Preliminary Environmental Information Report

Calderdale Energy Park

7 April 2026

Volume 2, Chapter 10 : Hydrology, Hydrogeology, Geology and Peat
PINS Reference: EN0110023
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Reg 5 (2) (a).

Calderdale energy park

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10 Hydrology, Hydrogeology, Geology and Peat

10.1 Introduction

10.1.1 This Chapter of the Preliminary Environmental Information Report (PEIR) has been prepared on behalf of the Applicant by Fluid Environmental Consulting and Logika Group and presents a preliminary assessment of the likely significant environmental effects of the Proposed Development in relation to Hydrology, Hydrogeology, Geology and Peat. It is based on the environmental information available to date (which is detailed in this Chapter), as well as the current description of the Proposed Development as set out in **Chapter 4: The Proposed Development**.

10.1.2 This Chapter concludes that there are likely to be a mixture of significant and not significant effects from the Proposed Development on Hydrology, Hydrogeology, Geology and Peat during the construction, operation and maintenance and decommissioning phases. Further detailed assessment will be undertaken for the Environmental Statement (ES).

10.1.3 This Chapter should be read in conjunction with:

- **Chapter 8: Biodiversity**;
- **Chapter 22: Materials and Waste**; and
- **Chapter 23: Other Environmental Matters**.

10.1.4 This Chapter is supported by the following appendices:

- **Appendix 10-1: Good Practice Methods**;
- **Appendix 10-2: Peat Survey Report**;
- **Appendix 10-3: Outline Peat Management Plan (oPMP)**;
- **Appendix 10-4: Preliminary Peat Landslide Hazard Risk Assessment (PPLHRA)**;
- **Appendix 10-5: Watercourse Crossing Inventory**;
- **Appendix 10-6: Groundwater Dependent Terrestrial Ecosystem (GWDTE) Assessment**;
- **Appendix 10-7: Public Water Supply Assessment**;
- **Appendix 10-8: Private Water Supply Assessment**; and

- **Appendix 10-9: Preliminary Flood Risk Assessment**.

10.1.5 Supporting Figures can be found at:

- **Figure 10-1: Study Area**;
- **Figure 10-2: Hydrological Setting**;
- **Figure 10-3: Water Framework Directive (WFD) Catchments**;
- **Figure 10-4: Designated Sites**;
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- **Figure 10-18: Risk of Flooding from Surface Water Climate Change Extents**.

10.2 Legislation, Policy and Guidance

10.2.1 Key policy, legislation and guidance relating to Hydrology, Hydrogeology, Geology and Peat and of relevance to this preliminary assessment comprises the following, as shown in **Table 10-1**.

Table 10-1: Legislation, Policy and Guidance for Hydrology, Hydrogeology, Geology and Peat

Type	Name	Relevance to Assessment
Legislation	The European Water Framework Directive (WFD) (2000/60/EC)[1]	Provides overarching legislation for the protection of the water environment.
	The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[2]	Regulations derived from overarching WFD legislation related to the water environment in England and Wales.
	Flood Directive (2007)[3]; Flood Risk Regulations 2009 (SI 2009/3042)	Aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. It sets the strategic level for flood risk that any development will need to comply with.
	Environmental Protection Act (1990)[4]	Provides overarching legislation for the protection of the environment, including the water environment receptors identified in this Chapter.
	Water Resources Act (1991) (as amended)[5]	Provides overarching legislation for the protection of water resources, including private and public water supplies, as considered in this Chapter.
	Land Drainage Act (1991)[6]	This Act requires that landowners maintain the flow of water within watercourses.

[1] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Available at: https://eur-lex.europa.eu/eli/dir/2000/60/oj/eng.
[2] The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 No. 407. Available at: https://www.legislation.gov.uk/uksi/2017/407/contents.
[3] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Text with EEA relevance). Available at: https://eur-lex.europa.eu/eli/dir/2007/60/oj/eng.
[4] Environmental Protection Act 1990 c. 43. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents.
[5] Water Resources Act 1991 (as amended). Available at: https://www.legislation.gov.uk/uksi/2009/3104/contents.
[6] Land Drainage Act 1991 c. 59. Available at: https://www.legislation.gov.uk/ukpga/1991/59/contents.

Type	Name	Relevance to Assessment
	Environment Act (1995)[7]; Environment Act 2021	This follows the Environmental Protection Act (1990) and provides overarching legislation for the protection of the environment, including identified receptors considered within this Chapter.
	Water Act (2014)[8]	Legislation relevant to public and private water supplies and water supply licencing requirements.
	The Groundwater (England and Wales) Regulations (2009)[9]	Regulations that aim to protect groundwater from pollution and deterioration and are applicable to groundwater receptors identified as sensitive to the Proposed Development.
	Private Water Supplies (England) Regulations 2016[10]; Private Water Supplies (England) (Amendment) Regulations 2018[11]	Regulations applicable to private water supplies, which are identified as sensitive receptors for the Proposed Development.
	The Waste (England and Wales) (Amendment) Regulations 2012[12]	These regulations clarify waste classification, defining what constitutes household, industrial, and commercial waste, duty of care for waste producers and waste transfer and EU compliance.
	The Environmental Permitting (England and Wales)	Framework for environmental permitting to protect human health and the environment (including water environment) from potential harm caused by Proposed Development activities.

[7] Environment Act 1995 c. 25. Available at: https://www.legislation.gov.uk/ukpga/1995/25/contents.
[8] Water Act 2014 c. 21. Available at: https://www.legislation.gov.uk/ukpga/2014/21/contents
[9] The Groundwater (England and Wales) Regulations 2009 No. 2902. Available at: https://www.legislation.gov.uk/uksi/2009/2902/contents/made.
[10] Private Water Supplies (England) Regulations 2016. Available at: https://www.legislation.gov.uk/uksi/2016/618/contents./
[11] The Private Water Supplies (England) (Amendment) Regulations 2018 No. 707. Available at: https://www.legislation.gov.uk/uksi/2018/707/contents/made.
[12] The Waste (England and Wales) (Amendment) Regulations 2012 No. 1889. Available at: https://www.legislation.gov.uk/uksi/2012/1889.

Type	Name	Relevance to Assessment
	Regulations 2016[13]	
	Water Act 2003[14]	The Act introduced a comprehensive abstraction licensing system to ensure efficient use of water resources, enhancing environmental protection. The Act facilitates the sustainable use of water by promoting water conservation, improving water company guidelines and enabling water resource management plans.
	Flood and Water Management Act 2010[15]	This Act was designed to improve flood risk management and ensure water resources are managed effectively.
National planning policy	National Policy Statement (NPS) EN-1 (2025)[16]	Government policy relevant to flood risk and impact on water quality and resources from the Proposed Development. Specific reference to Part 5, Section 5.8, which relates to Flood Risk, and Section 5.16, which relates to Water Quality and Resources.
	NPS EN-3 (2025)[17]	Overarching government policy and guidance relevant to the Proposed Development. Specific reference to paragraphs 2.12.59 to 2.12.67, and 2.12.75 to 2.12.80.
	NPS EN-5 (2025)[18]	Specific reference to Section 2.3, Climate change adaptation and resilience.

[13] The Environmental Permitting (England and Wales) Regulations 2016 No. 1154. Available at: https://www.legislation.gov.uk/uksi/2016/1154/contents.
[14] Water Act 2003 c. 37. Available at: https://www.legislation.gov.uk/ukpga/2003/37/contents.
[15] Flood and Water Management Act 2010 c. 29. Available at: https://www.legislation.gov.uk/ukpga/2010/29/contents.
[16] Department for Energy Security & Net Zero (DESNZ) (2025) Overarching National Policy Statement for energy (EN-1). Updated January 2026. Available at: https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1-2025/overarching-national-policy-statement-for-energy-en-1-2025-accessible-webpage.
[17] Department for Energy Security & Net Zero (DESNZ) (2025) National Policy Statement for renewable energy infrastructure (EN-3). Updated January 2026. Available at: https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3.
[18] Department for Energy Security & Net Zero (DESNZ) (2025) National Policy Statement for electricity networks infrastructure (EN-5). Updated January 2026. Available at: https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5.

Type	Name	Relevance to Assessment
	National Planning Policy Framework (NPPF)[19]	Section 14 of the NPPF sets out planning policies in relation to climate change, flooding, and coastal change.
	NPPF Consultation Draft[20]	The consultation draft of the NPPF contains Section 18. Managing flood risk and coastal change. This includes specific policies related to flood risk, including F4: Assessing flood risk for decision-making, F6: Development in areas at risk of flooding from rivers or the sea, F7: Ensuring development is safe from flooding and F8: Sustainable drainage systems and watercourses. In addition, Policy N2: Improving the Natural Environment under Section. 19 Conserving and enhancing the natural environment is relevant.
Local planning policy	Calderdale Council Local Plan 2018/19 – 2032/33 (adopted March 2023) [21]	Specific relevant policies include: CC1 (Climate Change), CC2 (Flood Risk Management), CC3 (Water Resource Management), CC4 (Catchment Management), GN3 (Natural Environment) and GN4 (Landscape Character).
	Pendle Local Plan (4th edition)[22]	Specific relevant policies include DM02(a) Flood risk, DM02(b): Surface Water and Foul Water and Management and DM15: Soils, Materials and Waste.
	Bradford Council Core Strategy Development	Specific relevant policies include EN1: Biodiversity and Geodiversity, EN6: Energy, EN7: Flood Risk, EN8: Environmental Protection Policy, EN9, EN11 and EN12: Minerals.

[19] Ministry of Housing, Communities and Local Government, Ministry of Housing, Communities & Local Government and Department for Levelling Up, Housing and Communities (2025) National Planning Policy Framework. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2.

[20] Ministry of Housing, Communities and Local Government (2025) National Planning Policy Framework: Plan-making and national decision-making policies. Available at: https://assets.publishing.service.gov.uk/media/697b71c52ff8d10a830d5d4a/Draft_NPPF_December_2025.pdf.

[21] Calderdale Council (2023) Local Plan 2018/19 – 2032/33. Available at: https://new.calderdale.gov.uk/planning-and-building-control/planning-policy/local-plan.

[22] Pendle Council (2025) Local Plan (4th edition). Available at: https://www.pendle.gov.uk/info/20072/planning_policies/600/local_plan_fourth_edition.

Type	Name	Relevance to Assessment
	Plan Document 2017-2030[23]	
National guidance	Planning Practice Guidance (PPG)[24]	The NPPF is accompanied by the PPG. The Flood Risk and Coastal Change PPG sets out how to account for and address risks associated with flooding and coastal change. It provides commentary on the sequential test, site-specific requirements for Flood Risk Assessment (FRAs), the role of the EA and local authorities in assessing planning applications, addressing residual risk, and sustainable drainage.
	Guidance for Pollution Prevention (GPP)[25]	These are the principal documents providing guidance on preventing contamination of surface water from construction activities. Note these are guidelines on good practice and are not legislation for England. GPP relevant to the Proposed Development comprise: • GPP1: Understanding your Environmental Responsibilities - Good Environmental Practices; • GPP2: Above Ground Oil Storage Tanks; • GPP4: Treatment and Disposal of Sewage Where No Foul Sewer Is Available; • GPP5: Works and Maintenance in or Near Water; • GPP6: Working at Construction and Demolition Sites; • GPP8: Safe Storage and Disposal of Used Oils; • GPP21: Pollution Incidence Response Planning; and • GPP26: Storage and Handling of Drums and Intermediate Bulk Containers. Local Guidance.
	Department for Environment, Food and Rural Affairs (DEFRA) National Standards for	The current national standards for the design, maintenance, and operation of SuDS in England. The standards are intended for application in the design of surface water drainage systems for new infrastructure and development (for both greenfield and brownfield sites) and are underpinned by 11 principles.

[23] Bradford Council (2017) Core Strategy Development Plan Document 2017-2030. Available at: https://www.bradford.gov.uk/planning-and-building-control/planning-policy/core-strategy-dpd/.
[24] Ministry of Housing, Communities and Local Government, Ministry of Housing, Communities & Local Government (2018 to 2021) and Department for Levelling Up, Housing and Communities (2025) Planning Practice Guidance - Flood Risk and Coastal Change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change.
[25] Guidance for Pollution Prevention (GPP). Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/.

Type	Name	Relevance to Assessment
	Sustainable Drainage Systems[26]	
	Construction Industry Research and Information Association (CIRIA) Report C753 The SuDS Manual[27]	Sets out key guidance for local authorities and developers to assist with the implementation of SuDS within new and existing infrastructure projects. This further covers the cycle of SuDS from design to maintenance. Overarching supporting information also looks at the effectiveness of SuDS to maximise benefits.
	Institute of Environmental Assessment and Management (IEMA) (now ISEP) 'A New Perspective on Land and Soil in Environmental Impact Assessment'[28]	The guidance sets out a framework for the assessment of impacts related to land and soil receptors, which is considered to be relevant to the receptors considered in this Chapter.
	Design Manual for Roads and Bridges (DMRB) LA 113 Road drainage and water environment[29]	Outlines a methodology for assessment, including criteria for sensitivity of receptors and magnitude of potential impact (which have informed those set out in this Chapter).
	Peatland Survey: Guidance on Developments on Peatland (Scottish Government,	This guidance defines a consistent sampling methodology to quantify and qualify the peat material on site and advice on how to publish peat surveys as part of wider site investigations for development management applications, with a particular focus on win farm developments.

[26] DEFRA (2025) National Standards for Sustainable Drainage Systems. Available at: https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds.
[27] Construction Industry Research and Information Association (CIRIA) (2015) The SuDS Manual (C753).
[28] IEMA (now ISEP) (2022) A New Perspective on Land and Soil in Environmental Impact Assessment.
[29] National Highways (formerly Highways England) (2020) Design Manual for Roads and Bridges (DMRB) LA 113 Road drainage and water environment.

Type	Name	Relevance to Assessment
	Scottish Natural Heritage, Scottish Environment Protection Agency (SEPA), 2017)[30]	
	Good Practice During Windfarm Construction (Scottish Renewables, Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA) & Forestry Commission Scotland, July 2024)[31]	This guidance shares the experience from the construction of wind farms across Scotland amongst the industry, planning authorities, key agencies and those more broadly involved in the planning and development of wind farms.
	Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, April 2017)[32]	Provides guidance on best practice methods to identify, mitigate and manage peat slide hazards and associated risks.
	Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and	This guidance provides a framework for assessing development impacts on groundwater abstractions and GWDTEs.

[30] Scottish Government, Scottish Natural Heritage, SEPA (2017). Peatland Survey: Guidance on Developments on Peatland.
[31] Scottish Environment Protection Agency (SEPA) & Forestry Commission Scotland (2024) Good Practice During Windfarm Construction.
[32] Scottish Government (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments.

Type	Name	Relevance to Assessment
	Groundwater Dependent Terrestrial Ecosystems, Land Use Planning System SEPA Guidance Note 31 (SEPA, 2017)[33]	
	Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems (SEPA 2024)[34]	This guidance sets out the Scottish regulator's expectations for the assessment of impact of developments on GWDTEs.
	Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables & SEPA, 2012)[35]	Provides guidance on the assessment of peat volumes, reuse of excavated peat, and minimisation of waste.
Local guidance	Calder Catchment Strategic Flood Risk Assessment (SFRA) Level 1 – Volumes I and II (2016)[36]	Provides flood risk information relevant to the PEIR Boundary.

[33] SEPA (2017) Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Land Use Planning System SEPA Guidance Note 31.
[34] SEPA (2024) Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems.
[35] Scottish Renewables and SEPA (2012) Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste.
[36] JBA consulting (2016) Calder Catchment Strategic Flood Risk Assessment (SFRA) Level 1 – Volumes I and II . Available at: https://www.wakefield.gov.uk/media/jihjqi0z/calder-catchment-strategic-flood-risk-assessment-sfra-volume-i.pdf and

Type	Name	Relevance to Assessment
	West Yorkshire Combined Authority Sustainable Drainage Systems Guidance[37]	Provides guidance on Sustainable Drainage Systems within developments.
	Calderdale Council Adopted Flood Risk and Drainage Supplementary Planning Document (2024)[38]	Sets out requirements in respect to flood risk and drainage within Calderdale.
	Calderdale Council Local Flood Risk Management Strategy (LFRMS) (2016)[39]	Sets out local flood risk management measures.
	Calderdale Council Ordinary Watercourse and Land Drainage Consent (2025)[40]	Provides guidance on obtaining consents for Ordinary Watercourses and land drainage.
	Pendle SFRA (2021)[41]	Provides flood risk information relevant to the PEIR Boundary.

https://www.wakefield.gov.uk/media/ojxevwiz/calder-catchment-strategic-flood-risk-assessment-sfra-volume-ii-wakefield.pdf.

[37] West Yorkshire Combined Authority Sustainable Drainage Systems Guidance. Available at: https://www.calderdale.gov.uk/docs/planning/wyca-suds-guidance.pdf.

[38] Calderdale Council (2024) Flood Risk and Drainage Supplementary Planning Document. Available at: https://calderdale-consult.objective.co.uk/kse/event/38086.

[39] Calderdale Council (2016) Local Flood Risk Management Strategy. Available at: https://new.calderdale.gov.uk/sites/default/files/2023-04/local-flood-risk-management-strategy.pdf.

[40] Calderdale Council Ordinary Watercourse and Land Drainage Consent (2025). Available at: https://new.calderdale.gov.uk/environment/flooding/ordinary-watercourses-and-land-drainage-consent.

[41] Pendle Council (2021) Pendle District Level 1 Strategic Flood Risk Assessment. Final Report. Available at:

Type	Name	Relevance to Assessment
	LFRMS for Lancashire (2021)[42]	Sets out local flood risk management measures.
	Bradford SFRA (2023)[43]	Provides flood risk information relevant to the PEIR Boundary.
	Bradford LFRMS (2016)[44]	Sets out local flood risk management measures.

10.3 Scoping and Stakeholder Engagement

2025 Scoping Opinion

10.3.1 In September 2025, a request for a Scoping Opinion was submitted alongside a Scoping Report to the Planning Inspectorate (PINS) under the Environmental Impact Assessment (EIA) Regulations.

10.3.2 **Table 10-2** presents the details of the PINS Scoping Opinion relevant to Hydrology, Hydrogeology, Geology and Peat and confirms how these have been addressed within the proposed scope of assessment.

10.3.3 Detailed responses were also received from other consultees and stakeholders and **Table 10-3** provides a summary of the key comments and how these have been addressed within the proposed scope of assessment.

https://www.pendle.gov.uk/downloads/file/7082/strategic_flood_risk_assessment_level_1.

[42] Lancashire County Council (2021) Lancashire Local Flood Risk Management Strategy 2021 – 2027. Available at: https://www.lancashire.gov.uk/council/strategies-policies-plans/environmental/lancashire-and-blackpool-flood-risk-management-strategy/.

[43] JBA consulting (2023) Bradford Level 1 Strategic Flood Risk Assessment. Available at: https://www.bradford.gov.uk/media/kzqoguch/bradford-district-l1-sfra-2023-final-report.pdf.

[44] Bradford Council (2016) Bradford District Local Flood Risk Management Strategy. Available at: https://www.bradford.gov.uk/media/4008/bradford-lfrms-final.pdf.

Table 10-2: Consideration of PINS Scoping Opinion

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
3.3.1	Coal Mining Activities	The Coal Authority confirmed that "*Whilst the site falls within the coalfield, it is located outside the Development High Risk Area*." This was confirmed through the scoping consultation response. On this basis, the Scoping Report seeks to scope this matter out. The Inspectorate agree with this approach.	Impacts on minerals are addressed in **Chapter 22: Materials and Waste**.
3.3.2	Tidal Flood Risk – All Phases	The development is not located near any tidal waterbodies and therefore the Inspectorate agrees that tidal flood risk is unlikely to be a significant effect and agrees to scope out.	Noted. Tidal flood risk has been scoped out.
3.3.3	Changes to flood risk associated with the cable route - operation	The Scoping Report identifies that the Bradford West Cable Corridor search area will 'cross beneath a number of risk areas and watercourses', and that due to the shallow nature of the excavations, groundwater flows will 'flow as existing or around the therefore remain unaffected'. The Scoping Report does not discuss the potential for implications of increasing impermeability of the land through the presence of the cable but states that there is the potential for existing flows to divert around the cables. The Inspectorate	Potential impacts of the Bradford West Cable Corridor on groundwater flows / flood risk have been scoped in.

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
		also notes the number of watercourses shown to be present on the site which is classified as being largely blanket bog (albeit that this has been noted as being inconsistent at present). As such, the Inspectorate is not content at present to scope this matter out, further information on potential effects should be provided in the ES. This matter was also raised by Calderdale Council.	
3.3.4	Effects on groundwater abstractions located over 250m from infrastructure (excavations > 1m depth) – all phases	The Scoping Report references that "*Guidance on Assessing the Impacts of Development on Groundwater Abstractions, August 2024, SEPA*", indicates that no further assessment is required should construction activities be >1m in depth and more than 250m away from the groundwater abstraction source. The EA in its consultation response notes that this guidance does not apply to England. The Inspectorate is content to scope this matter out providing a commitment is secured to maintain these distances. The Inspectorate also notes advice from the EA that should infrastructure coincide with a Source	Noted. Where construction works are proposed within 250m of a SPZ or Drinking Water Safeguard Zone (SGZ), impacts on groundwater abstractions will be considered (e.g. the northern section of the Western Access Route is within a SPZ). Further hydrogeological assessment will be provided in the ES. However, a precautionary assessment is presented in this Chapter.

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
		Protection Zone (SPZ) ; there is potential for likely significant effects and therefore this matter should be scoped in where necessary.	
3.3.5	Effects on GWDTEs located over 250m from infrastructure excavation >1m – all phases	The Scoping Report references "*Guidance on Assessing the Impacts of Development on Groundwater Abstractions, August 2024, SEPA*" as stating "*no further assessment is required should construction activities >1m in depth be greater than 250m away from the GWDTE*". The EA notes that this guidance does not apply to England. The Inspectorate is content to scope this matter out providing a commitment is secured to maintain these distances. The Inspectorate also notes advice from EA that should infrastructure coincide with a SPZ; there is a potential for likely significant effects and therefore this matter should be scoped into further assessment where necessary.	Noted. Where construction works are proposed within 250m of an SPZ or SGZ and GWDTEs, impacts on GWDTEs will be considered (e.g. the northern section of the Western Access Route is within a SPZ). Further National Vegetation Classification (NVC) Surveys are required for potential GWDTE assessment. Further hydrogeological assessment will be provided in the ES. However, a precautionary assessment is presented in this Chapter.
3.3.6	Erosion and sedimentation -operation	The Scoping Report seeks to scope this matter out noting that the Proposed Development will have a negligible impact on sediment loads. Little information has been provided to demonstrate this. The EA in its consultation	Noted. A preliminary assessment of the effects of sedimentation and erosion is presented in this Chapter and will be subject to detailed assessment in the ES.

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
		response requested that further assessment is undertaken, specifically highlighting gullying and gully erosion and the need to consider downstream impacts. The Inspectorate also notes the predominately peaty soils within the Proposed Development area which has the potential to be eroded and impacted by water flows. Noting this, the Inspectorate does not agree to scope this matter out. This matter was also raised by Calderdale Council.	
3.3.7	Study Area	The Inspectorate notes that the Scoping Report references that the study area will include buffers. The study area for the EIA should be wide enough to ensure that it encompasses all water features that have the potential to be significantly impacted. Sufficient cross-referencing within the ES should ensure all hydrological links, ecological and human receptors are considered in determining this. The study area should consider present conditions and future changes. Where possible, the study area should be agreed with relevant consultees.	The flood risk and hydrology study areas comprise a 1km buffer from the PEIR Boundary. In the absence of any specific guidance relating to wind farm developments, this has been set in accordance with DMRB LA 113 and professional judgement. Further information on the study areas is provided in this Chapter. The hydrogeology, geology and peat study area considers up to a 250m buffer around the PEIR Boundary, with the focus given to the Turbine Area at this PEIR stage.
3.3.8	Hebden Bridge Flood	The ES and Flood Risk Assessment (FRA)	The FRA and ES will refer to the Hebden Bridge FAS.

