimising requirement for watercourse crossings. Implementation of mitigation measures outlined in CEMP. Includes embedded best practice measures. Will be implemented by Principal Contractor. Best practice will be verified by onsite EnvCoW. Drainage strategy to be implemented. Detailed final design of watercourse crossings to be implemented. Dewatering undertaken for as short a time as practicable. Siting infrastructure to minimise peat	Minor	Adverse
Impacts on Surface Water Flow	Minor	Adverse		Minor	Adverse
Impacts to Groundwater Quality	Negligible	Adverse		Minor	Adverse
Impacts to Groundwater Flow	Negligible	Adverse		Minor	Adverse
Removal and Impact on Peat	Minor	Adverse		Minor	Adverse
Peat Landslide Impact on Watercourses	Minor	Adverse		Minor	Adverse
Compaction of Soils	Negligible	Adverse		Minor	Adverse
Impacts to PWS (PWS02)	Minor	Adverse		Minor	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
	Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
			excavation requirements. Management and storage of peat in line with the PMP. Application of additional peat excavation/re-use protocol and hierarchy to minimise temporary storage time. Pre-construction ground investigation works. WQMP to be agreed and implemented..		
During Operation					
Impacts on Surface Water Flow	Negligible	Adverse	Embedded design and best practice mitigation. Implement best practice and correct storage of fuels and management plans in the event of spills. Best practice to be outlined within OEMP and implemented by operation and maintenance contractor. Implementation of a Drainage Strategy, to include trackside and cross-drainage. Regulation of watercourse crossings	Negligible	Adverse
Impacts on Fluvial Geomorphology	Negligible	Adverse		Negligible	Adverse
Impacts to Groundwater Flow and Drying out of Peat	Minor	Adverse		Minor	Adverse
Impacts on Surface Water and Groundwater Quality from Chemical Pollution and Sedimentation	Minor	Adverse		Minor	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
	Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
			by CAR, to include maintenance and removing any blockages. WQMP to be agreed and implemented.		
Cumulative Effects					
Impacts to Surface Water Quality and Flow	Minor	Adverse	Embedded design and best practice mitigation. Implementation of mitigation measures as outlined in CEMPs.	Minor	Adverse
Impacts to Groundwater Quality and Flow	Minor	Adverse		Minor	Adverse

8.12 References

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