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
	Alleviation Scheme (FAS)	should clearly set out any information available in relation the Hebden Bridge Flood Alleviation Scheme FAS along with how this has been taken into account in the ES and FRA.	Refer to the Preliminary FRA (**Appendix 10-9**) for information related to the Hebden Bridge FAS.
3.3.9	Water Requirements	The Scoping Report provides information on the impact on water supplies but does not discuss water requirements, this should be considered and discussed with relevant consultees. The EA and Calderdale Council also raised this in their consultation responses.	A Water Supply Strategy will be produced for the ES that seeks to itemise consumptive water uses and appraise the options for potential water supply to support this, noting that the water is likely to be delivered by road. Yorkshire Water (YWS) and United Utilities Water (UUW) will also be consulted on options for the use of existing public water supplies for the activities required for the Proposed Development and this will be presented in the ES.
3.3.10	Horizontal Directional Drilling (HDD)	The Scoping Report makes reference to HDD potentially being required, the implications of this on the water environment should be considered for likely significant effects in terms of disturbance and potential for frac-out contamination. This matter was also raised by the EA.	Trenchless techniques (e.g. HDD) methods for construction will be carried out according to good practice detailed in the oCEMP. This will ensure the prevention of pollution release to the water environment.
3.3.11	Buffer zones	As part of the design iteration, buffer zones should be agreed with relevant consultation bodies.	The relevant authorities (namely the EA (Environment Agency) and Lead Local Flood Authorities (LLFAs))will continue to be consulted with regard to appropriate

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
			easements from watercourses and the design of proposed water crossings. Details of engagement are provided in **Table 10-3**.
3.3.12	Watercourses	Noting the number of watercourses present within the Proposed Development boundary, the ES should ensure that changes to these are considered in relation to giving rise to significant effects for other aspect topics such as biodiversity and ornithology with appropriate cross referencing.	Potential changes to watercourses at present relate to proposed crossing points and encroachment by the proposed infrastructure. Preliminary consideration of such changes is provided with this PEIR, where relevant, with further assessment provided in the ES.
3.3.13	Thermal impacts on groundwater receptors (including peat)	The EA highlighted that thermal impacts on groundwater receptors (including peat) should be scoped in for further assessment. The Applicant should discuss this matter further with the EA and other relevant consultation bodies.	Consideration of thermal impacts on ground conditions from underground cables will be discussed with the Environment Agency and relies on the final engineering detail. Heat generation is only considered a potential issue during the operational phase and this would be the focus of any further appraisal in the ES based on feedback from the Environment Agency and the final engineering detail. Cables would not be operational during construction and decommissioning, and an assessment of heat generation is not required for these phases.
3.3.14	Hydro-flouric Acid from	The Inspectorate note states that a BESS	Following the Scoping Report, the Battery Energy

PINS ID	Topic	Summary of Scoping Opinion	Consideration within the Proposed Scope of Assessment
	firewater at the BESS	safety management plan would be developed to further mitigate the risk of HF emissions. The EA in its consultation response (appendix 2 of this Scoping Opinion) set out a number of mitigation measures to reduce or fully mitigate significant effects. The Applicant should seek to agree these with the EA.	Storage System (BESS) element has been removed from the Proposed Development. Therefore, this is not considered further within the assessment.
3.3.15	Intra-related Assessments	The construction of roads and compounds should be considered in relation to soil/ground impacts and stability as well as the wind turbine generators, ensuring any significant effects arising from the construction, operation and decommissioning of all components are assessed.	A preliminary assessment of peat slide risk is addressed in **Appendix 10-4**. Ground investigation works will be undertaken to confirm ground conditions (including geotechnical properties) and to inform the detailed design. These will be secured as part of a Development Consent Order (DCO) requirement.

Table 10-3: Consideration of Scoping Responses from Other Consultees and Stakeholders

Consultee/ Stakeholder	Topic	Comment	Response
Environment Agency	Land contamination and minerals have been scoped out	If insufficiently assessed and mitigated, the Proposed Development could result in unacceptable impacts to controlled waters. Land contamination should be scoped in for further assessment.	A preliminary assessment of land contamination impacts is provided in **Chapter 23: Other Environmental Matters**.
	Historic Contamination	There are areas of historic landfills in the vicinity of the Proposed Development that	A preliminary assessment of land contamination impacts is provided in **Chapter**

Consultee/ Stakeholder	Topic	Comment	Response
		require to be assessed as part of the ES.	**23: Other Environmental Matters**.
	Retention of foundations and cabling following decommission	There is a potential risk to controlled waters from buried cables that remain in situ particularly at shallow depth due to disturbance from land uses such as agriculture.	The cables will be buried at a depth to avoid impacts on agricultural usage throughout the operational lifespan and at decommissioning (and beyond). It is anticipated that the cables will be left in-situ but further details on decommissioning activities will be provided in the ES.
	Watercourse crossings (culverts)	Potential impacts on hydromorphological process and therefore impacts to aquatic wildlife.	Watercourse crossings will be designed with consideration given to a proportionate approach, and in consultation with the EA and LLFA(s). Initial considerations are provided in **Appendix 10-5**. Further assessment of the potential impacts on hydromorphological processes will be provided in the ES.
	Consideration of sub-surface hydrology and flow within peat	Less informed choices for siting of infrastructure; possible increased risk of peat instability during and post construction. Possible increased water quality and habitat impact. Less effective peatland restoration planning. A comprehensive desk	Peat distribution, depth, condition and hydrology are addressed within the following preliminary technical appendices: • **Appendix 10-2: Peat Survey Report**; • **Appendix 10-4: PPLHRA**; and

Consultee/ Stakeholder	Topic	Comment	Response
		and field-based survey of the likely identification of peatland hydrological units, and hydrological flow paths within and between interconnected peat bodies, should be undertaken. This should apply to all peat related infrastructure scoping areas, including turbines, access tracks (including floating roads), cable routes and battery sites.	• **Appendix 10-6: GWDTE Assessment**. Further surveys, assessments and engagement with consultees / stakeholders will be undertaken for the ES. No BESS is proposed.
	Peat	Understanding the sub surface peatland hydrology and how that may change as a result of the construction could (a) inform the siting of infrastructure, by helping identify areas of sensitivity for increased drainage due to disturbance, (b) inform construction management planning which considers hydrological impacts on peat, (c) minimise risk of landslip, and (d) inform effective hydrologically based restoration planning on an extremely sensitive Special Area of Conservation (SAC) Blanket Bog site.	Peat distribution, depth, condition and hydrology are addressed within the following technical appendices: • **Appendix 10-2: Peat Depth Survey Report**; • **Appendix 10-3: oPMP**; • **Appendix 10-4: PPLHRA**; and • **Appendix 10-6: GWDTE Assessment**. Further surveys, assessments and engagement with consultees / stakeholders will be undertaken for the ES.
	Surface water classified under the WFD as ‘poor or bad’ (or equivalent	The definition for sensitivity of a receptor may result in increased degradation to WFD waterbodies. The sensitivity should be re-	Receptor sensitivity is combined with the magnitude of potential impact to result in the significance of effect, which should not be

Consultee/ Stakeholder	Topic	Comment	Response
	designation) as low sensitivity	assessed. Further degradation is not allowed under the Water Environment Regulations for those waterbodies with a poor/bad score; this makes them more sensitive environments, not less. Additionally, further deterioration of a waterbody graded as 'poor' should still be regarded as a negative change of that waterbody and be avoided where possible, i.e. deterioration is not justified on waterbodies with a status less than 'good.'	significant after mitigation for all watercourses regardless of sensitivity. Therefore, there should be no deterioration of waterbody status. For the avoidance of doubt, the sensitivity classification for poor status WFD water bodies has been increased to 'medium sensitivity' (see **Table 10-5**). A WFD Screening Assessment will be carried out as part of the ES.
	Flood Risk	The FRA and Drainage Strategy should be completed in line with NPS EN-1 (5.8.15), and should: • Take the impacts of climate change into account, across a range of climate scenarios • Detail the measures that will be included to ensure the development will be safe and remain operational throughout the development's lifetime, without increasing flood risk elsewhere • Identify and secure opportunities to reduce the causes and impacts of flooding overall	A full FRA will be produced in accordance with all relevant national and local policy and guidance for the ES. A Preliminary FRA has been prepared to accompany this PEIR (**Appendix 10-9**).

Consultee/ Stakeholder	Topic	Comment	Response
		• Demonstrate that a sequential, risk-based approach has been used • Demonstrate there will be no loss of floodplain storage	
	Opportunities to Reduce Flood Risk	In line with NPS EN-1 and the requirements of the Exception Test, new energy infrastructure in flood risk areas should look to, where possible, reduce flood risk overall. EN-1 also recommends that flood mitigation measures make as much use as possible of natural flood management techniques.	Any potential to achieve a reduction in offsite flood risk would be subject to hydraulic modelling, currently being undertaken. The results of this modelling and any potential to reduce flood risk will be presented in the ES.
	Watercourse Crossings	The type of watercourse crossing would be determined following further hydraulic assessment and in consultation with the EA and LLFA, which is welcomed. Any proposed crossings should be designed so that the soffit level of any bridges sits above the design flood level. Additionally, the EA have a general policy against the use of culverts, so for access crossings, open span structures are preferred.	Where peat is present and watercourses are small, culverts may be a more appropriate approach to minimise impacts to peat. Watercourse crossings will be designed with consideration of a proportionate approach and in consultation with the EA and LLFA(s). An initial watercourse crossing inventory is provided in **Appendix 10-5**.
	De-watering / Abstraction	During construction, consideration should be given to water scarcity and limitations now placed on granting of	Abstraction licences will be required. Further details will be provided in the ES.

Consultee/ Stakeholder	Topic	Comment	Response
		full abstraction licences from some aquifers under pressure. The Applicant may wish to consider the benefits of a scheme-wide dewatering application, rather than individual applications.	
	Trenchless Watercourse Crossings	"*We agree with the approach of minimising the number of watercourse crossings and encroachment to watercourses… The EA's position is a preference for HDD to allow cable crossings under watercourses*". Any HDD crossings beneath crossings should be supported by a hydrogeological risk assessment where these may interact with Principal or Secondary A aquifers or pass within influencing distance of surface watercourses or sensitive ecological receptors.	Trenchless techniques (including HDD) are being considered for crossings (as noted in **Chapter 4: The Proposed Development**). Watercourse crossings will be designed with consideration given to a proportionate approach, and in consultation with the EA and LLFA(s). Trenchless techniques / methods for construction will be carried out according to best practice detailed in the Outline Construction Management Plan (oCEMP). Further details and assessment will be provided in the ES.
	Land Contamination	A land contamination assessment is expected, given the presence of potential filled ground within and around the Proposed Development.	Consideration of land contamination is provided within **Chapter 23: Other Environmental Matters.**
	Private Water Supplies	*"The Applicant should ensure that enquiries about private water*	Information requests were issued to the Local Authorities and

Consultee/ Stakeholder	Topic	Comment	Response
		supplies are submitted to all local authorities who may hold records of private water supply abstractions which could be affected by aspects of the Proposed Development, i.e. not just the proposed Turbine Area".	the EA, on private and licensed water supplies. Further assessment will be undertaken as part of the ES. However, a preliminary assessment is presented in this Chapter.
	Foul Water Disposal	Potential pollution events affecting groundwater and surface water quality, associated with the generation of foul water onsite (construction, operation, decommissioning) should be scoped in.	The potential impacts of pollution events associated with foul water have been scoped in. All foul water will be carefully managed and appropriately disposed of off-site.
	Water Quality Monitoring	Details of a monitoring plan are to be provided. "*It should sample upstream and downstream of any discharge points, and should reflect locational variation in the site, seasonal variation and weather variation, where possible*".	A Water Quality Monitoring Plan (WQMP) would be included within the Construction Environmental Management Plan (CEMP) and would set out the frequency and locations of monitoring. An oCEMP including WQMP will be provided as part of the ES.
Calderdale Council	Sandstone Mineral Safeguarding	The proposed Turbine Area contains a Sandstone Mineral Safeguarding Area. Further instances of Sandstone are noted within the Bradford West Cable Corridor and site access search areas. A Mineral Resource Assessment,	Impacts related to minerals are addressed in **Chapter 22: Materials and Waste**.

Consultee/ Stakeholder	Topic	Comment	Response
		including assessment of underlying sandstone resources, should be undertaken.	
	Slope Stability and Geotechnical Risks	The LLFA recommends conducting assessments for slope stability, geotechnical risks and contamination to inform the ES and confirm no adverse flood risk/drainage interactions.	Detailed ground investigations to confirm the geotechnical properties of the underlying ground will be undertaken prior to the commencement of the construction phase. This will be secured as part of a DCO requirement.
	Surface Water Flood Risk	A Construction Phase Surface Water Management plan will be required.	A Drainage Management Plan will be produced, with consideration given to surface and foul water during construction. The principles are set out in **Appendix 10-9**. The CEMP will contain the details of the construction phase surface water management plan.
	Effects Scoped Out	The Council considers that site-specific hydrology and hydrogeology assessment on the potential effects upon existing and consented mineral workings, covering [inter alia] ground water levels, flow paths, dewatering risks, private water supplies/abstractions and water dependent habitats across the construction, operation and decommissioning	The preliminary assessment of impacts on private water supplies and GWDTEs is provided in this Chapter. Impacts related to minerals are addressed in **Chapter 22: Materials and Waste**.

Consultee/ Stakeholder	Topic	Comment	Response
		phases should be scoped in.	
	FRA – Subsurface flow modelling and climate change	The ES and FRA should be informed by a detailed modelling study to assess subsurface flows. Risk of hydrological disruption could occur, as certain features will remain in situ such as extensive hardstanding, foundations and cabling. Based on this the ES, FRA and any modelling study should look at the long term risks and also use appropriate climate change factors.	Calderdale Council have been contacted to discuss the potential advantages and disadvantages of modelling subsurface flows. A response is currently awaited.
	Walshaw Moor Estate Catchment Restoration Plan	We request to see a copy of the Walshaw Moor Estate Catchment Restoration Plan (WMECRP) and addendum. It would also be valuable to know the results of peat and habitat condition surveys which have been undertaken and the geographical spread of peatland restoration work for the first 8 years.	The WMECRP is available at the following website address: https://publications.naturalengland.org.uk/publication/6389907001442304. The results of habitat mapping for the Proposed Development are provided in **Chapter 8: Biodiversity**.
	Floating Tracks (Peat)	Floated tracks used in Northumberland have encountered issues with rippling, which suggests that floated track may not be a viable option. The document also indicates that cable routes will follow the access tracks where possible which would	Floating tracks will be designed and engineered appropriately according to the peat conditions. A series of baseline surveys has been undertaken to identify the peat resource present and consider impacts related to peat,

Consultee/ Stakeholder	Topic	Comment	Response
		require excavation to a minimum of 0.9m. The Draft EN-3 Paragraph 2.12.66 states "Applicants should provide geotechnical and hydrological information (such as identifying the presence of peat at each site and impacts on soil and hydrology) including the risk of landslide connected to any development work.	including **Appendix 10-2** to **Appendix 10-4**. Subsidence and unstable ground risks are addressed in **Chapter 20: Major Accidents and Disasters**. Ground investigation will be undertaken at the detailed design stage, following the grant of the DCO.
	Peat Avoidance	It is vital to avoid all deep peat areas building this into the site layout. Peat depth surveys and other preliminary surveys need to minimise vehicles crossing more sensitive areas.	Peat surveys have been undertaken and fed into the preliminary design, with infrastructure sited where possible to avoid deeper peat. Peat surveys were undertaken by survey staff on foot; please refer to **Appendix 10-2**. Further surveys will be undertaken to inform the ES.
	Patch repair of bare ground (peat)	The ES needs to ensure that it does not propose inappropriate solutions which will not work in the short to medium term. The build up of peat needs to be understood and built into restoration plans.	Peat depth surveys have been undertaken and fed into the preliminary design. Peat surveys were undertaken by survey staff on foot; please refer to **Appendix 10-2**. Further surveys will be undertaken for the ES. Restoration and management of peat will be set out in the ES.
	Surface water management (peat)	The surface water drainage strategy will need to be developed with due consideration	A Drainage Management Plan will be produced, with consideration given to

Consultee/ Stakeholder	Topic	Comment	Response
		given to the underling peat.	the underlying peat. The principles are set out in **Appendix 10-9**.
	Borrow pit locations (peat)	All borrow pits need to consider the impact on the hydrology of nearby peatland habitat. This is particularly problematic for deep peat mire and wet heath habitats where small drops in water table can have significant impacts over large distances.	Peat depth surveys have been undertaken **Appendix 10-2** and **Figures 10-10** and **10-11** and a habitat survey has been undertaken to feed into the design. Further surveys and assessments will be undertaken for the ES.
	Sensitivity of environment (peat)	Ancient and species rich grassland and associated CHEGD fungi (waxcaps and their allies) which can be of international importance need to be considered as with a Very High sensitivity classification.	Impacts on habitats and CHEGD Fungi are addressed in **Chapter 8: Biodiversity.**
Bradford Council	Flood Risk / Drainage	The LLFA considers that any flooding and/or drainage impacts associated with the Proposed Development will not extend to land or watercourses within the Bradford Council boundary.	Noted. Further consideration of the effects arising from the installation of the Export Cable will be presented in the ES.
YWS	Pollution Risk	Yorkshire Water Services (YWS) welcome the assessment and recognition of: • Pollution risks to groundwater and surface water during construction, operation, and decommissioning.	Good practice methods are set out in **Appendix 10-1**. A WQMP will be prepared for the Proposed Development and included as part of the ES. Further surveys, assessments and consultations will be

Consultee/ Stakeholder	Topic	Comment	Response
		• Foul water generation and associated pollution risks across all phases of development. To support this, the ES must include a detailed water quality monitoring programme, specifying: frequency of sampling and locations (including all key feeder streams and catchwaters). Baseline monitoring must be undertaken prior to any development to enable meaningful comparison and impact assessment.	undertaken for the ES.
	Reservoir Inflows	Given the strategic importance of the reservoirs and associated catchment land, YWS states that any ES must robustly assess potential changes in volumetric flow to the identified YWS reservoirs.	Potential changes to volumetric flow will be considered as part of the ES.
	Asset Protection	YWS assets are located within the Site and must be afforded appropriate protection. YWS expects to be consulted to confirm the extent and location of all relevant water supply infrastructure and agree appropriate mitigation.	YWS asset plans have been purchased and are presented in **Figure 10-9**. YWS will be consulted with regard to site-specific easements to their infrastructure, to confirm the extents and locations of their assets and agree on any necessary mitigation, which will be presented in the ES.

Consultee/ Stakeholder	Topic	Comment	Response
UUW	Assets and Property	UUW would expect to see plans showing the proposals in relation to any existing UUW assets and infrastructure as part of the DCO and would request that specific protective provisions are included to ensure that assets are protected. UUW will not allow building over or in close proximity to a water main or sewer. Construction compounds should not be located on top of UUW apparatus.	UUW asset plans have been purchased and are presented in **Figure 10-9**. UUW will be consulted with regards to site-specific easements to their infrastructure, to confirm the extents and locations of their assets and mitigation.
	Water Resources	The approach to the assessment of the impact on water resources must be considered and agreed with UUW. This assessment is necessary to ensure the proposals do not pose a risk of pollution or harmful disturbance to the water environment and public water supply resources, and to confirm that any risks can be reduced to an acceptable level.	UUW asset plans have been purchased and further surveys will be undertaken for further design and presented in the ES. UUW will be consulted with regard to site-specific easements to their infrastructure, to confirm the extents and locations of their assets and mitigation.
	Water Resources and the Groundwater Environment	Concerns relating to the potential to impact raw water quality and damage the integrity of sensitive upland habitats, particularly where deep peat or blanket bog is present, specifically in relation to water quality impacts, habitat loss and	Impacts on water quality are presented below, within this Chapter. Impacts on sensitive upland habitats are provided in **Chapter 8: Biodiversity**. Further assessment and surveys will be undertaken for the

Consultee/ Stakeholder	Topic	Comment	Response
		ecological damage, and carbon. The proposal should seek to address: the protection of water quality, protection of peat and priority habitats, and environmental protection and improvement.	ES. Note that deeper peat will be avoided by design, where possible.
	Storage of Hazardous Substances	The risks posed by storage and distribution of fuels, chemicals and wastes from the Proposed Development, should be assessed for the risk to the water environment. The Applicant should follow best practice in their use and storage of fuels, oils, chemicals and other wastes, to remove the risk of causing pollution during construction and operation of the scheme.	Potential impacts (during construction, operation and maintenance and decommissioning) on surface water and groundwater quality have been considered and the preliminary assessment is presented in this Chapter. A BESS is no longer proposed. Best practice will be followed for storage and distribution of fuels, chemicals and wastes from the Proposed Development (see **Appendix 10-1** as well as **Chapter 20: Major Accidents and Disasters** and **Chapter 23: Other Environmental Matters**).
	Contaminated Land	UUW requests that the assessment of potential environmental impacts from contamination fully considers the impact on our assets, water resources and water	A phase I contaminated land assessment will be undertaken and this will consider potential source - pathway - receptor linkages, which will be

Consultee/ Stakeholder	Topic	Comment	Response
		quality as a result of construction.	presented in the ES. A preliminary assessment of land contamination impacts is presented in **Chapter 23: Other Environmental Matters**. Further consultation will be undertaken with UUW to understand their assets, water quality and water resource systems for further design and mitigation. The oCEMP will be further developed / refined for the ES.
	EA's Approach to Groundwater Protection	The Applicant should follow 'The EA's approach to groundwater protection' in relation to the protection of drinking water supply from UUW groundwater abstractions. We wish to draw attention to Position Statements C1, C2 and C5 of the EA's approach.	The Proposed Development falls within an EA SPZ and in close proximity to a UUW borehole and assets, recognised to be of National / Regional significance. All potential pollution linkages will be identified through EIA and best available techniques (BAT) applied. A hydrogeological risk assessment will be undertaken in accordance with EA guidance, particularly considering any decommissioning in these zones. Where relevant, the Position Statements will be considered. Measures will be put in place to protect groundwater and consultation will be undertaken with the EA and UUW to

Consultee/ Stakeholder	Topic	Comment	Response
			mitigate groundwater risks, including via Environmental Permitting Regulations (EPR).
	Drainage	The risks posed by drainage from the Proposed Development, should also be assessed within the ES for the risk to groundwater abstractions. UUW have asked the Applicant to provide details of any drainage proposals in respect of both foul and surface water.	A Drainage Management Plan will be produced, with consideration given to water quality. The principles of the drainage strategy are outlined in **Appendix 10-9** and will be further refined for the ES.
	SPZ	Development activities are more appropriately situated away from sensitive groundwater protection areas, especially land within and adjacent to SPZ1. Similarly, it is also preferable to locate mitigation activities away from SPZ1. If development in these locations is necessary, UUW draw attention to the EA's position statements. Where the development has the potential to impact on a sensitive location within a SPZ, relating to a drinking water abstraction resource (including those not currently in use for public water supply purposes), UUW requires a	The PEIR Boundary is largely located outside of groundwater SPZs, with the exception of the northern section of the Western Access Route which does enter a SPZ. Further hydrogeological assessment will be required for construction works in or within 250m of the SPZ. Further consultation will be undertaken with UUW and the EA. This will be presented in the ES. However, a preliminary assessment is presented in this Chapter.

Consultee/ Stakeholder	Topic	Comment	Response
		'Hydrogeological Risk Assessment' for the specific borehole abstraction.	
	Flood Risk	In relation to sewer flood risk, UUW request that the Proposed Development does not result in an increase in flood risk from the public sewer as a result of: • Altering any existing exceedance flood paths of losses from the public sewer; • Any changes in ground levels which could materially change existing sewer flood risk; • Any changes to land or property currently affected by existing sewer flooding incidents; • Any above ground elements in areas where there is an existing risk of sewer flooding; • Any diversions / works to watercourses or existing sewers; and • Any proposed new drainage connections to the public sewer.	The FRA will be produced in accordance with all relevant national and local policy and guidance. The FRA produced to assess flood risk to and from the Proposed Development will assess flood risk from all sources, including sewer flood risk. A Preliminary FRA has been prepared to accompany this PEIR (**Appendix 10-9**) and will be updated to support the ES.
	Impact on Watercourses	UUW wishes to liaise with the Applicant to confirm the impact on any watercourses that interact with their assets to ensure that there are no detrimental	UUW will be consulted with regard to potential impacts to watercourses that have connectivity with their infrastructure. The design has been developed to date,

Consultee/ Stakeholder	Topic	Comment	Response
		consequences of these works in terms of asset operation, flood risk and changes to fluvial geomorphological processes.	with consideration given to watercourse easements.
	Water Supply Requirements	UUW request that the Applicant provides details of any water supply requirements for both construction and during operation. This should include details on rates of water supply required in litres per second and anticipated points of connection to the public water supply network. For temporary related activities, early consideration of any water supply requirements will also be required.	It is anticipated that potable water supplies will be provided by tanker during construction. If any potable water supply is to be used, this will be carried out through the consents and permitting applications process. Information regarding water supply requirements during operation will be provided in the ES.

Further Engagement Undertaken

10.3.4 Further engagement beyond the Scoping Opinion has been undertaken to date for Hydrology, Hydrogeology, Geology and Peat with consultees and stakeholders and how this engagement has informed the proposed scope of the assessment is provided in **Table 10-4**.

Table 10-4: Other Engagement Undertaken

Consultee / Stakeholder	Type and Date	Summary of Discussion	Discussion Response
Calderdale Council	Meeting – 29 August 2025	Initial meeting held with the EA and Calderdale Council (LLFA) to provide an update to the scheme. The LLFA will continue to be consulted as the design evolves.	Calderdale Council, in their role as the LLFA, will continue to be consulted with regard to watercourse crossings and drainage / SuDS.
	Emailed 21	Information request on private water supplies within an area extending 2 km	Replied 18 November 2025. 72 known Private Water Supply records provided.

Consultee / Stakeholder	Type and Date	Summary of Discussion	Discussion Response
	October 2025	beyond the Proposed Development red line boundary. Covering majority of Turbine Area.	
EA	Meeting – 29 August 2025	Initial meeting held with the EA and Calderdale Council (LLFA) to provide an update to the scheme. The EA will continue to be consulted as the design evolves, and to agree the scope of assessment in relation to flood risk and WFD Assessment.	The direct rainfall modelling methodology (to be used to assess fluvial / pluvial flood risk) was shared with the EA for their comment following this meeting.
	FOI Request 4 October 2025	Freedom of Information (FOI) request on licenced groundwater and surface water abstractions, private and public, within an area extending 2 km beyond the Proposed Development boundary.	The EA Yorkshire Area department replied on 4 November 2025. Provided water abstraction licence information, authorised and historical landfill information and waste disposal licence information. 30 water abstractions for the public water supply for YWS. Areas of FOI fall outside the Yorkshire EA Area– awaiting response.
	Meeting – 3 February 2026	Meeting held to provide updates on pluvial modelling methodology and approach to watercourse crossings.	Pluvial modelling and approach to watercourse crossings to be progressed with consideration given to EA comments.
Natural England	Site Visit 1 October 2025	Introduction to peatlands at the Site focusing on providing of a cross-section of habitats, peat condition and past peatland management.	Not applicable to the preliminary assessment presented in this Chapter.
Burnley Council	Email 23 October 2025	Information request on private water supplies within an area extending 2km beyond the Proposed Development red line	Replied 12 November 2025. One known Private Water Supply within 2km.

Consultee / Stakeholder	Type and Date	Summary of Discussion	Discussion Response
		boundary. Covering western section of Turbine Area.	
Bradford Council	Emailed 21 October 2025	Information request on private water supplies within an area extending 2 km beyond the Proposed Development red line boundary. Covering eastern section of Proposed Development.	Replied 18 November 2025. 91 known Private Water Supply records provided.
Pendle Council	Emailed 21 October 2025	Information request on private water supplies within an area extending 2 km beyond the Proposed Development red line boundary. Covering western section of Proposed Development.	Replied 3 November 2025. 38 known Private Water Supply records provided.
North Yorkshire Council	Online FOI form and email 23 October 2025	Information request on private water supplies within an area extending 2 km beyond the Proposed Development red line boundary. Covering extreme northern section of Proposed Development.	Replied 19 November 2025. 3 known Private Water Supply records provided.
YWS	Email – October 2025	YWS has been consulted with requests for information on the location and function of their assets within the PEIR boundary.	Asset plans have been provided as GIS shapefiles in November 2025 and are discussed in this Chapter below. Information regarding the function of these assets is still awaited.
UUW	Email - December 2025	UUW has been consulted with requests for information on the location and function of their assets within the PEIR boundary.	Asset plans purchased as GIS shapefiles in December 2025 and are discussed in this Chapter below.

10.3.5 Further consultation with the EA, Calderdale Council (LLFA), Lancashire County Council (LLFA), Bradford Council (LLFA), YWS and UUW will be undertaken in due course to inform the ES.

10.4 Assessment Methodology

Study Area

10.4.1 The study area includes the Proposed Development (Turbine Area, Bradford West Cable Corridor and the Access Routes) plus an appropriate buffer, which specifically relates to the likely significant effects being assessed. The study areas being considered in this Chapter are set out in **Table 10-5**.

Table 10-5: Study Areas

Study area	Buffer from PEIR boundary	Description
Flood Risk and hydrology	1km	In the absence of any specific guidance relating to wind farm developments and in accordance with DMRB LA 113, a 1km buffer has been considered appropriate as a sufficient distance to encompass catchments associated with the Turbine Area, Bradford West Cable Corridor and the Access Routes to enable the deposition of silts in overland flows and the dilution of any concentrated pollutants. Therefore, any impacts to waterbodies beyond 1km from the PEIR Boundary are considered to be negligible.
Peat	Up to 1km	Up to 1km is used for initial screening. Peat depth surveys undertaken on 100m grid across the Turbine Area and 20m grid around infrastructure within Turbine Area for the PEIR. The peat surveys for the ES will be across the Proposed Development on 100m grid and 10m grid around infrastructure where peat is expected from the baseline studies. This conforms with the Scottish Peat Survey Guidance (listed in **Table 10-1** and used UK-wide) and further peat surveys will be undertaken for the ES.
Hydrogeology	Up to 1km	1km was used for information requests and initial screening. A radius of 0.25km has been used around proposed infrastructure footprint to identify relevant receptors.
GWDTEs	Turbine Area and southern part of Western Access Route (only at this stage)	The GWDTE is limited by the extent of the ecological surveys completed to date. This will be updated for the assessment within the ES. A distance of 0.25km around the proposed infrastructure footprint will be used to identify potential GWDTEs.

10.4.2 The study areas are shown in **Figure 10-1**.

10.4.3 To establish the baseline conditions within the study areas, data have been obtained from the following sources, summarised in **Table 10-6**. These sources are referenced throughout the Chapter, where required.

Table 10-6: Baseline Data Sources

Data Reference	Information Obtained
Bing map (2024) aerial imagery. Accessed July 2025.	Ordnance Survey (OS) aerial Mapping 1:25k and 1:50k scale to identify water features within the study area
Google Earth (2024) aerial imagery. Accessed July 2025.	Aerial mapping to identify water features within the study area
1:25,000 and 1:50,000 scale Ordnance Survey (OS) mapping and 1:10,000 scale OS Open data	Topographical information, and to identify water features within the study area
British Geological Survey (BGS) (2024) Digimap 1:50,000 Sheet 195 Lampeter Solid and Drift (2006) BGS Map Portal. Available at: https://webapps.bgs.ac.uk/data/MapsPortal/map.html?id=10954300010954 Accessed July 2025.	Geological information on bedrock and superficial deposits
British Geological Society (BGS) (2024) GeoIndex Boreholes database, 1:50,000. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html Accessed July 2025.	Geological information from relevant historical boreholes
Soilscapes map for England and Wales 1:250K. Available at: https://mapapps2.bgs.ac.uk/ukso/home.html Accessed December 2025.	Soil coverage information
EA Flood Map for Planning, Flood Zones. Available at: https://flood-map-for-planning.service.gov.uk/ Accessed December 2025.	Extents of Flood Zones 2 and 3
EA Surface Water Flood Risk Mapping (Risk of Flooding from Surface Water). Available at: https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-use-the-map/risk-of-flooding-from-surface-water-understanding-and-using-the-map Accessed December 2025.	Strategic surface water flood extent information for the present day and climate change scenarios
EA Reservoir Flood Risk Mapping. Available at: https://www.gov.uk/guidance/reservoir-flood-maps-when-and-how-to-use-them Accessed December 2025.	Reservoir flood extents for both 'dry day' (when local rivers are at normal levels) and 'wet day' (when local rivers had already overflowed their banks) scenarios
Flood Warning Areas. Available at: https://environment.data.gov.uk/dataset/87e5d78f-d465-11e4-9343-f0def148f590 Accessed December 2025.	EA Flood Warning Areas
Flood Alert Areas. Available at: https://environment.data.gov.uk/dataset/864c72de	EA Flood Alert Areas

Data Reference	Information Obtained
-d465-11e4-855f-f0def148f590 Accessed December 2025.	
BGS 1:625K Hydrogeology mapping. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html Accessed December 2025.	Hydrogeological information
EA Groundwater Vulnerability Mapping (updated 25 July 2025). Available at: http://magic.defra.gov.uk/ Accessed October 2025.	Vulnerability ratings of groundwater aquifers
Calder Catchment SFRA - Volume 1 (2016). Available at: https://new.calderdale.gov.uk/sites/default/files/2023-06/calder-catchment-sfra-volume-1.pdf Accessed December 2025.	Flood risk information
Calder Catchment SFRA - Volume 2 (2016). Available at: https://new.calderdale.gov.uk/sites/default/files/2023-06/calder-catchment-sfra-volume-2.pdf Accessed December 2025.	Flood risk information
Pendle Borough SFRA (2021). Available at: https://www.pendle.gov.uk/info/20072/planning_policies/277/evidence_base_documents/11 Accessed December 2025.	Flood risk information
City of Bradford SFRA (2023). Available at: https://www.bradford.gov.uk/planning-and-building-control/planning-policy/evidence-base/?Folder=Environment%5CStrategic+Flood+Risk+Assessment+(SFRA) Accessed December 2025.	Flood risk information
Calderdale LFRMS. Available at: https://new.calderdale.gov.uk/environment/flooding/local-flood-risk-management-strategy Accessed December 2025.	Flood risk information
Bradford LFRMS. Available at: https://www.bradford.gov.uk/emergencies/flooding/flood-risk-management/ Accessed December 2025.	Flood risk information
LFRMS for Lancashire. Available at: https://www.lancashire.gov.uk/council/strategies-policies-plans/environmental/lancashire-and-blackpool-flood-risk-management-strategy/ Accessed December 2025.	Flood risk information
EA LiDAR 1m Topographic Dataset. Available at: https://www.data.gov.uk/dataset/b1ff0a9c-74d3-4b97-a3fb-c8ab39ef6152/lidar-composite-dtm-2020-1m Accessed December 2025.	Topographical information
Main River Mapping. Available at: https://environment.data.gov.uk/dataset/25dde009-ba7d-40de-8380-c5c3bb32ccdc Accessed December 2025.	Main River locations. Ordinary watercourse locations have been derived using OS mapping.

Data Reference	Information Obtained
Centre for Ecology and Hydrology (CEH) (2024): National River Flow Archive (NRFA) website for river flow data. Available at http://www.ceh.ac.uk/data/nrfa/data/search.html Accessed July 2025.	Rainfall and river flow data relevant to the Proposed Development
Shoothill GaugeMap. Available at: https://www.gaugemap.co.uk/ Accessed December 2025.	River flow data relevant to the Proposed Development
EA Catchment Data Explorer. Available at: https://environment.data.gov.uk/catchment-planning Accessed December 2025.	Catchment definition for Proposed Development
EA Groundwater Source Protection Zones. Available at http://magic.defra.gov.uk/ Accessed October 2025.	SPZ information relevant to the Proposed Development
EA Drinking Water Safeguard Zones (Groundwater and Surface Water) and Protected Areas (Surface Water). Available at https://environment.data.gov.uk/ Accessed October 2025.	Safeguard zone and protected area information relevant to the Proposed Development
Meteorological Office website for rainfall data. Available at: http://www.metoffice.gov.uk/climate/uk/averages Accessed October 2025.	Rainfall information
EA Water Framework Directive River Basin Management Plans. Available at: https://www.gov.uk/guidance/river-basin-management-plans-updated-2022 Accessed December 2025.	Water body identification and quality status information
Joint Nature Conservation Committee (JNCC): Designated Sites View and Geological Conservation Review (GCR) site archives. Available at: https://jncc.gov.uk/our-work/geological-conservation/ Accessed Accessed October 2025.	Geological sites identified as sensitive for their geological value
National Biodiversity Network (NBN) Atlas (formerly NBN Gateway). Available at: https://nbnatlas.org/ Accessed October 2025.	Information provided on biodiversity
Walshaw Moor Estate Catchment Restoration 2017-2042 Plan (MRP002) Available at https://publications.naturalengland.org.uk/publication/6389907001442304 Accessed October 2025.	Information on the Walshaw Moor Catchment Restoration Plan (WMCRP)
Natural England: England Peat Map. Available at: https://england-peat-map-portal-ncea.hub.arcgis.com/ Accessed July 2025.	Peat distribution information
EA National LIDAR Programme. Available at: https://environment.data.gov.uk/survey	Elevation information
Multi-Agency Geographic Information for the Countryside. Available at http://magic.defra.gov.uk/ Accessed October 2025.	Information source - general

Data Reference	Information Obtained
Mining Remediation Authority Map Viewer. Available at: https://datamine-cauk.hub.arcgis.com/ Accessed October 2025.	Historical mining information, including locations of mine adits

10.4.4 The data collection has been supplemented by the following:

Peat Surveys: As presented in **Appendix 10-2** and **Figures 10-10** and **10-11**, the following surveys were conducted in accordance with the following good practice guidance in the absence of English guidance; Peatland Survey: Guidance on Developments on Peatland (Scottish Government, Scottish Natural Heritage, SEPA, 2017) Good Practice During Windfarm Construction (Scottish Renewables, Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA) & Forestry Commission Scotland, July 2024):

- Phase 1 (2022): a total of 1,854 probing locations were completed on a 100m grid for the original peat survey area by TNEI;
- Phase 2 (September, October and November 2025): infilling of 100m grid across the Peat Survey Area, at 50m intervals with 10m offset probes along all proposed and existing access tracks; and across the footprint of proposed infrastructure on a 20m grid and probing within a 50m buffer area on a 20m grid. This totalled 6,409 probes and eight cores.

PPLHRA: Walkover surveys of the proposed infrastructure locations were undertaken in July and October 2025 to verify the site geomorphology and other relevant mapping related to the assessment of peat landslide risk. The preliminary assessment is presented within **Appendix 10-4**; and

Flood Risk and Hydrology Walkover: A site walkover was completed on 27 October 2025 to gain baseline information with regards to flood risk and the site's existing hydrological regime.

Methodology

10.4.5 The significance of effects of the Proposed Development on baseline conditions associated with Hydrology, Hydrogeology, Geology and Peat is presented in this Chapter. The combination of the sensitivity of the receptor and the magnitude of the potential impact determines the significance of the effect.

10.4.6 There are no published guidelines or criteria for assessing and evaluating effects on Hydrology, Hydrogeology, Geology and Peat within the context of EIA The assessment is based on a methodology derived from IEMA guidance, DMRB guidance (as listed in **Table 10-1**) and professional judgement and expertise.

Assessment Criteria

10.4.7 Sensitivity criteria are based on both the likely effect on a receptor due to a particular activity, as well as the importance of the resource under consideration or designated value of the receptor.

10.4.8 The magnitude of potential impact is the potential effect in relation to the resource that has been evaluated, quantified using the scale high, medium, low or negligible. Timing, scale, size and duration of a potential impact are considered.

10.4.9 The receptor sensitivity and magnitude of potential impact criteria described in this section are considered appropriate for the prevailing conditions in the PEIR Boundary.

Receptor Sensitivity

Non-Peat Receptors

10.4.10 The sensitivity of affected receptors has been considered on a scale of high, medium, low or negligible.

10.4.11 Sensitivity criteria are based on both the ability of a receptor to accommodate the anticipated impact of the likely changes and the importance of the resource under consideration or designated value of the receptor (e.g. a designated area of international or national importance has a higher value and therefore higher sensitivity than other areas of lower status). Evaluation of the sensitivity of receptors for Hydrology, Hydrogeology, Geology and Peat requires a considerable degree of judgement, based on defined characteristics and values of the receptors (as set out in **Table 10-7**) and professional experience.

10.4.12 The sensitivity criteria used in the preliminary assessment are presented in **Table 10-7**.

Table 10-7: Sensitivity Criteria

Sensitivity of Receptor	Definition
High	• Private water supply abstraction for human or stock consumption (surface water or groundwater). • Public drinking water supply abstraction (surface or groundwater) and SPZ. • Surface water classified under the WFD as ‘high’ (or equivalent older chemical or biological monitoring designation). • Groundwater classified under the WFD as ‘good’. • Watercourse known to have fish spawning grounds. • Groundwater vulnerability to pollution is classified as high.

Sensitivity of Receptor	Definition
	• Internationally or nationally designated ecological sites (Special Protection Area (SPAs), SACs, Site of Special Scientific Interest (SSSIs) and National Nature Reserves). • Habitats listed in Regional Biodiversity Action Plans or Annex I habitats that are groundwater dependent. • Internationally important species sensitive to hydrological change. • Essential Infrastructure or Highly Vulnerable development (Annex 3, NPPF), members of the public using National Trails and other publicly accessible tracks and footpaths and YWS and UUW staff attending their assets (in the context of flood risk) • Existing infrastructure (in the context of peat slide).
Medium	• Private water supply abstraction not for human or stock consumption (surface water or groundwater). • Public non-drinking water supply abstraction (surface water or groundwater). • Watercourses that are known to supply and are within 1km of a public water supply reservoir. • Surface water classified under the WFD as 'good', 'moderate', 'poor' or 'bad' (or equivalent older chemical or biological monitoring designation). • Groundwater classified under the WFD as 'moderate' or 'poor'. • Watercourse known to support an important fishery population. • Groundwater vulnerability to pollution is classified as medium to high. • Ecological sites designated at a regional level. • Other water-dependent habitats (not covered above under 'high'). • More Vulnerable development (Annex 3, NPPF) (in the context of flood risk) • Foul drainage network with insufficient capacity to receive flows from a development, where additional foul flows would lead to flooding / releases to the environment. • Users of the estate tracks (in the context of peat slide). • Dwellings or other frequently used buildings (in the context of peat slide).
Low	• Ecological sites designated at a local level. • Watercourses that supply a public water supply reservoir but are >1km distant. • Watercourses not connected to a public water supply reservoir and are not classified under WFD. • Tributaries to the watercourses known to supply a public water supply reservoir. • Groundwater vulnerability to pollution is classified as medium.

Sensitivity of Receptor	Definition
	• Less Vulnerable development (Annex 3, NPPF), and construction staff and operational staff attending the Proposed Development (in the context of flood risk).
Negligible	• Groundwater vulnerability to pollution is classified as low. • Water Compatible Development (Annex 3, NPPF) (in the context of flood risk). • Foul drainage network with sufficient capacity (current or planned for) to receive flows from the Proposed Development; therefore, not envisaged to result in flooding / releases to the environment.

Peat Receptors

10.4.13 In addition to the criteria set out in **Table 10-7**, assessment of the sensitivity of peat is based on the degree to which the peatland in its baseline condition has been degraded by natural or man-made activities. Uneroded, open peatland without evidence of drainage is considered to be of highest sensitivity, while peatlands degraded by forestry, drainage or erosion are considered to have a poorer baseline condition. A depth criterion is also applied, in which deeper peats are considered to hold more carbon (for which peat volume is a proxy) and are more likely to exhibit a functional hydrological system, with associated flood regulation benefits. **Plate 10-1** illustrates this approach with the sensitivity classification for each degradation and depth combination provided below the associated image, coloured using Red-Amber-Green (RAG) styling.

10.4.14 Any assessment regarding peat resource considers the peat as a carbon store and therefore the following forms the basis for the assessment of sensitivity.

10.4.15 The assessment of sensitivity does not take into account vegetation (e.g. botanical species) or designation (e.g. as an SAC or SSSI). These aspects are considered, as appropriate, within the ecological impact assessment presented in **Chapter 8: Biodiversity**.

10.4.16 The sensitivity of a Proposed Development related to peat is therefore based on the percentage of its infrastructure on each category of peat, as follows:

- High: >25% of the infrastructure is located on peat with depth >2.0m in open terrain or >3m in forestry, densely drained, eroded, gullied or intact open terrain;
- Medium: >25% of infrastructure is located on peat with depth between 1.0m and 2.0m in open and undegraded terrain or >2.0m in forestry, densely drained, eroded or gullied open terrain;

- Low: >25% of infrastructure located on peat with depth between 0.3 m and 1.0 m in open terrain or 1.0m and 2.0m in forestry, densely drained, eroded or gullied open terrain; and
- Negligible: >75% of the infrastructure is located on non-peat or shallow peaty / organic rich soils less than <0.3m in depth or peat <1.0m in forestry, densely drained, eroded or gullied open terrain.

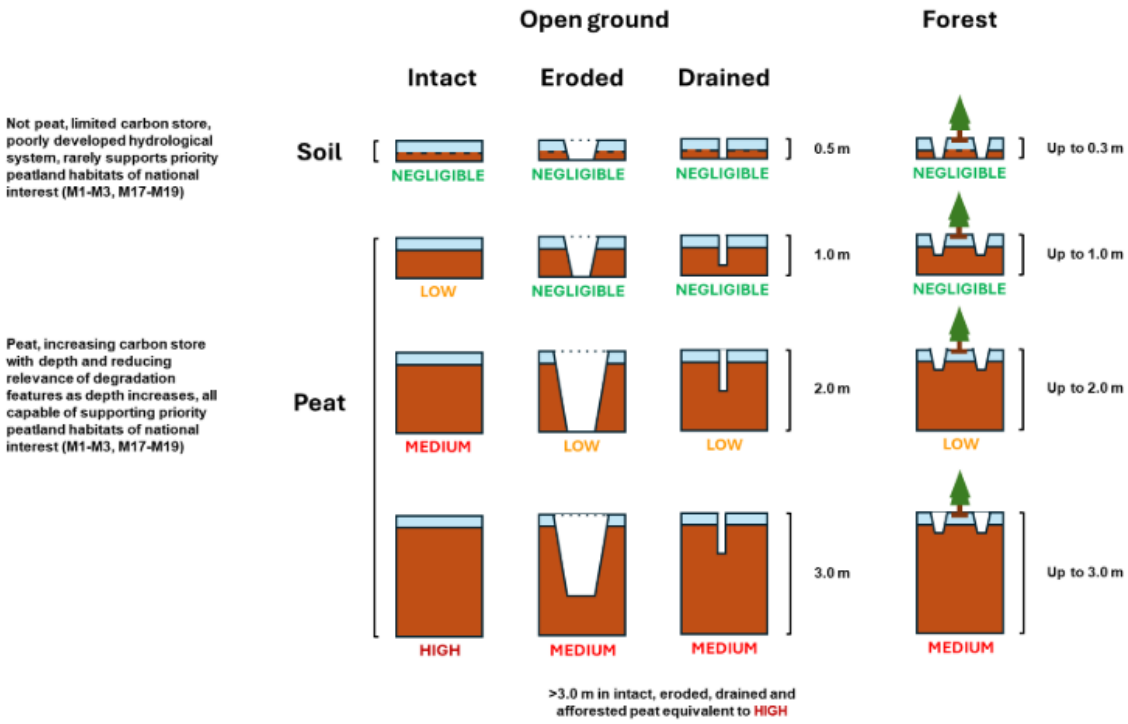

Plate 10-1: Peat Sensitivity

Assessment of the Magnitude of Potential Impact

Assessment of the Magnitude of Potential Impact on Non-Peat Receptors

10.4.17 The magnitude of the potential impact has been assessed based on the location of the receptor and the proximity of operational infrastructure or construction activity taking place. The criteria for the assignment of the magnitude of potential impacts are provided in **Table 10-8**.

Table 10-8: Magnitude of Potential Impacts Criteria

Magnitude of Potential Impacts	Definition
High	• Impact resulting in loss of feature or use.

Magnitude of Potential Impacts	Definition
	• Fundamental (long-term or permanent) changes to surface water, groundwater and geology (in terms of quantity, quality and morphology). • Excavated peat volume associated with the infrastructure footprint and associated earthworks is = / >10% of the peat volume across the peat survey area within a site. • Large change in peak flood level (in the context of flood risk).
Medium	• Impact resulting in loss of part (<10%) of feature or use. • Substantial but non-fundamental and short to medium term changes to the surface water, groundwater and geology (in terms of quantity, quality and morphology). • Excavated peat volume associated with the infrastructure footprint and associated earthworks is = / >5% and <10% of the peat volume across the peat survey area within a site. • Moderate change in peak flood level (in the context of flood risk).
Low	• Impact on feature or use. • Detectable but non-fundamental and temporary changes to the surface water, groundwater and geology (in terms of quantity, quality and morphology). • Excavated peat volume associated with the infrastructure footprint and associated earthworks is = / >2% and <5% of the peat volume across the peat survey area within a site. • Small change in peak flood level (in the context of flood risk).
Negligible	• Impact but of insufficient magnitude to affect feature or use. • No perceptible changes to the surface water, groundwater, and geology (in terms of quantity, quality, and morphology). • Excavated peat volume associated with the infrastructure footprint and associated earthworks is <2% of the peat volume across the peat survey area within a site. • Negligible change in peak flood level (in the context of flood risk).

Assessment of the Magnitude of Potential Impact on Peat Receptors

10.4.18 As noted in **Table 10-8**, the assessment of the magnitude of potential impact in relation to peat is based on the absolute volume of peat calculated to be disturbed by the Proposed Development as a proportion of the total onsite resource, with this latter value based on the full volume of peat calculated across the surveyed peat area. The threshold values (2%, 5% and 10%) reflect an increasing magnitude of potential impact. Importantly, for the assessment to be upheld, the assumption is that any excavated peat has an appropriate reuse specified within the Peat Management Plan (PMP), Habitat Management and Monitoring Plan (HMMP), or these documents in combination. Where this is not the case, significant effects cannot be ruled out at this stage.

Significance of Effect

10.4.19 The predicted significance of the effect has been determined through the combination of sensitivity of the receptor and the magnitude of potential impact, as detailed in **Table 10-9**, alongside professional judgement.

Table 10-9: Significance Criteria

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

10.4.20 Major and moderate effects are considered to be significant. Minor effects are considered to be not significant. Where the significance of the effect is assessed as being moderate or above, site-specific additional mitigation is required.

10.4.21 In addition to determining the significance of the effect, the assessment process also includes a qualitative description regarding the nature of the effect, as outlined in **Table 10-10**. These terms add information about how the effect will affect receptors.

Table 10-10: Nature of Effect Descriptors

Term	Nature of Effect Descriptors
Adverse	An effect which has the potential to decrease receptor value or status relative to baseline conditions.
Beneficial	An effect which has the potential to increase receptor value or status relative to baseline conditions.

Term	Nature of Effect Descriptors
Short-term	Effects that persist only for a short time (e.g. during the construction (or decommissioning) phase only); includes reversible effects.
Medium-term	Effects that may persist until additional mitigation measures have been implemented and become effective.
Long-term	Effects that persist for a much longer time (e.g., for the duration of the operational phase (essentially until the development ceases or is removed/ reinstated)); includes effects which are permanent (irreversible) or which may decline over longer timescales.
Temporary	A reversible effect where recovery is possible and for which effects would persist only for a short or medium-term.
Frequent	Refers to a recurring effect that occurs repeatedly; in some cases, a lower level of impact may occur with sufficient frequency to reduce the ability of a receptor to recover effectively.

Limitations and Assumptions

10.4.22 The following limitations and assumptions have been identified at this stage:

- The PEIR assessment focuses on the Turbine Area where the infrastructure is planned. A detailed assessment for the Access Routes and Bradford West Cable Corridor will be provided for the ES. However, a preliminary assessment of likely significant effects has been provided as part of this Chapter;
- Consideration of onsite topography has been based on EA 1m Light Detection and Ranging (LiDAR) (2022);
- Floods are natural occurrences and the risks they pose are wide ranging. With regards to flood risk specifically, the assessment is primarily concerned with the risk to people and property from nearby fluvial watercourses, as well as flooding from other sources including surface water (pluvial) flooding, groundwater flooding, foul water and flooding from artificial sources;
- Hydraulic models are a simplified representation of reality and are based on a series of estimates and assumptions. Datasets supplied by the EA will be used to inform the FRA and surface water modelling will be undertaken in accordance with EA guidelines (these will be set out in the full FRA);
- The PEIR assessment focuses on desk-based studies for public and private water supply information. However, at this stage, it is dependent on UUW and YWS asset plans and the Local Authority records being accurate. Further consultation will be undertaken with UUW and YWS for the ES and where required, local residents for Private Water Supplies;

- Peat depth probing will be undertaken at required densities and verified by representative coring. However, peat depth models will, out of necessity, interpolate across areas where probing frequencies will be up to 100m apart;
- Baseline conditions such as surface water flow and visible groundwater emergence are subject to seasonal variation and may not be fully captured during proposed site visits. While observations will be made under varying weather conditions, temporary or ephemeral features may be undetected;
- Further stakeholder engagement is ongoing and further peat, hydrological features and GWDTEs surveys will be required; and
- In the absence of relevant English guidelines in relation to wind farm developments, the following Scottish guidelines will be adopted as they are considered to be the most established and tested guidance to date:
    - Peatland Survey: Guidance on Developments on Peatland (Scottish Government, Scottish Natural Heritage, SEPA 2017);
    - Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, April 2017);
    - Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Land Use Planning System SEPA Guidance Note 31 (SEPA, 2017); and
    - Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems (SEPA 2024); and
    - Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables & SEPA, 2012).

10.5 Baseline Conditions

Existing Baseline

Topography Land Cover and Land Use

Turbine Area

10.5.1 The Turbine Area is described in **Chapter 3: Description of the PEIR Boundary and Surrounding Area** and shown in **Figure 3-2**. The Turbine Area consists of approximately 2,227.35ha of open moorland at Walshaw Moor, located on either

side of the three Walshaw Dean Reservoirs (though these lie outside of the PEIR Boundary), north of Hebden Bridge, West Yorkshire.

10.5.2 The majority of the Turbine Area is located within the administrative boundary of Calderdale Council. Small areas of the northwestern Turbine Area are located within the administrative boundary of Pendle Council and a small portion of the northeastern Turbine Area is located within the administrative boundary of Bradford Council.

10.5.3 Walshaw Moor is a prime grouse shooting site and a habitat for several species of endangered ground-nesting birds such as curlew, golden plover, lapwing and snipe. There are several grouse butt structures and associated drainage ditches across the Turbine Area.

10.5.4 The majority of the Turbine Area forms the catchment of the Walshaw Dean Reservoirs and Widdop Reservoir that are used for public water supply and storage by YWS.

Bradford West Cable Corridor

10.5.5 The Bradford West Cable Corridor will link the Turbine Area with the Point of Connection at the Bradford West Substation. The Bradford West Cable Corridor is located within the administrative boundaries of Bradford Council and Calderdale Council (see **Chapter 3: Description of the PEIR Boundary and Surrounding Area**). The location of the Bradford West Cable Corridor is shown in **Figure 3-3.**

10.5.6 The Bradford West Cable Corridor runs from high ground to the east of the Turbine Area at a level of approximately 430m above ordnance datum (AOD) to the Bradford West Substation, which is located at a level of approximately 265m AOD. The Corridor crosses areas of relatively high ground associated with areas downslope of Oxenhope Moor and Thornton Moor and crosses a low point of approximately 215m AOD associated with Denholme valley.

10.5.7 A section of the route from the A6033 Hebden Bridge Road crosses upland moor, to the north / down gradient of a man-made conduit, then along the Calder / Aire Link along much of it, north of Thornton Moor Reservoir and across agricultural fields in the east. The land use becomes more urban and developed further towards the east.

Access Routes

10.5.8 There will be access from the east and west into the Turbine Area. All of the proposed access routes are described in **Chapter 3: Description of the PEIR Boundary and Surrounding Area** and shown in **Figures 3-4** and **3-5**.

10.5.9 The Western Access Route will be the main AIL route and will run from the A6068 across agricultural fields onto Two Laws Road or crossing Two Laws Road (there are currently two options), and onto a new section of access track, into the Turbine Area. This initial section of the track from the A6068 will use an existing watercourse crossing and access track to the UUW underground reservoir before crossing agricultural fields. South of the Two Laws Road, it will pass to the west of Watersheddles Reservoir and over open moorland to the Turbine Area.

10.5.10 The Eastern Access Route will run off the A646, before the junction with the A58 to Halifax, travelling in a northwest direction towards the A6033 near Oxenhope, before leaving the A6033 to cross into the Turbine Area via an existing minor road.

10.5.11 The Western Access Route is located within the administrative boundaries of Calderdale Council, Pendle Council and Lancashire County Council. The Eastern Access Route is located within the administrative boundaries of Calderdale Council and Bradford Council.

Hydrological Setting

10.5.12 The hydrological Study Area is presented in **Figure 10-1** with the main hydrological catchments. The hydrological setting of the PEIR Boundary is presented in **Figure 10-2,** and the WFD catchments are shown in **Figure 10-3**. Further information on the baseline hydrological regime within the PEIR Boundary is provided in the following sections.

Hydrology – Turbine Area

Hydrological Catchments

10.5.13 Online EA information (Catchment Data Explorer) indicates that the vast majority of the Turbine Area lies within the Aire and Calder Management Catchment of the Humber River Basin District and is within the Calder Upper Operational Catchment. A number of sub-catchments drain the Turbine Area to the south into the Hebden Water, which ultimately discharges to the River Calder (Yorkshire) at Hebden Bridge. The sub-catchments are described as follows:

- The western part of the Turbine Area drains to the south via a dense network of tributaries to Greave Clough. The majority of Greave Clough is culverted into the Widdop Reservoir (drinking water supply) south of the Turbine Area via Greave Clough Conduit and overflow discharges into the Graining Water before becoming the Hebden Water at the confluence with Alcomden Water. The section of Greave Clough south of the conduit flows into Alcomden Water south of the Turbine Area, which becomes the Hebden Water at the confluence with the Graining Water;

- The central sub-catchment area has fewer surface watercourses and contains the three Walshaw Dean Reservoirs (Walsham Dean Upper, Middle and Lower Reservoirs used for drinking water supplies), which are all linked and discharge to Alcomden Water; and
- The extreme eastern sub-catchment of the Turbine Area drains into Crimsworth Dean Beck, which flows southwards and joins Hebden Water approximately 1km upstream of Hebden Bridge.

10.5.14 A small area in the far west of the Turbine Area drains west to Thursden Brook and on to the River Brun, through Burnley. This portion of the Turbine Area is located within the Ribble Management Catchment of the North West River Basin District and is within the Calder Operational Catchment.

10.5.15 The northeastern boundary of the Turbine Area broadly follows the watershed between the catchment that drains much of the Turbine Area to the Hebden Water catchment and the watercourses to the north (the River Worth and Bridgehouse Beck) that ultimately drain into the River Aire. The PEIR Boundary does marginally cross into the catchments of the watercourses to the north, all of which drain to the north and ultimately discharge into the River Worth via the Ponden, Lower Laithe and Leeshaw Reservoirs. These watercourses are located within the Aire and Calder Management Catchment of the Humber River Basin District and are within the Aire Middle Operational Catchment.

Artificial Water Features and Management

10.5.16 The Turbine Area is drained by hundreds of kilometres of gullies formed by erosion and artificial drains cut to improve (dry) the land. A number of these surface drainage features have been restored under the WMECRP. A detailed breakdown of restored and unrestored lengths of surface drainage features will be provided within the ES.

10.5.17 The Walshaw Dean Reservoirs were completed in 1913 to provide water to the town of Halifax. Whilst they are excluded from the PEIR Boundary, the PEIR Boundary encircles them. These features are YWS assets and are designated as WFD Water Bodies by the EA.

10.5.18 The Walshaw Dean Reservoirs flow into one another, from the Upper, through the Middle and Lower, and ultimately discharge to Alcomden Water or are taken off to feed the potable water network. YWS manages the release of flows from the reservoirs to Alcomden Water.

10.5.19 Similarly, Widdop Reservoir was completed in the 1870s to supply water to Halifax and is also designated as a WFD Water Body by the EA. Widdop Reservoir is located just southwest of the PEIR Boundary. This infrastructure is fed by

watercourses that drain the Turbine Area. The natural catchment of Widdop Reservoir is relatively small, and to supply the reservoir with larger volumes of water, a conduit was built to divert flows from Greave Clough, which drains the western part of the Turbine Area.

10.5.20 Greave Clough was historically dammed to collect and convey flows west. Two penstocks, operated by YWS, are present to allow intake to be diverted from Greave Clough to Widdop Reservoir. YWS have confirmed that under normal conditions, flows from this watercourse are diverted to Widdop Reservoir via the penstock / culvert, and a conditioning flow continues south in Greave Clough, which discharges to Graining Water.

10.5.21 The Greave Clough to Widdop Reservoir conduit is a YWS asset and conveys flows in a southwesterly and westerly direction. At approximately its midpoint, the tunnel runs as an open channel for approximately 20m as it changes direction. In this location, the Pig Hole Dyke is allowed to flow into the channel by means of a leaping weir. Flow can be allowed to continue down the route of the original watercourse by making manual alterations to the weir to prevent water from dropping into the artificial channel. YWS operates this infrastructure.

10.5.22 Identified watercourses and water features are shown in **Figure 10-9**.

Water Quality (WFD Water Bodies)

10.5.23 The EA designated WFD surface water bodies within the Turbine Area or with direct connectivity with the Turbine Area are listed in **Table 10-11**. This information has been sourced from the EA's Catchment Data Explorer. The locations of the associated WFD catchments are shown in **Figure 10-3**.

Table 10-11: Turbine Area WFD Surface Water Body Status

Information from the EA's Catchment Data Explorer		
WFD Water Body	**Ecological Status**	**Chemical Status**
Walshaw Dean Upper Reservoir (GB30430563)	Moderate (2019)	Does Not Require Assessment (2022)
Walshaw Dean Middle Reservoir (GB30430575)	Moderate (2019)	Does Not Require Assessment (2022)
Walshaw Dean Lower Reservoir (GB30430594)	Moderate (2019)	Does Not Require Assessment (2022)
Widdop Reservoir (GB30430604)	Moderate (2019)	Does Not Require Assessment (2022)
Graining Water (GB104027062840)	Moderate (2022)	Does Not Require Assessment (2022)

Information from the EA's Catchment Data Explorer		
WFD Water Body	**Ecological Status**	**Chemical Status**
Alcomden Water (GB104027062850)	Good (2022)	Does Not Require Assessment (2022)
Crimsworth Dean Beck (GB104027062820)	Moderate (2022)	Does Not Require Assessment (2022)
Bridgehouse Beck (GB104027064200)	Moderate (2022)	Does Not Require Assessment (2022)
Worth (GB104027064210)	Moderate (2022)	Does Not Require Assessment (2022)

10.5.24 Further information on the baseline conditions of the relevant WFD water bodies will be provided within the screening assessment as required by the WFD and associated implementation instruments ("WFD Screening Assessment"), which will be produced to support the ES.

Drinking Water Protected Areas

10.5.25 The Walshaw Dean Reservoirs and Widdop Reservoir are designated as Surface Water Drinking Water Protected Areas by the EA. The Upper and Lower Walshaw Dean Reservoirs are classified as 'Currently Not at Risk', whilst Widdop Reservoir and the Middle Walshaw Dean Reservoir are classified as 'At Risk' of failing drinking water protection objectives of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. A WFD Screening Assessment will be completed as part of the ES.

10.5.26 Surface Water SGZs are defined as catchment areas that influence the water quality for their respective Drinking Water Protected Area. SGZs are identified where the Protected Area is classified as "at risk" of failing the WFD drinking water protection objectives. These are shown in **Figure 10-2**.

10.5.27 Much of the Turbine Area (associated with the catchments of Greave Clough and Alcomden Water) is located within the Hebden Water SGZ (SWSGZ6203).

River Flows

10.5.28 Historic streamflow data is available from the NRFA website for gauging station 27012 - Hebden Water at High Greenwood, which was in operation between 1954 and 1973 and is located approximately 800m downstream of the Turbine Area boundary. The mean flow recorded was 0.698m^3/s. No peak flow data is available.

10.5.29 River level information is also available on the Shoothill GaugeMap for the 'Nutclough' gauge on Hebden Water, located just downstream of Victoria Road

bridge at Nutclough Mill in Hebden Bridge, approximately 4km south of the Turbine Area. This station was opened in 2000 and reports a typical range of between 100.7m AOD and 101.8m AOD.

Hydrology – Western Access Route

Hydrological Catchments

10.5.30 Online EA information (Catchment Data Explorer) indicates that the majority of the Western Access Route lies within the Ribble Management Catchment of the North West River Basin District, within the Colne Water Operational Catchment. A small portion of the Western Access Track, south of Two Laws Road, is located within the Aire and Calder Management Catchment of the Humber River Basin District, within the Aire Middle and Calder Upper Operational Catchments.

10.5.31 The majority of the Western Access Route falls within the catchments of the Wycoller Beck and River Laneshaw, which flow to the west and form a confluence at Laneshaw Bridge and continue westwards as Colne Water.

10.5.32 A small portion of the Western Access Track south of Two Laws Road is located within the catchment of Watersheddles Reservoir, which is located approximately 70m east of the PEIR Boundary at its closest point. Watersheddles Reservoir discharges to the River Worth, which flows east into Ponden Reservoir.

10.5.33 Finally, the southern extent of the Western Access Track, where it abuts the Turbine Area, is located upstream of the Walshaw Dean Upper Reservoir, which as described above discharges to Alcomden Water.

Artificial Water Features and Management

10.5.34 There are no artificial watercourses or water bodies within the majority of the Western Access Route. However, there are a number of existing culverts beneath Two Laws Road / Lancashire Moor Road that convey flows south / southwest beneath the highway.

10.5.35 Flows within the River Laneshaw are assumed to be managed to some degree, given the presence of Laneshaw Reservoir upstream of the PEIR Boundary.

10.5.36 The southern extent of the Western Access Route, where it reaches the moorland, is drained by a network of gullies and artificial drains. A portion of these surface drainage features has been restored under the WMECRP. A detailed breakdown of restored and unrestored lengths of surface drainage features will be provided within the ES.

Water Quality (WFD Water Bodies)

10.5.37 The EA designated WFD Surface Water Bodies within the Western Access Route or within direct connectivity with the Western Access Route are listed in **Table 10-12**. This information has been sourced from the EA's Catchment Data Explorer. The associated WFD catchments are shown in **Figure 10-3**.

Table 10-12: Western Access Route WFD Surface Water Body Status

Information from EA's Catchment Data Explorer		
WFD Water Body	**Ecological Status**	**Chemical Status**
Colne Water (Laneshaw) (GB112071065210)	Moderate (2019)	Does Not Require Assessment (2022)
Wycoller Beck (GB112071065180)	Good (2022)	Does Not Require Assessment (2022)
Worth (GB104027064210)	Moderate (2022)	Does Not Require Assessment (2022)
Watersheddles Reservoir (GB30430471)	Moderate (2019)	Does Not Require Assessment (2022)
Walshaw Dean Upper Reservoir (GB30430563)	Moderate (2019)	Does Not Require Assessment (2022)

10.5.38 Further information on the baseline conditions of the relevant WFD water bodies will be provided within the screening assessment as required by the WFD and associated implementation instruments ("WFD Screening Assessment"), which will be produced to support the ES.

Drinking Water Protected Areas

10.5.39 As stated previously, Walshaw Dean Upper Reservoir is designated as a Surface Water Drinking Water Protected Area and is classified as 'Currently Not at Risk'.

10.5.40 Watersheddles Reservoir is designated as a Surface Water Drinking Water Protected Area and is 'At Risk'. While Watersheddles Reservoir is not located within the PEIR Boundary, the Western Access Route crosses the Oldfield SGZ (SWSGZ6003), which is located north of the Turbine Area and extends to Great Wolf Stones on the opposite side of the Watersheddles Reservoir valley. Further information in relation to Drinking Water Protected Areas will be provided within the WFD Screening Assessment prepared to support the ES.

River Flows

10.5.41 The Shoothill GaugeMap indicates that the nearest gauging station to the Western Access Route is Carry Bridge on the Colne Water. This station is located south of

Colne Cemetery, approximately 5km downstream of the proposed crossings of the River Laneshaw, Hullown Beck and Ratten Clough. This station was opened in 2009 and reports a typical range of between 143.8m AOD and 145.1m AOD.

Hydrology – Eastern Access Route

Hydrological Catchments

10.5.42 The Eastern Access Route lies within the Aire and Calder Management Catchment of the Humber River Basin District, within the Aire Middle, Calder Upper, and Calder Middle Operational Catchments.

10.5.43 The Eastern Access Route crosses several watercourses, including:

- Great Grough Hole;
- An unnamed tributary of the Rag Clough Beck;
- The Thornton Moor Conduit is crossed by Hebden Bridge Road and Nab Water Lane (proposed to be utilised as part of the Eastern Access Route) and runs parallel to the proposed access track for approximately 950m;
- The Hard Nese Clough;
- An unnamed tributary of Leeming Water;
- Nan Scar Beck runs parallel to Nab Water Lane, which will form part of the proposed access track, for approximately 500m;
- An unnamed tributary of Thornton Moor Conduit;
- An unnamed tributary of Warley Moor Reservoir; and
- An unnamed tributary of Haigh Cote Dam.

10.5.44 The majority of watercourses and catchments crossed by the Eastern Access Route drain to the north and ultimately discharge to Bridgehouse Beck. The Thornton Moor Conduit discharges to Thornton Moor Reservoir and the southern extent of the Eastern Access Route drains to Warley Moor Reservoir. The western extent of the Eastern Access Route is located in the catchment of Crimsworth Dean Beck.

Artificial Water Features and Management

10.5.45 The Thornton Moor Conduit is crossed twice by the Eastern Access Route and runs parallel (upslope) to the route for approximately 950m. The Thornton Moor Conduit was built in 1885 and acts as a catchwater. It is a YWS asset that consists of a man-made channel, approximately 8km in length. The conduit collects water from

the upper catchment of Bridgehouse Beck and conveys flows to the east, to feed Thornton Moor Reservoir.

Water Quality (WFD Water Bodies)

10.5.46 The EA designated WFD Surface Water Bodies within the Eastern Access Route or within direct connectivity with the Eastern Access Route are listed in **Table 10-13**. This information has been sourced from the EA's Catchment Data Explorer. The associated WFD catchments are shown in **Figure 10-3**.

Table 10-13: Eastern Access Route WFD Surface Water Body Status

EA's Catchment Data Explorer		
WFD Water Body	**Ecological Status**	**Chemical Status**
Crimsworth Dean Beck (GB104027062820)	Moderate (2022)	Does Not Require Assessment (2022)
Bridgehouse Beck (GB104027064200)	Moderate (2022)	Does Not Require Assessment (2022)
Thornton Moor Reservoir (GB30430596)	Moderate (2019)	Does Not Require Assessment (2022)
Warley Moor Reservoir (GB30430621)	Moderate (2019)	Does Not Require Assessment (2022)
Leeming Reservoir (GB30430571)	Moderate (2019)	Does Not Require Assessment (2022)

10.5.47 Further information on the baseline conditions of the relevant WFD water bodies will be provided within the screening assessment as required by the WFD and associated implementation instruments ("WFD Screening Assessment"), which will be produced to support the ES.

Drinking Water Protected Areas

10.5.48 The Eastern Access Route is not located within any Surface Water Drinking Water Protected Area. However, Thornton Moor Reservoir and Warley Moor Reservoir are designated as Surface Water Drinking Water Protected Areas and are classified as 'At Risk' and 'Currently Not at Risk', respectively.

10.5.49 The northern part of the Eastern Access Route is located within the Chellow Heights SGZ (SWSGZ6002) associated with Thornton Moor Reservoir and Stubden Reservoir. The southern portion of the Eastern Access Route is located within the Hebden Water SGZ (SWSGZ6203).

River Flows

10.5.50 The Shoothill GaugeMap indicates that the nearest gauging station to the Eastern Access Route is Oxenhope on Leeming Water. This station is located downstream of Leeming Reservoir, approximately 1km downstream of the PEIR Boundary at its closest point. This station was opened in 2006. Further information is being obtained regarding levels for this station with the data provider.

Hydrology – Bradford West Cable Corridor

Hydrological Catchments

10.5.51 The entirety of the Bradford West Cable Corridor is located within the Aire and Calder Management Catchment of the Humber River Basin District, within the Aire Middle Operational Catchment, with the exception of the western tip of the corridor where it connects to the Turbine Area, which is located within the Calder Upper Operational Catchment.

10.5.52 The western part of the Bradford West Cable Corridor up to Nan Scar Beck follows the same alignment as the Eastern Access Route, and therefore crosses the same first six watercourses, which all ultimately discharge to Bridgehouse Beck:

- Great Grough Hole;
- An unnamed tributary of Rag Clough Beck;
- Thornton Moor Conduit;
- Hard Nese Clough;
- An unnamed tributary of Leeming Water; and
- Nan Scar Beck.

10.5.53 East of Nan Scar Beck, the Bradford West Cable Corridor diverges from the Eastern Access Route and continues east, crossing a series of tributaries that feed Leeming Reservoir / Leeming Water and potentially have some connectivity with the Sugden Conduit. The Bradford West Cable Corridor also crosses Sugden Conduit itself just north of Thornton Moor Reservoir, a series of small drainage ditches south of Long Causeway and Denholme Beck, which flows into Harden Beck.

Artificial Water Features and Management

10.5.54 Thornton Moor Conduit is crossed twice by the Bradford West Cable Corridor and runs parallel (upslope) to the corridor for approximately 950m. As described above, Thornton Moor Conduit acts as a catchwater and supplies Thornton Moor Reservoir.

10.5.55 Sugden Conduit is also a YWS asset and supplies water to Stubden Reservoir, which is located approximately 650m southeast of the Bradford West Cable Corridor. Sugden Conduit follows a similar route to Thornton Moor Conduit, albeit approximately 60m downslope. Sugden Conduit acts as a catchwater and runs in an open channel for the majority of its length. However, Sugden Conduit is below ground for approximately 1.5km, where it crosses beneath Thornton Moor Road (and the route of the Bradford West Cable Corridor).

Water Quality (WFD Water Bodies)

10.5.56 The EA designated WFD Surface Water Bodies within the Bradford West Cable Corridor or within direct connectivity with the Bradford West Cable Corridor are listed in **Table 10-14**. This information has been sourced from the EA's Catchment Data Explorer. The associated WFD catchments are shown in **Figure 10-3**.

Table 10-14: Bradford West Cable Corridor WFD Surface Water Body Status

EA's Catchment Data Explorer		
WFD Water Body	**Ecological Status**	**Chemical Status**
Crimsworth Dean Beck (GB104027062820)	Moderate (2022)	Does Not Require Assessment (2022)
Bridgehouse Beck (GB104027064200)	Moderate (2022)	Does Not Require Assessment (2022)
Harden Beck (GB104027062870)	Moderate (2022)	Does Not Require Assessment (2022)
Thornton Moor Reservoir (GB30430596)	Moderate (2019)	Does Not Require Assessment (2022)
Stubden Reservoir (GB30430598)	Moderate (2019)	Does Not Require Assessment (2022)
Leeming Reservoir (GB30430571)	Moderate (2019)	Does Not Require Assessment (2022)

10.5.57 Further information on the baseline conditions of the relevant WFD water bodies will be provided within the screening assessment as required by the WFD and associated implementation instruments ("WFD Screening Assessment"), which will be produced to support the ES.

Drinking Water Protected Areas

10.5.58 The Bradford West Cable Corridor is not located within any Surface Water Drinking Water Protected Areas. However, Thornton Moor Reservoir and Stubden Reservoir are designated as Surface Water Drinking Water Protected Areas and are classified as 'At Risk'. The western part of the Bradford West Cable Corridor is located within

the Chellow Heights SGZ (SWSGZ6002), associated with the Thornton Moor Reservoir and Stubden Reservoir.

River Flows

10.5.59 The Shoothill GaugeMap indicates that the nearest gauging station to the western portion of the Bradford West Cable Corridor is Oxenhope on Leeming Water. There are no gauges on the Denholme Beck.

Designated Sites

10.5.60 The Turbine Area lies within the following terrestrial ecology-related designations, which are shown in **Figure 10-4**:

- South Pennine Moors SAC - designated for European dry heaths, blanket bogs and old sessile oak woods; and
- South Pennine Moors SSSI - designated for breeding birds, upland moorland, grassland and upland bog (including blanket bog) and geological significance (Namurian strata).

10.5.61 As shown in **Figure 10-4**, the Western Access Route is partly within the South Pennine Moors SAC and SSSI from the Turbine Area and along the Two Laws Road. The Eastern Access Route is partly within the South Pennine Moors SAC and SSSI for the section from Moor Close Hill to Knoll Hill, for approximately 3km. The section of the Bradford West Cable Corridor from the Turbine Area to Moor Close Hill, approximately 2.5km in length, lies within the South Pennine Moors SAC and SSSI.

10.5.62 The above designations reflect the nationally and regionally important moorland breeding bird assemblage and nationally important breeding population of curlew, internationally important breeding populations of merlin, golden plover and twite; and nationally and internationally important habitats such as blanket bog, wet and dry heath, species-rich acid flushes and mires and acid grassland. Further details are provided in **Chapter 8: Biodiversity** and **Chapter 9: Ornithology**.

10.5.63 As the Proposed Development lies within the above designations, a separate Habitat Regulations Assessment (HRA) is being carried out.

Meteorological Summary

10.5.64 The nearest meteorological station to the PEIR Boundary is Bradford station[45] situated 12.7km to the northeast, with grid reference 414900, 435200 and an

[45] metoffice.gov.uk/pub/data/weather/uk/climate/stationdata/bradforddata.txt.

elevation of 114m AOD. Monthly data between 1994 and 2024 shows an average annual rainfall of 939.5mm.

10.5.65 Rainfall data from a nearby station within the Hebden Water catchment at High Greenwood (Station 27012) and an approximate elevation of 280m AOD were obtained from the NRFA. Over the period between 1991 and 2020, the average annual rainfall was 1,397mm. This is higher than the value from the Bradford station, which lies within a different catchment and at a lower elevation than the Turbine Area, which may therefore be an underestimate. The NRFA information is considered more accurate due to its proximity to the Turbine Area, although its elevation may not be reflective of the highest areas.

Soils

10.5.66 A review of the available soil mapping (Soilscapes map for England and Wales) has identified that the majority of the Turbine Area is underlain by blanket bog peat soils, except for the valley sides and valley floors associated with reservoirs and watercourses, where the soil is loamy. There is a small area of alluvium in the south of the Turbine Area.

10.5.67 The Western Access Route is underlain by blanket peat soils along the section from the Turbine Area to the Lancashire Moor Road and low permeability loamy soils in the section from Lancashire Moor Road to where the Western Access Route joins the A6068. The Eastern Access Route is covered by upland soils and loamy soils, with no soil cover to the north of Halifax. The Bradford West Cable Corridor is covered by blanket peat soils where it joins the Turbine Area and the majority is covered by low permeability loamy soils, with no soil cover in and around Bradford.

Peat

Turbine Area

10.5.68 The England Peat Map (**Figure 10-6**) online mapping indicates that the Turbine Area is underlain predominantly by peat (no minimum depth definition but >50% organic matter) or shallower peaty soil (organic matter >20%). This corresponds with BGS 1:50K scale superficial geology data and the soil mapping for England and Wales, which show peat as the primary superficial deposit other than on steeper valley sides and in valley floors. There is a small area of alluvium in the south of the Turbine Area.

10.5.69 Both sets of online mapping data are superseded by site-specific Phase 1 probing data undertaken on a 100m grid over the majority of the Turbine Area and Phase 2 probing data undertaken on variable grids to reflect the infrastructure positions at this preliminary stage.

10.5.70 A peat model interpolated from both the Phase 1 and Phase 2 data confirms the presence of peat (>0.3m by the Soil Survey of England & Wales definition) over much of the Turbine Area, with depths generally greater than 1.0m and several areas >3.0m in depth. The interpolated peat depth map and probing locations are shown in **Figure 10-11**. Peat condition is highly variable across the Turbine Area, being a function of both natural geomorphological processes and management pressures.

Access Routes

10.5.71 The England Peat Map online mapping indicates that the Western Access Route is underlain by peat between the Turbine Area and Two Lane Road, after which it runs along an area between deeper and shallower peat with no peat in the area where the route joins the A6068.

Bradford West Cable Corridor

10.5.72 The England Peat Map online mapping indicates that the Bradford West Cable Corridor runs through and along the edge of an area of peat close to the Turbine Area and crosses shallower peat for more than half its length before crossing an area with no peat beneath.

10.5.73 Full results of the peat surveys completed to date (for this PEIR) are provided in **Appendix 10-2**. **Figures 10-10** and **10-11** show the peat depth distribution across the peat survey area.

10.5.74 Peatland habitats and the NVC ecological habitat are considered in **Chapter 8: Biodiversity.**

Peat Geomorphology and Condition

10.5.75 Geomorphological mapping of the Turbine Area has been undertaken using multi-epoch satellite imagery and high-resolution LiDAR digital terrain data, verified by reconnaissance walkover surveys. **Figure 10-4.7** shows the resulting geomorphological map.

10.5.76 In the west of the Turbine Area, extensive natural linear gully networks have eroded peat and act to focus drainage into the valley floors. Many of these gullies are revegetated with only partially bare gully sides and limited evidence of active erosion in their floors. On the Field of the Mosses, west of Greave Clough, many of these gullies are rooted in and possibly caused by headcut upslope from Cross Dyke, a large man-made ditch that runs northeast across the mid-slopes. Inter-gully areas vary in condition from fully vegetated to patchy coverage, with *sphagnum* species often lacking.

10.5.77 In the centre, north and east of the Turbine Area, extensive artificial drainage networks (moor drains or 'grips') have been cut into the peat at higher elevations, usually in areas where gullies are not already present. Drain spacings are typically 20m to 30m, and based on their geometry and pronounced edges, many were likely to have been actively incising, prior to restoration under the WMECRP. While restoration to slow water flows has taken place, vegetation recovery within the drains varies considerably. Gullying is extensive in these areas, and again, some linear gullies appear to be associated with a large man-made dyke extending south from Dick Delf Hill.

10.5.78 In the south and east of the Turbine Area, there is relatively extensive evidence of past peat cutting (possibly for fuel or horticultural end uses), grazing, burning and mowing / flailing to support habitat for game birds.

10.5.79 To the north and outside of the Turbine Area, there are two recorded peat landslides, one of which is known as the Crow Hill bog burst (Ross, 2020), though LiDAR data indicates no equivalent features within the Turbine Area. The Crow Hill bog burst took place in 1824. It is unclear whether the second landslide, located on Stanbury Bog, took place at the same time, although its morphology and degree of recovery are similar, implying that this is a possibility. There are no records of landslides within the Turbine Area.

10.5.80 Using NatureScot criteria for peatland condition assessment, the condition of peatland at the Turbine Area is interpreted as follows: where gullies are present, peatland condition varies between 'Actively Eroding' (where gully sides and / or floors are bare) and 'Drained' (where revegetated); where artificial drains are present, peatland condition corresponds to 'Drained' (post-restoration); where neither gullies nor drains are present in more expansive areas of planar peatland, the vast majority of peatland is 'Modified', this indicated by patchy bare peat, fire history, frequent impacts from grazing, cutting and dominance of heather and purple moor grass and relative sparsity of *sphagnum*.

10.5.81 Detailed mapping of the proposed infrastructure footprint and an associated buffer zone to identify any areas of near-natural peat or modified peat with near-natural features retained, so that these can be avoided, will be undertaken at the next design stage and will be presented as part of the ES.

Geology – Turbine Area

Drift Geology

10.5.82 Online 1:50K BGS superficial geology mapping shows that the majority of the Turbine Area is underlain by superficial peat deposits and elsewhere superficial deposits are absent. The superficial geology is shown in **Figure 10-7a**.

Solid Geology

10.5.83 Online 1:50K BGS solid geology mapping indicates the western area of the Turbine Area is underlain by the Upper Kinderscout Grit, consisting of Sandstone, and the Millstone Grit Group, consisting of Mudstone, Siltstone and Sandstone. In the area to the east, these deposits are overlain by the Woodhouse Flags, consisting of Sandstone and the Marsden Formation, consisting of Mudstone and Siltstone. The solid geology is shown in **Figure 10-8a**.

10.5.84 Some borehole records are available; most apparently relate to ground investigation holes drilled to investigate foundation conditions for the reservoirs and dam walls. One historical borehole record (SD93SW22) indicates depth to rock of 4.5m.

Structural Geology

10.5.85 BGS mapping shows a fault crossing the Turbine Area orientated northeast southwest, through the central part, close to the Walshaw Dean Reservoirs, with one perpendicular and running beneath the Lower Walshaw Dean Reservoir. A number of other faults cross the western and eastern parts of the Turbine Area, orientated northwest-southeast as shown in **Figure 10-8a**.

10.5.86 There are no GCR sites within the Turbine Area. The Turbine Area lies within 250m of Crimsworth Dean SSSI designated as a GCR area for its EW-Namurian geology, important as some of the best exposed sequences of non-marine Upper Carboniferous strata anywhere in Europe[46].

Quarries and Mining

10.5.87 The Mining Remediation Authority Map[47] indicates that the majority of the Turbine Area lies outwith Coal Mining Reporting Areas, with only a very small area where Turbine Area encroaches on a Coal Mining Reporting Area in the southwestern corner. However, there are no Mine Entries and this area is not also classified as a Development High Risk Area.

10.5.88 Old historical maps indicate areas in the vicinity of the Turbine Area were previously quarried for sandstone.

[46] Scottish Geology Trust (2026) Crimsworth Dean Available at: https://geoguide.scottishgeologytrust.org/p/gcr11/gcr11_crimsworthdean Last Accessed 22 November 2025.
[47] https://datamine-cauk.hub.arcgis.com/

Geology – Access Routes

Drift Geology

10.5.89 The Eastern Access Route is not underlain by any superficial deposits as shown on the 1:50K geological mapping. A section runs through areas of peat. The superficial geology is shown in **Figure 10-7b**.

Solid Geology

10.5.90 The Western Access Route is underlain by the Rossendale Formation of mudstone and siltstone from where it joins the A6068, and along the Two Lane Road and Millstone Grit Formation strata to the Turbine Area. The Eastern Access Route is underlain by siltstones, mudstones and sandstones of the Marsden Formation, the Rossendale Formation and the Millstone Grit Formation. The solid geology is shown in **Figure 10-8b**.

Structural Geology

10.5.91 The structural geology and faulting are shown in **Figure 10-8b**. Faults are present across the wider area with no single pattern of orientation. Two east-west faults bisect the Western Access Route by Watersheddles Reservoir. Another fault lies perpendicular to the access track in this area. The Western Access Route is bisected by a north-west-south-east orientated fault close to the junction with the A6086.

10.5.92 The Eastern Access Route is bisected by three faults, two of which are north-south downthrow faults and one is an east-west downthrow fault that runs almost parallel to Far Peat Lane.

10.5.93 All recorded faults on the BGS 1:50k mapping are inferred faults.

Artificial Ground

10.5.94 There is no artificial ground recorded on 1:50k BGS artificial ground mapping along the Western Access Route.

10.5.95 The Eastern Access Route runs through small areas of artificial ground which appear to be associated with the construction of reservoirs.

Quarries and Mining

10.5.96 The Western Access Route lies within a Coal Mining Reporting Area between the A6068 and Two Laws Road.

10.5.97 The Eastern Access Route lies within a Coal Mining Reporting Area and passes through an area of mine entries and coal outcrops at White Moor.

Geology – Bradford West Cable Corridor

Drift Geology

10.5.98 Superficial geology is absent beneath the section of Bradford West Cable Corridor from the boundary with the Turbine Area to Sawood, except for a very small area of peat. Where present along the section from Sawood to Bradford, the superficial deposits comprise Glacial Till. The superficial geology is shown in **Figure 10-8b**

Solid Geology

10.5.99 The Bradford West Cable Corridor is underlain by bedrock of the Millstone Grit Formation and mudstones, siltstones and sandstones of the Rossendale Formation and the Pennine Lower Coal Measures Formation. The solid geology is shown in **Figure 10-8c**.

Structural Geology

10.5.100 There are a number of faults crossed by the Bradford West Cable Corridor orientated southwest - northeast and northwest - southeast. The structural geology and faulting are shown in **Figure 10-8c**.

Artificial Ground

10.5.101 There is an area of Made Ground indicated on the 1:50K geology mapping in the vicinity of the Bradford West Cable Corridor between the A629 and the B6144.

Quarries and Mining

10.5.102 The Bradford West Cable Corridor passes through a Coal Mining Reporting Area to the east of Oxenhope and the online map indicates the presence of coal mine entries and coal outcrops beneath the corridor. These coal seams are also present on the 1:50K geology mapping.

10.5.103 Artificial ground is shown on the 1:50k BGS mapping at two locations within the Bradford West Cable Corridor. One location is an area of 2,920m^2 north of Thornton Moor Reservoir. The second is an area of 5,000m^2, located east of the crossing with the A629.

Hydrogeology – Turbine Area

Classification and Vulnerability

10.5.104 The BGS Aquifer designation dataset for England and Wales provided on the multi-agency geographic information centre (MAGIC) website indicates that the bedrock is classified as a Secondary A aquifer and that the superficial deposits are classified as unproductive. A Secondary A aquifer is defined as supporting water supplies at a local rather than strategic scale, and in some cases forming an important source

of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

10.5.105 The Millstone Grit aquifers are generally considered to have limited vulnerability to pollution due to their low permeability, though evidence of effects of agricultural fertilizer with increases in nitrogen species and sulphate over baseline levels are known in some areas.

10.5.106 EA groundwater vulnerability maps on the MAGIC website indicate that aquifer vulnerability underlying the area is low to medium.

Aquifer Properties

10.5.107 The Millstone Grit formation of the Central Pennines is an important local aquifer, providing water for potable and industrial use and is classed by BGS as a moderately productive aquifer. Flow is predominantly via fractures and discontinuities and the sandstone horizons act as separate aquifers while the shale and mudstone layers are generally aquicludes or aquitards. Intergranular permeability in both the sandstones and shales/mudstones is low. Borehole yields are highly variable and are dependent on the degree of fracturing encountered, but are typically less than 10 L/s. The degree of fracturing is reported to decrease with depth such that significant groundwater flow and well production generally occur in the upper 60m, though targets associated with major structures at greater depth might be productive.

10.5.108 Hydro-chemical characteristics are highly variable due to the complex geology and layered nature of the aquifer(s), rock chemistry and other controls on hydrochemistry. No chemistry records have been located for groundwater in the vicinity of the Turbine Area.

10.5.109 The Millstone Grit aquifers are known to host springs, which are noted on old historical maps as emerging on slopes that drain to Alcomden Water and Walshaw Dean Water.

10.5.110 Recharge will occur over most of the area from downward percolation of rainfall through the peat and surficial cover to the underlying bedrock. The superficial drift cover also offers protection to the aquifer from point source pollution.

Water Quality (WFD Water Bodies)

10.5.111 The EA designated WFD Groundwater Bodies within the Turbine Area or with direct connectivity to the Turbine Area comprise:

- ‘Aire and Calder Carb Limestone / Millstone Grit / Coal Measures’ groundwater body (within the ‘Aire and Calder Carb Limestone - Millstone Grit Coal - Measures’ Operational Catchment, in the Humber Management Catchment).

- Quantitative Status: Good (2019).
- Chemical Status: Poor (2019).

- 'Douglas, Darwen and Calder Carboniferous Aquifers' groundwater body (within the Operational Catchment of the same name, in the North West Management Catchment).
  - Quantitative Status: Good (2019).
  - Chemical Status: Poor (2019).

10.5.112 The 'Douglas, Darwen and Calder Carboniferous Aquifers' groundwater body underlies a small portion of the Turbine Area in the west, where land slopes to the west associated with the surface water catchment of the Black Clough (Don). The remainder of the Turbine Area is underlain by the 'Aire and Calder Carb Limestone / Millstone Grit / Coal Measures' groundwater body.

10.5.113 The locations of the groundwater WFD catchments are shown in **Figure 10-3b**.

Private Water Supplies

10.5.114 There is one recorded historical water well close to the Turbine Area boundary, at Widdop Lodge (Geoindex reference SD93SW22), installed in 1991 for domestic use. A number of other historic water wells are indicated within 2km of the Turbine Area. The available borehole logs indicate stratification of shale.

10.5.115 It is not known if these historical wells still exist and are currently providing water supplies, or if any others exist within the Turbine Area or wider area.

10.5.116 A Private Water Supply Assessment is provided in **Appendix 10-8,** which presents information provided by the relevant councils on 35 water supplies potentially connected to the proposed infrastructure (with a focus on the Turbine Area at this stage), that would require further assessment. There are 26 supplies fed by springs, eight supplies from boreholes and one from surface water (**Figure 10-9**).

10.5.117 A screening assessment will be completed on the supplies following receipt of the information provided by the residents, both from questionnaires and site visits (see the proposed methodology in **Appendix 10-8**). The screening will be based on the source of the Private Water Supply in relation to the disturbed areas that would be associated with the Proposed Development to eliminate any sources that would not be hydrologically or hydrogeologically connected.

GWDTEs

10.5.118 The initial assessment suggested that there were five potentially high GWDTEs and three potentially moderate GWDTEs. Further assessment of the

hydrological/hydrogeological found that despite the presence of a moderately permeable sandstone aquifer underlying a proportion of the Turbine Area, none of the potential GWDTE was found to be truly Groundwater Dependent (GWD). The potential GWDTEs tended to form large, continuous areas with no visible means of groundwater discharge, such as flushes or visible springs. Often, the potential GWDTEs were also covered by impermeable superficial peat deposits. As such, all eight potentially GWDTE were interpreted as being rainfall-fed.

Hydrogeology – Access Routes

Classification and Vulnerability

10.5.119 The BGS Aquifer designation dataset for England and Wales is provided on the MAGIC website and indicates there is no superficial aquifer along the Access Routes. The bedrock aquifer beneath both routes is designated as a Secondary A aquifer. EA groundwater vulnerability maps on the MAGIC website indicate aquifer vulnerability is low to medium along the Western Access Route and is medium along the Eastern Access Route.

Source Protection Zones

10.5.120 A Source Protection Zone (SPZ) 1 area is defined within the Environmental Permitting (England and Wales) Regulations 2016 as one of the following:

- The area within 50m of a point where the groundwater is abstracted for domestic supply or food production purposes; or
- The area where it takes groundwater that is intended to be used to supply water for domestic or food production purposes, up to 50 days to travel to the groundwater abstraction point[48].

10.5.121 There is an EA designated SPZ1 overlying the Western Access Route at the River Laneshaw. This is understood to comprise a covered reservoir supplied from groundwater abstraction boreholes that is managed by UUW.

10.5.122 A second SPZ1 is approximately 490m to the east of the Western Access Route at Cornclose (measured from the proposed access track to the edge of the SPZ1).

10.5.123 There are three historical water wells associated with Cornclose Farm: one installed into bedrock for North West Water Authority (SD94SW17), one installed into bedrock (SD94SW17/A) and one installed into superficial deposits for agricultural use (SD94SW46). These may be associated with the SPZ1.

[48] Environment Agency (2024) Available at: https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs.

Water Quality (WFD Water Bodies)

10.5.124 The 'Aire and Calder Carb Limestone / Millstone Grit /Coal Measures' WFD Groundwater Body underlies the entirety of the Eastern Access Route. This waterbody is located within the 'Aire and Calder Carb Limestone - Millstone Grit Coal - Measures' Operational Catchment, in the Humber Management Catchment, and has a Quantitative Status of Good (2019) and a Chemical Status of Poor (2019).

10.5.125 The 'Aire and Calder Carb Limestone / Millstone Grit /Coal Measures' WFD Groundwater Body also underlies a small area of the Western Access Route, where the access route meets the Turbine Area, and upslope of Watersheddles Reservoir, where the Western Access Route meets Two Laws Road. As above, this groundwater body has a Quantitative Status of Good (2019) and a Chemical Status of Poor (2019).

10.5.126 The remainder of the Western Access Route is underlain by the 'Douglas, Darwen and Calder Carboniferous Aquifers' WFD Groundwater Body, within the Douglas Darwen and Calder Carboniferous Aquifers Operational Catchment, in the North West Management Catchment. This waterbody has a Quantitative Status of Good (2019) and a Chemical Status of Poor (2019).

10.5.127 The locations of the groundwater WFD catchments are shown in **Figure 10.3b**.

GWDTE

10.5.128 A full GWDTE assessment has not been completed for either of the access routes, as NVC data is not currently available. This will be completed for the ES. However, a precautionary assessment has been included within this Chapter.

Hydrogeology – Bradford West Cable Corridor

Classification and Vulnerability

10.5.129 The BGS Aquifer designation dataset for England and Wales is provided on the MAGIC website and indicates that along the Bradford West Cable Corridor, the superficial deposits are classified as unproductive, with a small section from Denholm designated as Secondary A (undifferentiated). The bedrock along the Bradford West Cable Corridor is classified as a Secondary A aquifer. EA groundwater vulnerability maps on the MAGIC website indicate that the aquifer vulnerability underlying the Bradford West Cable Corridor is low to medium, with medium-high designations in the Denholm area of the Corridor.

Source Protection Zones

10.5.130 There is a designated SPZ1 approximately 450m north of the Bradford West Cable Corridor.

Water Quality (WFD Water Bodies)

10.5.131 The 'Aire and Calder Carb Limestone / Millstone Grit /Coal Measures' WFD Groundwater Body underlies the entirety of the Bradford West Cable Corridor. This waterbody is located within the 'Aire and Calder Carb Limestone - Millstone Grit Coal - Measures' Operational Catchment, in the Humber Management Catchment, and has a Quantitative Status of Good (2019) and a Chemical Status of Poor (2019).

10.5.132 The locations of the groundwater WFD catchments are shown in **Figure 10-3b**.

Private Water Supplies

10.5.133 There are historic water wells indicated in the vicinity of the Bradford West Cable Corridor, at Hare Croft.

GWDTE

10.5.134 A GWDTE assessment has not been completed for the Bradford West Cable Corridor, as NVC data is not currently available. This will be completed for the ES.

Flood Risk

10.5.135 A Preliminary FRA has been undertaken to support the PEIR (**Appendix 10-9**) and relevant baseline conditions from this are summarised below.

Tidal Flooding

10.5.136 The PEIR Boundary is located inland and remote from any tidal waterbodies, and as such, there is no risk of tidal flooding. Tidal flooding has therefore not been considered further within the preliminary assessment below.

Historic Flooding

10.5.137 The Turbine Area is located upstream of Hebden Bridge, which has a complex flooding history. In response to historic flood events, the Hebden Bridge FAS has been developed, which has recently been granted planning permission. The proposed FAS will provide a 1 in 100 year standard of protection (SoP) on the River Calder, and a 1 in 200 year SoP on Hebden Water.

10.5.138 In addition to the Hebden Bridge FAS, a series of Natural Flood Management (NFM) projects have been constructed and/or continue to be developed within the Calder catchment, with the aim of providing flood mitigation.

10.5.139 As shown in **Figure 10-14**, the PEIR Boundary is not located within any EA Flood Warning Areas. However, it is located within the following Flood Alert Areas:

- River Calder (012WAFEL): Rivers Calder, Brun, Don and Pendlewater from Laneshaw Bridge to the River Ribble, including Trawden, Burnley, Nelson, Colne, Accrington and Whalley;
- River Calder, Walsden Water, Hebden Water (123WAF963): River Calder and its tributaries from Todmorden to Brighouse; and
- River Aire, Bradford Beck (123WAF961): River Aire from Stockbridge to Castleford, including Bradford Beck, Oulton Beck and Kippax Beck.

Fluvial / Pluvial Flooding

10.5.140 The EA's Flood Map for Planning (FMfP) (**Figure 10-15**) indicates that the majority of the Turbine Area, Bradford West Cable Corridor and Access Routes are located within Flood Zone 1, indicating a low probability of flooding from fluvial sources. Areas of Flood Zone 2 and 3 ('medium' and 'high' risk, respectively) are present in the centre of the Turbine Area (associated with the locations of reservoirs, Ordinary Watercourses to the north and the channel of the Greave Clough) and associated with the routes of the River Laneshaw and Denholme Beck.

10.5.141 The EA's FMfP in this location is based on strategic-level modelling, and the full network of Ordinary Watercourses is not represented. No existing detailed modelling is available for the PEIR Boundary.

10.5.142 To quantify flood risk associated with the Ordinary Watercourse network within the Turbine Area and Western Access Route, specifically, a site-specific hydraulic model is currently being developed and the results of the modelling will be presented in the ES. Information contained within the Calder Catchment SFRA indicates that in the upper reaches of the Calder catchment, surface water (pluvial) and fluvial flooding mechanisms are closely linked. Therefore, it is proposed that a direct rainfall hydraulic model is used to simulate and quantify fluvial and pluvial flood risk within the Turbine Area and Western Access Route, and immediately downstream. This approach has been agreed with the EA.

10.5.143 For the Eastern Access Route and Bradford West Cable Corridor, where ground levels are largely not proposed to change, the EA's Risk of Flooding from Surface Water (RoFSW) dataset will be used to assess fluvial and pluvial flood risk.

10.5.144 Model results for the Turbine Area and Western Access Route are not yet available. Therefore, the RoFSW dataset in combination with the FMfP has been used to assess fluvial / pluvial risk for the entirety of the PEIR boundary at this stage.

10.5.145 The present-day RoFSW mapping (**Figure 10-16**) indicates that the PEIR Boundary is intersected by several medium to high risk areas, where surface water flooding is anticipated during the 1 in 30 year (high risk) and 1 in 100 year (medium risk)

rainfall events. Almost all areas of risk are associated with overland flow paths that are a product of the underlying topography or are associated with the routes of Ordinary Watercourses and ditches / gullies. For further details pertaining to areas of surface water flood risk, refer to **Appendix 10-9**.

Groundwater Flooding

10.5.146 The EA's Areas Susceptible to Groundwater Flooding (AStGWF) dataset included within the Calder Catchment SFRA (Volume 2) indicates that the Turbine Area is located within an area with a 0% to 25% chance of groundwater emergence. The AStGWF dataset also indicates that part of the Eastern Access Route, which lies within the Calderdale district (the majority), has a 0% to 25% chance of groundwater emergence.

10.5.147 The BGS national dataset on the susceptibility of groundwater flooding, as referenced within the Pendle SFRA, indicates that the majority of the PEIR Boundary within Pendle is located within an area where there is 'limited potential for groundwater flooding to occur', with only a couple of areas associated with the routes of watercourses and an area along Two Lanes Road identified as with 'potential for groundwater flooding to occur at surface'.

10.5.148 The JBA Groundwater Flood Map referenced by the Bradford SFRA indicates that portions of the Bradford West Cable Corridor that run parallel to / within Hebden Bridge Road, and between Hill House Edge Lane and Long Causeway lie partially within areas where 'groundwater levels are between 0.025m and 0.5m below the ground surface', suggesting that groundwater has the potential to emerge locally. The remainder of the Bradford West Cable Corridor crosses areas largely at little risk of groundwater emergence. However, the Export Cable does cross some small, localised areas where 'groundwater levels are between 0.5m and 5m below the ground surface', which is described as posing a potential risk to subsurface assets but where surface emergence is unlikely.

Sewer Flooding

10.5.149 Given the predominantly greenfield nature and remoteness of the PEIR Boundary, it is anticipated that there will be limited to no formal sewers or surface water drainage networks in place. Public utilities mapping has confirmed that no public sewers are located within the Turbine Area, Eastern Access Route or Western Access Route, and only a limited number of YWS sewers are located within the Bradford West Cable Corridor, to the north of Denholme.

Reservoir Flooding

10.5.150 The EA's Flood Risk from Reservoirs mapping (**Figure 10-17**) indicates that the following reservoir breach extents impact the PEIR Boundary:

- Reservoir breach extents associated with the Walshaw Dean Reservoirs extend southwards through the centre of the Turbine Area but are confined to the valley of Alcomden Water;
- The breach extent associated with Widdop Reservoir marginally encroaches into the southwest of the Turbine Area but is confined to the valley of the Greave Clough;
- Breach extents associated with the Doe Park, Stubden and Thornton Moor Reservoirs impact the Bradford West Cable Corridor, and are confined to the route of the Denholme Beck and its floodplain;
- Western Access Route is located within the breach extent of the Laneshaw Reservoir, although this extent is confined to the route of the River Laneshaw; and
- The Eastern Access Route is not located within any reservoir flood extents.

10.5.151 Reservoirs are designed and maintained to a very high standard, and any breach of a reservoir is considered highly unlikely.

Flooding from Artificial Sources – Conduits

10.5.152 Three YWS water supply conduits are located within the PEIR Boundary: the Greave Clough to Widdop Reservoir Conduit, the Thornton Moor Conduit, and the Sugden Conduit.

10.5.153 The Greave Clough to Widdop Reservoir Conduit is located in the south of the Turbine Area, downslope of and at least 200m from the Proposed Development. As a result, it is not considered to present a risk of flooding to the Proposed Development from overtopping or blockage. Similarly, the Sugden Conduit is located significantly downslope of the PEIR Boundary. Therefore, it is not considered to present a risk from overtopping.

10.5.154 The PEIR Boundary crosses the Thornton Moor Conduit, where it currently crosses beneath Hebden Bridge Road and Nab Water Lane, which run parallel to each other between Hebden Bridge Road and Hill House Edge Lane. As the conduit is located upslope of the PEIR Boundary, there is a risk should the conduit overtop or breach, impacting the access track. Should this occur, flows are anticipated to flow overland and follow the route of natural topography to the north.

10.5.155 Notwithstanding the above, these conduits are managed by YWS and therefore flooding as a result of overtopping or blockage is considered to be unlikely.

Flooding from Artificial Sources – Canals

10.5.156 The Rochdale Canal, Calder and Hebble Navigation, and Leeds and Liverpool Canal are located significantly downslope of the PEIR Boundary. Considering this, and the proximity of the PEIR Boundary to these areas, the risk of flooding from canals is low.

Existing Drainage Regime

10.5.157 As described above, the Turbine Area is drained by an expansive network of both natural and artificial drains/ditches. Culverts are present (often circular pipes within the Turbine Area) where ditches and drains pass beneath existing access tracks. A subset of these surface drainage features has been restored under the WMECRP, a breakdown of which will be provided in the ES.

10.5.158 Given the predominantly greenfield nature and remoteness of the PEIR Boundary, specifically the Turbine Area, it is anticipated that there will be limited to no formal surface water drainage networks in place. It is anticipated that surface water drainage networks serving the existing highways will be present, particularly those that lie within the Access Routes. Where highways are not to be altered as a result of the Proposed Development, it is anticipated that they will continue to drain as they do now.

10.5.159 It is anticipated that the existing access tracks within the Turbine Area are not positively drained, and surface water runs off following natural topography.

Water Supply Infrastructure

10.5.160 UUW and YWS were consulted to provide plans of water supply infrastructure within the PEIR Boundary. The infrastructure provided is shown in **Figure 10-9**, with the UUW infrastructure located to the north of the Turbine Area and the Western Access Route.

10.5.161 In the south of the Turbine Area, a YWS pipeline runs from the weirs in Greave Clough to Widdop Reservoir, these are open where they cross Pig Hole Dike so that water from the dyke is diverted to Widdop Reservoir.

10.5.162 A YWS pipeline also runs from Walshaw Dean Middle and Walshaw Dean Lower Reservoirs towards Graining Water. Founded track crosses this pipeline 60m east of the crossing over Alcomden Water.

10.5.163 Alongside the Bradford West Cable Corridor, there is a culvert that runs from Grinding Stone Hole in the West to Nab Water further east. The Bradford West Cable Corridor crosses the culvert as it crosses the A6033.

Private and Public Water Supplies and Abstractions

Public Water Supplies

10.5.164 There are 13 reservoirs located within the PEIR Boundary or up to 1km distant:

- Walshaw Dean Upper Reservoir and the associated connected Middle and Lower Reservoirs within the centre (but outside of) the Turbine Area and the Hebden Water catchment;
- Widdop Reservoir to the southwest of the Turbine Area and within the Hebden Water catchment;
- Watersheddles Reservoir to the east of the Western Access Route and within the River Aire catchment;
- Laneshaw Reservoir to the east of the Western Access Route and within the Colne Water catchment;
- Gorple Lower Reservoir to the south of the Turbine Area and within the Hebden Water catchment;
- Warley Moor Reservoir to the west of the Eastern Access Route and within the Luddenden Den catchment;
- Leeming Reservoir to the north of the Bradford West Cable Corridor and within the River Aire catchment;
- Thornton Moor Reservoir to the south of the Bradford West Cable Corridor and within the River Aire catchment;
- Stubden Reservoir to the south of the Bradford West Cable Corridor and within the River Aire catchment;
- Hewenden Reservoir to the north of the Bradford West Cable Corridor and within the River Aire catchment; and
- Doe Park Reservoir to the south of the Bradford West Cable Corridor and within the River Aire catchment.

10.5.165 Three of these reservoirs, namely Walshaw Dean Reservoirs (Upper, Middle and Lower), Widdop Reservoir and Watersheddles Reservoir, are potentially connected to the Turbine Area, where the majority of the infrastructure is located as shown in **Figure 10-9a**. **Appendix 10-7** presents the catchment areas associated with each reservoir and the footprint of the proposed infrastructure within each.

Further Data Collection

10.5.166 Further high-density peat depth surveys will be undertaken in accordance with the relevant guidance (Guidance on Developments on Peatland: Peatland Survey (2017)) as the proposed layout is subject to further refinement. Interim surveys will be undertaken to inform iterative layout design. The design-freeze layout will be subject to detailed survey grids, including earthwork footprints, to ensure calculations of peat excavation are sufficiently robust. Probing data will be used to minimise overlap with peat, and where peat cannot be avoided, to locate and route infrastructure in areas of lowest impact.

10.5.167 A hydrological walkover survey of the Turbine Area will be carried out to 'ground-truth' the existing baseline conditions. This will include identifying and documenting watercourse crossings (proposed and existing), identifying other water features such as wetlands and springs, identifying water supply infrastructure, undertaking a review of areas identified as floodplain within the EA Flood Maps and providing a general overview of landscape and land cover relevant to hydrology, soils and geomorphology. A hydrological walkover of the Bradford West Cable Corridor and Access Routes has also not been carried out for the PEIR stage and will be completed for the ES, including the aspects listed above.

10.5.168 A full PLHRA will be undertaken according to Scottish Government (2017) good practice guidance (set out in **Table 10-1**), this guidance being the industry standard across the UK. The PLHRA will assess the natural and construction-related likelihood of peat instability, identify key receptors, calculate risk and provide appropriate mitigation measures to reduce risks to acceptable levels.

10.5.169 Private water supply visits will also be undertaken for the Private Water Supply study area, which comprises supplies both within the PEIR Boundary and potentially hydrologically connected properties, if required. This will be determined through consultation with the private water supply owners to verify the source location, the conveyance infrastructure, use, treatment and any other pertinent details.

10.5.170 A GWDTE assessment will be completed for the Access Routes and Bradford West Cable Corridor once further NVC survey data is available.

10.5.171 Further hydrogeological assessment of groundwater effects within peat adjacent to infrastructure will be undertaken.

10.5.172 Further phases of peat probing and hydrological visits will be undertaken.

10.5.173 The results of the pluvial modelling will also be used to inform the understanding of baseline pluvial flood risk once this is available.

Future Hydrology, Hydrogeology, Geology and Peat Conditions

Collection of Predicted Data

10.5.174 Professional judgement alongside a desk study has been used to identify the likely future baseline conditions.

Future Baseline

10.5.175 The predicted environmental conditions and potential changes which may occur in the absence of the Proposed Development are outlined below. This includes:

- Natural changes;
- Changes brought about through the WMECRP; and
- Changes due to climate change, land use practices and future developments.

10.5.176 Through the ongoing restoration programme, continued rewetting of peatland and raising of water levels to increase the suitability of conditions for *Sphagnum* moss growth and overall improvement in peatland health.

10.5.177 The main future baseline changes to flood risk would occur as a result of climate change, increasing fluvial and surface water flood extents, as well as naturally increasing the greenfield runoff rate because of increased rainfall intensity. The EA's FMfP mapping includes future flood extents due to the predicted impacts of climate change up to 2125. This confirms that Flood Zones 2 and 3 would increase in extent marginally as a result of climate change (**Figure 10-9**).

10.5.178 The EA's RoFSW mapping (including the impacts of climate change up to 2060) shows that the majority of the PEIR Boundary remains at a very low risk of surface water flooding (**Figure 10-18**). However, there are several localised areas shown to be at risk of surface water flooding, as per the present-day scenario. Surface water flood extents are shown to increase slightly between the present day and future climate change scenarios.

10.5.179 Less snow on the ground in winter and drier summers will lead to a reduction in groundwater recharge for groundwater supplies and a reduction in water quantity and quality in summer months for surface water resources.

10.5.180 Higher intensity rainfall events will increase runoff and potentially reduce water quality as water will have less time to filter through vegetation and shallow soils.

10.5.181 In addition, it is assumed that there will be a continuation of rough grazing in open moorland areas, increasing erosion, drying and ground poaching. There will also

be continued impediment of natural water flows and, potentially fish migration, due to the existing culverted watercourse crossings within the catchments.

10.6 Environmental Measures

10.6.1 This section describes details of the environmental measures for Hydrology, Hydrogeology, Geology and Peat which have been identified for the Proposed Development (as presented in **Chapter 4: The Proposed Development**). These measures are an inherent part of the Proposed Development, and have been included to avoid, reduce or compensate for the adverse likely significant effects of the Proposed Development or enhance beneficial effects.

10.6.2 A number of environmental measures have already been applied as part of the iterative design process (see below and **Chapter 4: The Proposed Development** and **Chapter 5: Alternatives and Design Evolution**), to avoid the higher value areas of blanket bog, water bodies, watercourses, and areas of high flood risk, where possible.

10.6.3 Where possible, the proposed infrastructure has been sited with an objective to maintain at least a 50m ‘buffer zone' from natural watercourses and water bodies shown on 1:50,000 scale and 1:25,000 scale OS mapping. Where possible, the proposed infrastructure is also located outside of flood zones, with the exception of watercourse crossings. Watercourse crossings are located as far from the public water supply reservoirs as practicable.

Construction

10.6.4 The environmental measures included during the construction phase of the Proposed Development are set out below.

10.6.5 It is proposed to limit the extent of cut and fill (i.e. areas of decreasing ground levels and areas of increasing ground levels, respectively) across the turbine locations and the use of cut and fill access roads within the Turbine Area as far as practicable. Iterative layout design has, and will continue, to consider hardstanding orientations as well as turbine positioning to minimise cut and fill footprints. Internal site access tracks will be aligned to minimise overlap with deeper peat deposits or, where possible, routed over gradients sufficiently shallow to enable floated (non-excavated) construction. Opportunities to reuse infrastructure for dual purposes (reducing the number of footprints) and to reduce the number of temporary hardstandings will also be investigated further for the ES.

10.6.6 Individual turbine layouts will be iterated in response to increasingly resolute peat depth data to allow any identified areas of deeper peat to be avoided where possible, or to prioritise deeper peat for temporary infrastructure (which will be reinstated post-construction phase).

10.6.7 Where peat must be excavated to enable construction, opportunities will be sought to reuse peat in a positive way to support habitat recreation (e.g. through patch repair of bare ground, restoration of eroded gullies and reinstatement of peat in cutover areas). Peatland restoration opportunities will be identified to improve the quality of the peatland as part of the Proposed Development.

10.6.8 Measures and methods to be used when handling excavated materials, storage and reuse of peat. Further details are provided within **Appendix 10-3**. These will be implemented as part of a CEMP / PMP.

10.6.9 Temporary infrastructure will be designed to minimise the number of watercourse crossings and encroachments into 50m buffer zones around all mapped water features.

10.6.10 Infrastructure will be located at appropriate buffer distances from any confirmed GWDTEs where possible, or construction measures will be employed to mitigate the effects.

10.6.11 A CEMP will be prepared and will include temporary drainage measures to ensure the existing drainage regime is maintained during the construction phase and that the potential for pollution of surface water runoff is managed.

10.6.12 Any potential temporary changes to the existing fluvial / pluvial flow routes will be addressed within the CEMP, which will outline any temporary measures that would be put in place to control flood flows (such as preventing flows from entering open excavations). Furthermore, the CEMP would ensure that construction activities would not impede or alter overland flow routes to ensure that flood risk is not increased elsewhere.

10.6.13 Where appropriate, access tracks and internal site access tracks will be constructed using permeable materials.

10.6.14 It is proposed that suitable offsets will be provided from the top of the banks of all watercourses to ensure that ecological corridors are maintained and access for maintenance works is provided, where practicable.

10.6.15 Where underground cables, Export Cable and vehicular crossings are to be constructed across / beneath watercourses, suitable land drainage consent for ordinary watercourses would be obtained to undergo works.

10.6.16 Construction works undertaken adjacent to or within watercourses (i.e. to construct new crossings) will comply with relevant guidance. The CEMP will provide details regarding the mitigation to be implemented to protect the water environment, including drinking water protected areas and SGZs, from adverse effects the during construction phase.

10.6.17 A suite of good practice procedures, methods and measures for activities such as fuel handling and storage, concrete batching, pollution prevention, etc. will be produced. Further details are provided in **Appendix 10-1**. These will be implemented as part of a CEMP, secured as part of a DCO requirement. These will be outlined in the oCEMP that will be submitted with the DCO Application.

10.6.18 The following management plans will be prepared and adhered to during the construction phase of the Proposed Development:

- CEMP, which will include:
  - Water Management Plan (WMP);
  - Water Quality Monitoring Plan;
  - Pollution Prevention Plan (PPP);
- PMP; and
- HMMP.

Operational and Maintenance

10.6.19 The environmental measures included during the operational and maintenance phase of the Proposed Development are set out below.

10.6.20 A sequential approach to the development layout has been taken and it is proposed that sensitive equipment will be located outside of the design flood extents and away from watercourses, ensuring that they remain operational in times of flood.

10.6.21 Turbines are proposed on level platforms, which will require groundworks dependent on cut and fill requirements. To assess the impact of ground-level changes on flood risk, pluvial hydraulic modelling will be undertaken to determine baseline and proposed flow routes. This modelling will help to inform the design of levels and to demonstrate that flood risk will not be increased as a result of the Proposed Development. Where internal site access tracks cross watercourses, suitably sized structures would be incorporated, subject to approval from the EA / LLFA.

10.6.22 Surface water runoff from new impermeably surfaced areas will be managed to ensure that there is no increase in flood risk elsewhere and to provide water quality and biodiversity benefits where possible. It is anticipated that surface water runoff will be encouraged to infiltrate wherever possible, to maintain the existing drainage regime and the saturated condition of the adjacent peat. An outline drainage strategy will be produced, confirming attenuation requirements, the provision of SuDS features, discharge locations and discharge rates. Suitable management and

maintenance plans for SuDS will be employed to ensure the drainage system operates as designed for its lifetime.

10.6.23 Where welfare facilities are provided, it is anticipated that foul flows will be isolated and stored within a cess tank, prior to removal for appropriate treatment by a suitably qualified contractor.

10.6.24 Stand-off distances to YWS and UUW assets will be discussed with the relevant sewerage / water authorities. Stand-offs from these assets will be free from construction, structures and access roads. In a few specific locations where these stand-offs cannot be achieved, build over or build near agreements may need to be sought. In these cases, the relevant sewerage / water authority will be consulted to discuss engineering design and any relevant mitigation that may be required.

10.6.25 Development will be suitably offset from watercourses to allow sufficient space for access for maintenance. The watercourse offsets will be discussed and agreed upon with the EA / LLFA.

10.6.26 The following management plans will be prepared and adhered to during the construction phase of the Proposed Development:

- Operational SuDS Management and Maintenance Plan;
- Operational Water Quality Monitoring Plan;
- Operational Peat Restoration Monitoring Plan; and
- HMMP.

Decommissioning

10.6.27 Similar to the construction phase, a Decommissioning Environmental Management Plan (DEMP) would be employed during the decommissioning stage to ensure that the natural drainage regime is maintained and that any potential pollution of surface water runoff is managed. Furthermore, the DEMP would ensure that decommissioning activities would not impede flow routes or increase flood risk elsewhere.

Assumptions

10.6.28 The development of the pluvial hydraulic model is currently in progress. Once this has been developed, it will be used to refine the infrastructure layout and design, including the design of proposed ground levels and any necessary flood risk or overland flow mitigation.

10.7 Potential Effects Scoped Out

10.7.1 This section lists the effects which are scoped out of the Hydrology, Hydrogeology, Geology and Peat assessment as they are not considered likely to be significant. This includes the evidence that justifies this approach, as shown in **Table 10-15**.

Table 10-15: Potential Effects Scoped Out

Effects Scoped Out	Justification	Phase
Tidal flood risk	The development is not located near any tidal waterbodies.	Construction, operation and maintenance and decommissioning
Coal Mining Activities (Turbine Area only)	The Coal Authority confirmed that "*Whilst the site falls within the coalfield, it is located outside the Development High Risk Area. The Coal Authority has no comment to make*."	Construction, operation and maintenance and decommissioning
Peat instability	Impacts on peat with the potential to reduce stability are most likely to occur during construction (or decommissioning) and not during operation, provided installed drainage measures are maintained and periodic monitoring of floating infrastructure and permanent peat storage areas is undertaken (in line with measures specified in the PLHRA and PMP).	Operation and maintenance
Loss of peat / carbon loss	Impacts on peat soils and carbon are not anticipated to be caused by operation of the wind farm. Provided monitoring and remedial works (as necessary) defined in the PMP and Habita are implemented, operational effects relating loss of peat / carbon loss are considered not significant.	Operational and maintenance

10.8 Preliminary Assessment

10.8.1 The preliminary assessment of likely significant effects is presented below. This incorporates the environmental measures outlined in **Section 10.6**, before then outlining additional mitigation, where required. The likely significant effects assessed in this PEIR (and that will be assessed within the ES) are summarised in **Table 10-16**.

Table 10-16: Likely Significant Effects Assessed

Effect	Description of Effect	Phase
Erosion and Sedimentation	Potential for the construction of infrastructure and water crossings to result in increased sediment loads observed in watercourses / waterbodies.	Construction, operation and maintenance and decommissioning
Alteration of Flow, Natural Drainage Patterns/Runoff Volumes and Rates – Groundwater Flows	Potential for development of tracks and cable trenches to alter natural drainage by the creation of altered preferential flow pathways. Potential for groundwater levels in peat to be reduced in the immediate vicinity of proposed infrastructure. Potential for groundwater flows supporting GWDTE to be altered.	Construction, operation and maintenance and decommissioning
Potential pollution events affecting groundwater and surface water quality	Potential for construction activities to pollute watercourses and groundwater through oil, chemical and fuels spills. Potential for existing historical contamination to be disturbed and pollute watercourses and groundwater.	Construction, operation and maintenance, decommissioning
Peat instability	Potential for construction activities to result in peat instability with associated effects on terrestrial habitats, aquatic habitats and water supply.	Construction and decommissioning
Loss of peat / carbon loss	Potential for construction activities to result in loss of peat (peatland habitats considered in **Chapter 8: Biodiversity**). Release of greenhouse gas emissions from disturbance of peat is presented in **Chapter 11: Carbon and Climate Change**.	Construction, operation and maintenance and decommissioning
Risk of flooding from all sources to site users	Potential risk of flooding posed to the Proposed Development / site users.	Construction, operation and maintenance and decommissioning
Risk of flooding from all sources to off-site people and property	Potential for a change in off-site flood risk.	Construction, operation and maintenance and decommissioning
Potential pollution events associated with the generation of foul water onsite	Potential for the release of foul discharges to the environment.	Construction, operation and maintenance and decommissioning

10.8.2 The sensitive receptors considered within the assessment are presented in **Table 10-17**.

Table 10-17: Sensitive Receptors

Sensitive Receptors		Sensitivity	Rationale / Designations
Terrestrial	Non peaty or peaty / organic rich soils <0.3 m in depth Peat <1 m in depth in densely drained, eroded or gullied open terrain	Negligible	In line with Guidance on Developments on Peatland - Site Surveys.
	Peat >0.3 m to 1 m in depth in open terrain Peat >1 m to 2 m in densely drained, eroded or gullied open terrain	Low	In line with Guidance on Developments on Peatland - Site Surveys.
	Peat >1 m in depth in open terrain Peat >2 m in depth in forestry or in densely drained, eroded or gullied open terrain	Medium	In line with Guidance on Developments on Peatland - Site Surveys.
	GWDTE	Low/High	No Potential GWDTE areas were found to be groundwater dependent. However, where identified GWDTEs would be high.
Groundwater	Shallow groundwater	Low to High	Maintains GWDTEs and peat resources. Supports surface water features and private water supplies.
	Deep groundwater	High	Limited resource, however, is the supply for some private water supplies.
Surface watercourses and waterbodies within the PEIR Boundary	Main tributaries to Walshaw Dean Reservoirs, including: ▪ Round Hill Dike; ▪ Lower Sough; ▪ Grey Fosse Clough; ▪ Walshaw Dean Shoulder Nick; ▪ Black Clough;	Medium	Tributaries to public water supply reservoirs.

Sensitive Receptors		Sensitivity	Rationale / Designations
	▪ Old Dike; and ▪ Grave Stone Clough. Main tributaries to Widdop Reservoir, including: ▪ Greave Clough; ▪ Rushy Clough; ▪ Cross Dike; ▪ Waterfall Syke; and ▪ Hole Sike.		
	Minor unnamed tributaries	Low / Negligible	Unsuitable habitat for fish and limited impact on public water supply reservoirs.
	▪ Walshaw Dean Reservoirs; ▪ Widdop Reservoir; ▪ Watersheddles Reservoir; ▪ Laneshaw Reservoir; ▪ Gorple Lower Reservoir; ▪ Warley Moor Reservoir; ▪ Leeming Reservoir; ▪ Thornton Moor Reservoir; ▪ Stubden Reservoir; ▪ Hewenden Reservoir; and ▪ Doe Park Reservoir.	High	Public supply reservoirs and WFD Water Bodies.
	Watercourses downgradient of PEIR Boundary: ▪ Crimsworth Dean Beck; ▪ Alcomden Water; ▪ Graining Water; ▪ Bridgehouse Beck; ▪ River Worth; ▪ Colne Water; ▪ Wycoller Beck; and ▪ Harden Beck.	Medium	EA designated WFD surface watercourses.
	Colne Water tributaries, including: ▪ Raven Clough; ▪ Hullown Beck; ▪ River Laneshaw; and ▪ Smithy Clough. Crimsworth Dean Beck tributaries, including: ▪ Paddock Beck; ▪ Calf Hey Clough; ▪ Mare Greave Clough; ▪ Middle Moor Clough;	Low	Surface watercourses not designated by the EA under WFD

Sensitive Receptors		Sensitivity	Rationale / Designations
	▪ Bent Clough; ▪ Stony Dike; ▪ Clay Dike; ▪ Rushy Dike; ▪ Thurish Dike; and ▪ Red Dike Clough.		
	Downstream non-WFD watercourses	Negligible	Reservoirs act as a buffer. For directly connected watercourses, risk remains low due to limited contaminant sources, distance to receptors, and natural attenuation.
Flood Risk	Members of the public using on-Site Public Right of Way (PRoW), YWS and UUW staff visiting their assets, and the following land uses / developments downstream of the PEIR Boundary: ▪ Essential transport infrastructure crossing areas at risk; ▪ Utility infrastructure in areas of risk; and ▪ Existing wind / solar farms.	High	Essential Infrastructure or Highly Vulnerable Development in line with Annex 3 of the NPPF. Members of the public are not expected to have knowledge of the on-site flood regime.
	The following land uses / developments within / downstream of the PEIR Boundary: ▪ Hospitals; ▪ Health services; ▪ Residential property; and ▪ Hotels.	Medium	More Vulnerable Development in line with Annex 3 of the NPPF. Members of the public are not expected to have knowledge of the on-site flood regime.
	Construction staff and operational staff attending the Proposed Development, and the following land uses / developments within / downstream of the PEIR Boundary: ▪ Commercial premises; ▪ Car parks; and ▪ Agricultural buildings.	Low	Less Vulnerable Development in line with Annex 3 of the NPPF. Construction / operational staff are expected to have been briefed on flood risk as part of the site induction process.

Sensitive Receptors		Sensitivity	Rationale / Designations
	The following land uses / developments within / downstream of the PEIR Boundary: ▪ Open space, nature conservation and biodiversity, outdoor sports and recreation; ▪ Flood control infrastructure; and ▪ Water and sewage transmission infrastructure and pumping stations.	Negligible	Water Compatible Development in line with Annex 3 of the NPPF.

10.8.3 For the preliminary assessment, the construction and decommissioning phases have been considered collectively within the evaluation below, given the similarity in activities during these phases.

Construction and Decommissioning Phases

Erosion and Sedimentation

10.8.4 Unmanaged erosion / sediment deposition and suspended solids generated from ground disturbance and the installation of new infrastructure could be transported to receptors directly by surface runoff or could cause modification to stream channel morphology. This can result in the smothering of habitats and effects on both terrestrial and aquatic flora and fauna. Effects may occur from the following sources:

- Construction of the Access Routes and internal site access tracks and associated turning heads. The majority of new and upgraded internal access site tracks will be constructed using a standard cut and fill method, which will involve stripping and stockpiling of material to expose underlying soils or bedrock, potentially increasing runoff and the potential for the transportation of sediment. Floating tracks will involve building the internal site access tracks on the existing surface vegetation mat with geotextile layers, minimising excavation of peat, however excavated side slopes will be required;
- Construction of new watercourse crossings, increasing the potential for increased runoff of silt and debris and erosion;
- Removal and stockpiling of material for each turbine foundation base as well as crane hardstandings, auxiliary crane pads and blade storage areas, which could result in increased silt runoff;

- Dewatering of shallow groundwater and direct rainfall into excavations (potentially containing silt and other debris), which may result in transportation of fine sediments into watercourses. This would be compounded by increased movement over and around these disturbed environments;
- Extreme rainfall events, which could result in the overflowing of existing on-site drainage with resulting erosion and sediment transport from construction areas, as well as the potential failure of pollution prevention measures to operate under high runoff flow conditions;
- Vehicle movements transporting silt offsite;
- Rock, topsoil, peat storage and reuse; and
- Peat slides of material into watercourses.

10.8.5 Infrastructure within the PEIR Boundary has been located, in so far as possible, over 50m from watercourses or waterbodies (as shown on 1:50,000 and 1:25,000 scale OS mapping), as this is considered to be a sufficient distance for the drainage management strategy and sediment control measures to control any release of sediment to the receiving watercourses. All works will be undertaken using the embedded good practice methods presented in **Appendix 10-1** and watercourse crossings will be constructed in accordance with sizing as informed by hydraulic modelling (separate to the pluvial flood modelling being undertaken).

10.8.6 The magnitude of potential impact is considered to be negligible where construction works are outside the watercourse buffers and good practice is adhered to, and low where works are within the 50m buffers. This is the case for the majority of construction works.

10.8.7 The sensitivities of the watercourses and waterbodies within the catchments onsite are categorised as low to medium, as listed in **Table 10-17**. It is noted that the watercourses feed the UUW and YWS reservoirs in the area and some of the Private Water Supplies.

10.8.8 For the majority of the construction works which are offset more than 50m from watercourses, the direct, temporary, short-term adverse effects are minor (not significant) due to the low or medium sensitivity of the watercourses combined with the negligible magnitude of potential impact. No additional mitigation is required for these works.

10.8.9 Where construction work is within 50m of a watercourse, but the watercourse is considered to be of low sensitivity due to being over 1km from a public water supply reservoir or not hydrologically connected, then no additional mitigation is required.

10.8.10 The locations where the encroachments (I-prefix) or watercourses crossings (wc-prefix) are directly related to medium sensitivity watercourses (presented in **Appendix 10-5** and shown in **Figure 10-9**) include:

- I3 unnamed watercourse directly upgradient of Watersheddles Reservoir - a bellmouth watercourse crossing;
- I11 unnamed tributary of Greave Clough, which supplies Widdop Reservoir - 36m from watercourse and 1,420m^2 of infrastructure footprint within 50m buffer,
- I15 Grave Stone Clough, which directly discharges to Wishaw Dean Upper Reservoir - 41m from watercourse and 274m^2 of infrastructure footprint within 50m buffer;
- I16 Unnamed watercourse, which directly discharges to Wishaw Dean Upper Reservoir - 44m from watercourse and 363m^2 of infrastructure footprint within 50m buffer;
- wc_02 crosses an unnamed tributary to Greave Clough;
- wc_04, which crosses Waterfall Syke and discharges into Greave Clough, which supplies water to Widdop Reservoir;
- wc_06 crosses an unnamed tributary to Greave Clough;
- wc_07, which crosses Greave Clough, which supplies water to Widdop Reservoir;
- wc_08 crosses Foul Sike, which discharges into Greave Clough;
- wc_09, which crosses Greave Clough;
- wc_10, which crosses Hole Sike, a tributary to Greave Clough;
- wc_11, which crosses Bullion Clough, a tributary to Greave Clough;
- wc_12 crosses the Alcomden Water, which has a WFD classification of Good;
- wc_13 located on Shaw Dike;
- wc_17, which crosses an unnamed watercourse;
- wc_18, which crosses the unnamed watercourse;
- wc_23 located on unnamed watercourse;
- wc_24, which crosses Black Clough;

- wc_27, which crosses Old Dike; and
- wc_28, which crosses an unnamed watercourse.

10.8.11 The above are also presented in **Appendix 10-5**. Where the construction works are within the watercourse buffers, the direct, temporary, short-term adverse effects are moderate (significant) due to the medium sensitivity of watercourses for the watercourse crossings and four encroachment locations listed above, combined with the low magnitude of potential impact. Additional mitigation is required to control sediment release.

Additional Mitigation

10.8.12 To limit the effects where works are proposed within the 50m watercourse buffers and where required, additional mitigation measures include:

- Additional drainage management, such as capture and treatment (e.g. sediment traps and bunds or, if necessary, in specific locations, the use of siltbusters or similar);
- Water quality monitoring programmes over the course of construction works in proximity to the watercourses; and
- Sequencing to limit the amount of construction works in any one catchment, particularly during wetter periods.

10.8.13 The above will be secured as part of the CEMP, an outline of which is provided and will be further developed prior to the submission of the DCO Application.

10.8.14 A monitoring programme will be developed and implemented in conjunction with YWS and UUW for the public water supply reservoirs to understand the parameters of concern and to set up reporting requirements, a process for information transfer and an emergency response plan. A baseline water quality monitoring programme will be completed, followed by monitoring during construction (and reinstatement / site restoration / early post construction sub-phases) to ensure that no adverse effects occur as a result of the Proposed Development. The monitoring programme will be secured as part of the CEMP.

10.8.15 A monitoring programme will also be established for the private water supplies, in consultation with local affected residents. This will involve baseline data collection prior to the construction phase to ensure that all private water supplies are identified / understood, with regular monitoring throughout the construction stage. This programme will allow any potential impacts on the private water supplies to be promptly identified and remedial actions undertaken. Remedial actions may include additional protection of the source, enhanced treatment or the installation of an

alternative supply. The monitoring programme will be secured as part of the oCEMP.

Residual Effects

10.8.16 Assuming the additional mitigation measures are applied, the residual effects will reduce to **minor (not significant)**.

Alteration of Flow, Natural Drainage Patterns/Runoff Volumes and Rates - Groundwater Flows

10.8.17 The construction of internal site access tracks and cable trenches has the potential to alter natural drainage onsite by the creation of altered preferential flow pathways. If constructed against the topographic gradient, roads could act as barriers to runoff and groundwater flow, resulting in groundwater discharge and the ponding of water. If constructed in line with the gradient, the development of preferential flow down the tracks / trenches could occur. Changes to the natural drainage and runoff rates could affect the hydrological continuity within areas of peat, sensitive water-dependent habitats, such as bog habitats, or increase erosion rates.

10.8.18 The alteration of surface flows is assessed within the flood risk section below. Flow alteration is therefore only considered in this section for groundwater, which is focused on the peatland habitats and effects from infrastructure and associated drainage.

10.8.19 The assessment of effects on groundwater from the proposed infrastructure and associated drainage considers the permeability of the underlying geological formations, use or function of the groundwater and likely significant effects, which will be based on a conceptualisation of the hydrogeological model at each location as part of the ES. However, a preliminary assessment has been undertaken at this stage, as presented below.

10.8.20 Shallow groundwater sensitivity is defined as high where it supports private water supplies, GWDTEs and peat, as these are all high-sensitivity receptors.

10.8.21 Private water supply information is currently being collated and is not yet available for assessment. These sources will be determined, inspected in the field and assessed in the ES. However, as noted above, these are considered to be receptors of up to high sensitivity.

10.8.22 GWDTEs have been reviewed across the Turbine Area. The potential GWDTEs that are connected to the Proposed Development across the Turbine Area have been determined not to be groundwater dependent. Therefore, further assessment is not required. However, potential GWDTEs across the Access Routes and the Bradford West Cable Corridor connected to the Proposed Development will be

assessed in the ES. At this stage, a precautionary approach has been adopted for the preliminary assessment (i.e. it is assumed that GWDTEs are present).

10.8.23 Peat is present across much of the PEIR Boundary (specifically the Turbine Area) and would surround much of the proposed infrastructure footprint. As a result, there is a potential for groundwater within peat to be altered. To understand the potential effects on peat groundwater, the understanding of groundwater flow and groundwater level variation within peat is important and excavations within peat will result in seepage, dewatering and interception of groundwater flow. The low permeability of the catotelmic (underlying and degraded) peat greatly inhibits the movement of groundwater within it, resulting in very slow movement and dewatering effects from any excavations being realised over only very short distances.

10.8.24 Groundwater within the upper layer of peat, known as the acrotelm, flows more freely as it has a higher permeability and this is the layer where groundwater levels fluctuate. The acrotelm tends to be between 0.1m and 0.3m thick in general. The lower layer of peat, the catotelm, is naturally always saturated, so there is no real groundwater level change within it. Within the PEIR Boundary there are numerous drains which have cut down into the peat and affected the peatland habitat by drying it out. Assessment of the extent of this drying varies across the PEIR Boundary, however recent discussions with NatureScot on wind farm sites in Scotland have resulted in a regulator acceptance of effects from excavations or drains being limited to within 10m of excavations.

10.8.25 Effects on groundwater in peat are assessed by considering infrastructure cutting through peat bodies, where groundwater will then be intercepted. Although it is considered that effects on groundwater will not extend far in the peat from the areas of excavation, the continuity of the groundwater within the peat will be interrupted and the down gradient peat is likely to experience reduced flows without additional mitigation. To manage any reduction in groundwater the upgradient flows will be captured, for example, using a french drain and transferred, in a diffuse manner, such as using an infiltration drainage tunnel, to the down gradient peat in regular intervals. These are standard good practice methods that are applied in wind farm construction drainage management.

10.8.26 Peat is considered to be a high sensitivity receptor and therefore, the groundwater supporting it is also considered to be of high sensitivity.

10.8.27 Further assessment of the magnitude of potential impact is required. However, considering the high sensitivity receptors (private water supplies, GWDTEs and peat), significant effects cannot be ruled out at this stage. Further assessment will be undertaken at the ES and additional mitigation will be required to reduce effects on groundwater.

Additional Mitigation

10.8.28 Groundwater discharges, along with infiltration of rainfall, will limit the down gradient effects on low permeability peat to short distances, up to ~10m, from excavations. Upgradient effects will be limited to a few metres due to the steepness of drawdown curves in low permeability peat and deep cut-off ditches in areas of peat should be avoided to limit any other dewatering effects or interception of shallow groundwater.

10.8.29 As with effects from erosion and sedimentation outlined above, a monitoring programme will also be established for the private water supplies identified in the PWS assessment, in consultation with local affected residents. This will involve baseline data collection prior to the construction phase to ensure that all private water supplies are identified / understood, with regular monitoring throughout the construction phase. This programme will allow any potential impacts on the private water supplies to be promptly identified and remedial actions undertaken. Remedial actions are likely to require the installation of an alternative supply if the flows are reduced substantially. The monitoring programme will be secured as part of the CEMP.

Residual Effects

10.8.30 Assuming that standard good practice methods are applied and that there is a comprehensive and robust approach to groundwater recharge down gradient of infrastructure, the residual effects are expected to be **not significant**.

Potential Pollution Events Affecting Groundwater and Surface Water Quality

10.8.31 Pollution of watercourses could potentially occur through the following pathways:

- Oil and chemical spills from:
    - Oil leakages during vehicle movements or when on standby;
    - Refuelling areas in the construction compound; and / or
    - Chemical / fuel storage areas.
- Leakage of cement powder or liquid concrete during batching, transportation or pouring. Concrete is highly alkaline (high pH) and changes in the pH balance could affect the water quality and the species that depend on baseline conditions;
    - Plant washing and vehicle wheel wash areas;
    - Improper management of onsite waste;
    - Poor sanitary plumbing;

- Poor water storage; and
- Sedimentation and erosion (as outlined above).

10.8.32 There will be a number of good practice procedures in place to avoid pollution, which will include specific refuelling areas, the use of drip trays, and specific storage areas for any chemicals or fuels. The construction compounds will be constructed with an impermeable membrane and any surface water runoff, along with any pollutants, will be routed through oil / water separators as part of good practice procedures. The concrete washout will also be located on an impermeable membrane within the construction compounds. Many of these good practice methods are presented in **Appendix 10-1** and will be secured by the CEMP.

10.8.33 Taking into account the application of good practice, there is still a small risk of potential fuel spillage onsite due to vehicles, plant and machinery and the potential for leaks or accidents.

10.8.34 Given most of the construction works will be situated outside of the buffer of sensitive watercourses (i.e. more than 50m away) and there is a wide ranging and comprehensive list of procedures to reduce the likelihood of a pollution event as well as an emergency response plan (as noted above), it is considered that a significant pollution event on the water environment is unlikely.

10.8.35 The receptors of pollution arising from the construction of the Proposed Development are:

- The EA designated SPZ1 overlying the Western Access Route at the River Laneshaw. This receptor is of high sensitivity;
- The watercourses and groundwater discharging to the public water supply reservoirs, which are also of high sensitivity; and
- The watercourses and groundwater discharging to the private water supply reservoirs, which are of high sensitivity.

10.8.36 Currently, information provided by local councils shows that there are no known Private Water Supplies in proximity to the proposed infrastructure. Whilst these will be assessed in detail in the ES, a preliminary assessment has been provided below.

10.8.37 The magnitude of potential impact of a pollution event is considered to be negligible for the majority of the proposed infrastructure, where it lies outside of the 50m buffer of watercourses. Alongside the distance to watercourses, there are low-permeability formations onsite, limiting the potential for infiltration and a comprehensive suite of procedures for pollution prevention and response (as set out in **Appendix 10-1**).

10.8.38 For the majority of the construction works which are offset more than 50m from watercourses, the direct, temporary, short-term adverse effects are minor (not significant) due to the high sensitivity of receptors (the watercourses and groundwater discharging to public and private water supplies) combined with the negligible magnitude of potential impact. No additional mitigation will be required for these works.

10.8.39 Where the construction of the access tracks within the Western Access Route overlie the SPZ1 at the River Laneshaw, the magnitude of potential impact is considered to be low. This is due to the access track partially utilising an existing track that will be upgraded, and there is Glacial Till at the surface (which is of low permeability that will restrict any contamination infiltration), and once the track is constructed, there will be no works in this area, only traffic movements. However, the track will be used as a route to access the Proposed Development long-term (i.e. into the operational and maintenance phase) and thus the potential impact is not temporary.

10.8.40 For the access track works on the Western Access Route overlying the SPZ1, the direct, permanent, long-term adverse effects are moderate (**significant**) due to the high sensitivity of the SPZ1 and potential Private Water Supplies combined with the low magnitude of potential impact. Additional specific mitigation will be required to control pollution of the water supply.

Additional Mitigation

10.8.41 To protect the water supply within the SPZ1 at the River Laneshaw, specific construction methods will be adhered to in agreement with UUW, including those within the oCEMP. This is likely to include restrictions on fuels, oils or other chemicals that could leak and enter the groundwater.

Residual Effects

10.8.42 It is assumed that by implementing the additional mitigation within the SPZ1, the significance of effect can be reduced to **minor (not significant)**.

Peat Instability

10.8.43 Peat landslides have the potential to displace peat and associated habitats, leading to permanent carbon losses, pollution to watercourses through ingress of organic-rich material from landslide runout, impacts to water quality in private water supplies and public water supplies (such as reservoirs), or damage to public and private infrastructure, which could cause injury or loss of life. While naturally occurring peat landslides are relatively rare, the construction phase has the potential to trigger landslides or to increase landslide likelihood in areas of marginal stability.

10.8.44 Peat landslides generally occur as either peat slides or bog bursts. The former are slab-like translational failures that typically occur on moderate slopes (5-10°) and at intermediate peat depth ranges (0.5m – 1.5m), while the latter are retrogressive failures occurring on gentler slopes (typically <5°) and in deeper peats (>1.5m). Peat slides have occurred on numerous occasions in the North Pennines, but not in the South Pennines, while bog bursts are very rarely reported in England, the most notable examples being the historic bursts that occurred close to the north of the Turbine Area.

10.8.45 Following industry best practice guidance (Scottish Government, 2017), the potential for natural and construction-induced peat instability has been assessed using a combined qualitative (landslide susceptibility) and quantitative (limit equilibrium) approach to determine the natural (baseline) likelihood of both peat slides and bog bursts across the Turbine Area.

10.8.46 The potential for construction-induced peat instability has been assessed by comparing the proposed infrastructure layout with areas of relatively higher baseline likelihood from both the qualitative and quantitative approaches. Construction may be associated with instability where excavation works remove support from upslope soils or load in-situ soils. To address the latter, a loading assessment from floating tracks subject to vehicle loads has been undertaken for areas that do not involve excavation.

10.8.47 The results of this assessment have been used to identify areas of relatively higher likelihood ('source zones'). Areas with likelihoods of 'moderate' or higher (see definitions in **Appendix 10-4**), are considered to be those potentially susceptible to instability and runout from these areas, impacting on receptors, which might be associated with 'medium' or higher risks under risk assessment frameworks commonly used in PLHRA.

10.8.48 Receptors have been identified based on proximity to potential source areas in relation to peat (i.e. locations in which proposed infrastructure overlaps with peat soils assessed to have 'moderate' or higher likelihood of instability under natural conditions or associated with construction). These are documented below.

- All watercourses within the Turbine Area supply public water supplies and are therefore assigned a high sensitivity in the context of peat slide;
- All blanket bog within credible runout distance of a potential source area is assigned a high sensitivity due to the international / national designation (as a SAC and SSSI), while degraded blanket bog habitats are assigned a medium sensitivity since these are not pristine habitats;

- The Pennine Way (as a National Trail) and other PRoW, which have been assigned a high sensitivity. Estate tracks have been assigned a medium sensitivity;
- Existing infrastructure has been assigned a high sensitivity due to potential disruption, requirement for clean-up and likely requirement for financial compensation to cover consequential losses; and
- Dwellings or frequently used buildings have been assigned a medium sensitivity, since peat landslides generally lack the density of runout to damage properties (typically deflecting around those of brick or stone construction).

10.8.49 At this preliminary stage, a full runout analysis has not been undertaken. This will be provided in the ES. A summary of the approach that will be used is provided below. A preliminary assessment is provided based on the observed sensitivity of receptors and the number and location of potential source zones identified from the likelihood assessment described above.

10.8.50 The runout assessment will use published information on runout distances for peat slides and bog bursts and anticipated 'source volumes' (landslide sizes, specific to each source zone) to estimate the runout length and direction of potential landslides sourced from proposed infrastructure locations. The assessment considers thinning of runout (due to conservation of volume), the roughness of the ground over which the runout passes, physical barriers, and slope geometry to evaluate credible runout distances and determine the likelihood of impact if a landslide occurs. The calculated risk is a function of the likelihood of an event occurring and the consequences if an impact on a receptor takes place. This will be determined for the final infrastructure layout and will be reported in the ES.

10.8.51 Based on a preliminary likelihood assessment, there are circa 71 potential source zones for peat slides and 14 potential source zones for bog bursts where the Proposed Development overlaps with areas of 'moderate' likelihood. There are no areas calculated to have 'high' or 'very high' likelihood of instability. It should be noted that these numbers do not refer to the predicted number of events but highlight the areas most likely to experience instability in association with construction. Typically, construction-induced instability can be entirely avoided through avoidance, detailed design taking account of peat stability and controls applied during the construction phase.

10.8.52 Based on the location of these source zones and the analysis provided in **Appendix 10-4**, runout would primarily affect watercourses, and to a lesser extent, the reservoirs into which the watercourses flow. Some estate tracks would be crossed by runout pathways. The Pennine Way would not be affected. No properties would

be affected. Only very limited areas of blanket bog might be affected, with the majority of habitat impacts on degraded blanket bog, heath or grassland.

10.8.53 Further assessment of the magnitude of potential impact is required. However, considering the high sensitivity receptors (including public water supplies), significant effects cannot be ruled out at this stage. Further assessment will be undertaken at the ES, and additional mitigation will be required to reduce the effects related to peat slide.

Additional Mitigation

10.8.54 Additional mitigation would include:

- Detailed ground investigation at critical locations post-consent, including collection of site-specific peat strength data;
- Specification of design measures to prevent or minimise construction-induced failure; and
- Specification of control measures to limit impacts (e.g. temporary debris fences during construction for critical locations) and general good practice measures (including raising awareness of peat instability for site personnel through toolbox talks), active monitoring of construction locations, and preparation of emergency response and cleanup protocols.

10.8.55 These additional mitigation measures will be secured by the CEMP.

Residual Effects

10.8.56 Based on experience of applying this form of assessment to wind farms in similar settings (peat depth, slope, landslide susceptibility, infrastructure and construction methods), residual effects are typically identified to be **not significant**. In Scotland, where best practice guidance for assessing peat landslide risk was developed and has been applied for circa 20 years, a majority of large wind farm schemes undergo a technical audit of PLHRAs as part of the EIA process. The assessment methodology described above has been audited and found to be satisfactory on numerous prior occasions in Scotland. However, at this stage, significant effects cannot be ruled out and as outlined above, further detailed assessment will be provided in the ES.

Loss of Peat / Carbon Loss

10.8.57 The construction of the Proposed Development will require excavation of peat soils in order to enable construction of turbine foundations, hardstanding areas, tracks and other ancillary infrastructure. Some of this peat will be permanently excavated and some temporarily excavated and reinstated at its point of origin. Residual peat

(i.e. that which is permanently excavated), must be placed in a new location that ensures its long term viability as a wetland soil, capable of sustaining vegetation of a quality equivalent to (or better than) that present at the time of excavation, and with minimal net loss of carbon (which may occur through drying and oxidation of peat).

10.8.58 Guidance on the excavation, storage and reuse of peat has been available in Scotland since 2012 (Scottish Renewables & SEPA, 2012). A preliminary assessment of peat excavation and reuse has been undertaken (**Appendix 10-3**) based on the layout and peat depth data available at this stage, the latter being comprehensive and therefore reliable.

10.8.59 Peat excavation volumes have been calculated using the current full infrastructure footprints, including surrounding cut and fill earthworks. Excavation volumes have been calculated for permanent infrastructure (crane hardstands, founded tracks, the substation) and temporary infrastructure (blade storage areas, working areas, construction compounds, the batching plant and borrow pits). Where excavation is not proposed (e.g. for floating tracks), no peat will be permanently or temporarily displaced. Due to the extent of peat onsite, soil volumes have not been calculated at this stage, but are anticipated to be substantially lower than those for peat, while the soil fraction is also regarded as a less sensitive resource. Separation of peat volumes into acrotelmic and catotelmic peat has not been undertaken at this stage. This information will be presented in the ES. Therefore, a precautionary approach has been adopted for the preliminary assessment.

10.8.60 Due to the anticipated peat excavation volumes, a number of options for peat management, re-use and restoration are being considered as outlined in **Chapter 4: The Proposed Development**.

10.8.61 Excavation, storage and reuse methods are documented in **Appendix 10-3** and informed by good practice on other wind farms consented in Scotland and Wales.

10.8.62 The peat soil and related habitats within the Turbine Area are the primary receptors. The effects on habitat are assessed in **Chapter 8: Biodiversity** and are based on the footprint (or area) of impact.

10.8.63 The effects on peat soil are assessed in terms of the volume of peat soil potentially impacted as a proportion of the overall onsite resource and the condition of the peat with respect to natural and artificial pressures (principally erosion, drainage by gullies or moor drains and cutting).

10.8.64 The preliminary assessment indicates a total excavation volume of circa 560,000m^3. Environmental measures (principally non-excavation through floating track) have saved a further circa 213,000m^3 of peat from being excavated. Of the total excavation volume, circa 387,000m^3 is to be permanently excavated and circa

173,000m^3 is to be temporarily excavated and directly reinstated. The total initial excavation volume is circa 2.5% of the total peat resource within the peat survey area (circa 23 million m^3) based on the detailed peat depth model derived from peat probing. At this stage, the peat restoration proposals are not fully confirmed, with a series of options under consideration. On this basis, significant effects cannot be ruled out at this stage, with further detailed assessment and mitigation measures to be developed, which will be presented in the ES.

Additional Mitigation

10.8.65 As noted above and set out in **Chapter 4: The Proposed Development**, a number of options are being considered for the reuse and / or restoration of peat. A combination of peat reuse options has been identified that would be sufficient to reuse all excavated peat within the PEIR Boundary. The volumes shown in association with each option may vary as the layout matures and the total volume under consideration may reduce as the proposed layout is refined. All options, shown in **Figure 10-3.4** and discussed in **Appendix 10-3**, are directly accessible from the proposed infrastructure or will require minor temporary enabling works to facilitate:

- Of the permanently excavated peat, circa 146,000m^3 could be placed in five borrow pits distributed across the Turbine Area. All are in shallower peat or close to / adjoining peat areas and are therefore viable landscape positions for peat to be reinstated;
- Approximately 19,000m^3 of peat could be placed in the construction compounds to a maximum depth of 2.0m. Again, the compound locations are in viable settings for peat translocation;
- Approximately 44,000m^3 could be used to repair two large dykes from which major linear gully networks have eroded by headcutting. The dykes are accessible directly from proposed infrastructure locations;
- Approximately 75,500m^3 of peat could be used to reinstate peat within peat cutting footprints identified on LIDAR data. These show typical cutting depths of 0.3 – 0.5m. Target depths will be circa 0.4m. Peat was likely to have been present at greater depths than currently and has been lost through gradual cutting and removal from the Turbine Area;
- Approximately 3,000 m^3 of peat could be used to reinstate peat cover in pits and quarries across the Site; and
- A peat storage area could be constructed within a track loop above Pisser Rough. The storage area could be constructed in cells using higher density rock,

and peat placed behind these rock bunds. Similar approaches have been used elsewhere in the UK. In total, circa 99,500 m^3 could be placed in this area.

10.8.66 These options are considered to be achievable and sufficient in scope to accommodate all permanently excavated peat such that a peat mass balance can be achieved.

10.8.67 To ensure reused peat remains viable with minimal hydrological and vegetative deterioration, monitoring and remedial measures will be specified within the oPMP. Monitoring will be built around target reinstatement conditions and remedial measures specified to enable any departure from these conditions to be addressed by additional intervention from the wind farm operator, funding secured under the HMMP for the Proposed Development. Further details will be presented in the ES.

Residual Effects

10.8.68 While significant effects cannot be ruled out at this stage, based on the above options and calculations and assuming monitoring and remediation measures are put in place, it is anticipated that it can be confirmed through further detailed assessment and mitigation development for the ES that there will be no significant effects.

Risk of Flooding from All Sources to Site Users and Offsite People and Property

10.8.69 The potential flood risk associated with the construction and decommissioning phases includes an increase or change in fluvial / pluvial flood risk, specifically due to changes in ground levels as a result of earthworks, stockpiling and excavations associated with the construction of the Bradford West Cable Corridor (changing overland flow routes / pathways), or uncontrolled discharges of surface water from new impermeable areas (increasing the rate at which water runs off from the PEIR Boundary). As detailed within the Preliminary FRA, flood risk during construction associated with tidal, groundwater and artificial sources is considered to be low.

10.8.70 There is no specific quantitative methodology that allows flood risk effects to be assessed. However, the assessment is based on a technical understanding of flood risk within the PEIR Boundary and how runoff will be managed during the construction and decommissioning phases. With this in mind, determining the effects during the construction and decommissioning phases is based on professional judgement and is qualitative.

10.8.71 Receptors for any change in flood risk include:

- Construction staff, members of the public using PRoW, YWS and UUW staff visiting their assets; and

- Offsite people and property (third parties).

10.8.72 Receptor sensitivity classifications have been determined based on a combination of guidance contained within the DMRB and professional experience, as summarised in **Table 10-6**. In accordance with **Table 10-16,** construction staff are considered to have a low sensitivity, members of the public have a high sensitivity, and offsite properties have varying degrees of sensitivity (negligible to high) depending on the nature of the land use.

10.8.73 A CEMP will be adopted to minimise the environmental impacts during the construction phase. A DEMP will be adopted setting out best practice measures which will be incorporated during the decommissioning works.

10.8.74 Considering environmental measures and following the implementation of environmental management plans, the direct, short-term, temporary adverse effects are minor (not significant) due to the negligible to high sensitivity of receptors combined with the negligible magnitude of potential impact. No additional mitigation is required.

Additional Mitigation

10.8.75 None required.

Residual Effects

10.8.76 The residual effect remains unchanged from the pre-additional mitigation effect (i.e. minor and **not significant**).

Potential Pollution Events Associated with the Generation of Foul Water Onsite

10.8.77 Any foul water on site will be captured and taken offsite for appropriate treatment subject to agreement with the relevant bodies. Therefore, foul water will be within a closed system within the construction compounds. Therefore, the effects will be **not significant**.

Additional Mitigation

10.8.78 None required.

Residual Effects

10.8.79 The residual effects remain unchanged from the pre-additional mitigation effects outlined above (e.g. **not significant**).

Operational and Maintenance Phase

Erosion and Sedimentation

10.8.80 During the operational and maintenance stage, no major ground-disturbing activities are expected, and vegetation cover across reinstated areas will be established and maintained, reducing the likelihood of sediment mobilisation. Drainage infrastructure will continue to function to manage runoff, preventing erosion and associated sediment transport.

10.8.81 Routine maintenance activities (e.g. occasional vehicle access) are not anticipated to result in significant erosion, with appropriate controls and maintenance of drainage features upheld and secured as part of the oOEMP. Long-term effects on erosion and sedimentation are therefore expected to be unlikely during operation.

10.8.82 Monitoring will continue for an agreed period post-construction phase to confirm the infrastructure is no longer at risk of impacting sensitive receptors.

10.8.83 The direct, permanent, long-term adverse effect will be minor (not significant) due to the negligible to high sensitivity of receptors combined with the negligible magnitude of potential impact, as works will have ceased. No additional mitigation is required.

Additional Mitigation

10.8.84 None required.

Residual Effects

10.8.85 The residual effects remain unchanged from the pre-additional mitigation effects (i.e. minor and **not significant**).

Alteration of Flow, Natural Drainage Patterns / Runoff Volumes and Rates – Groundwater Flows

10.8.86 Operational infrastructure, such as the access tracks, internal site access tracks, hardstanding areas and drainage networks, will remain in place and continue to influence surface and groundwater flow and groundwater recharge patterns. However, these changes will be consistent with the post-construction drainage regime and will not introduce new hydrogeological effects beyond those already assessed for the construction phase.

10.8.87 The mitigation measures to capture and reinfiltrate groundwater to down gradient peat will continue during operation and in combination with surface water management measures that will incorporate attenuation and flow control measures to mimic natural runoff regimes and minimise downstream impacts. Regular inspection and maintenance of drainage management infrastructure will be

important to ensure ongoing effectiveness. The appropriate ongoing management and maintenance will be secured as part of the oOEMP.

10.8.88 As the operational and maintenance phase is consistent with the later construction phase, the direct, permanent, long-term adverse effect is moderate (**significant**) due to the high sensitivity of receptors (private water supplies, GWDTEs and peat) combined with the low magnitude of potential impact. Additional mitigation, as identified for the construction period, will be required to reduce effects.

Additional Mitigation

10.8.89 As infrastructure will remain throughout the operational and maintenance phase, the same additional mitigation measures that apply for the construction phase are necessary to mitigate for groundwater flow alteration and interruption.

Residual Effects

10.8.90 As with the construction phase, assuming that standard good practice methods are applied and that there is a comprehensive and robust approach to groundwater recharge down gradient of infrastructure, the residual effects are expected to be **not significant**.

Potential Pollution Events Affecting Groundwater and Surface Water Quality

10.8.91 Although pollution risk is significantly reduced during the operational and maintenance phase compared to the construction phase, potential pollution sources such as fuel storage or accidental leaks from maintenance vehicles still exist. However, these are limited in scale and frequency.

10.8.92 Operational and maintenance pollution risks will be mitigated through routine inspection, use of spill kits, secondary containment for hazardous substances, and compliance with pollution prevention guidance (e.g. GPPs). These measures will be secured as part of the oOEMP. As a result, the likelihood of pollution events affecting groundwater or surface water is considered unlikely.

10.8.93 The magnitude of potential impact of a pollution event during operation is considered to be negligible, as the majority is outside of the 50m buffer of watercourses, there is low permeability formations on site limiting the potential for infiltration, there are much-reduced operations and a comprehensive suite of procedures for pollution prevention and response will be employed.

10.8.94 Where the operational activities / infrastructure are offset by more than 50m from watercourses, the direct, permanent, long-term adverse effects are minor (not significant) due to the low to medium sensitivity of receptors (the watercourses and groundwater discharging to public and private water supplies) combined with the

negligible magnitude of potential impact. No additional mitigation is required for these operational activities.

10.8.95 For operational activities where the Western Access Route overlies the SPZ1, the magnitude of potential impact is considered to be low, as although works will have ceased, there remains a risk of a spill from operational and maintenance vehicle movements.

10.8.96 The direct, permanent, long-term adverse effects are moderate (significant) due to the high sensitivity of the SPZ1 combined with the low magnitude of potential impact. Additional specific mitigation is required to control pollution of the water supply.

Additional Mitigation

10.8.97 To protect the water supply within the SPZ1 at the River Laneshaw, a specific operational drainage management plan will be required as part of the OEMP for the access track, to limit potential infiltration of any potentially contaminated track runoff, along with procedures to restrict activities within the SPZ.

Residual Effects

10.8.98 It is assumed that by implementing the additional mitigation within the SPZ1, the significance of the effect can be reduced to **minor (not significant)**.

Risk of Flooding from all Sources to Site Users and Offsite People and Property

10.8.99 The potential flood risks associated with the operational stage include an increase or change in flood risk, specifically due to changes in ground levels or uncontrolled discharges of surface water from new impermeable areas / the drainage network. There is no specific quantitative methodology that allows flood risk effects to be assessed. However, the assessment is based on a technical understanding of flood risk at the PEIR Boundary and how runoff will be managed.

10.8.100 Hydraulic modelling is being undertaken to understand fluvial/pluvial flood risk at the PEIR Boundary pre- and post-development. As a result, the assessment of flood risk from these sources will be quantified. However, determining the flood risk effects of the completed Proposed Development on all other sources of flood risk will be based on the professional judgement of competent experts and will be qualitative.

10.8.101 As detailed within the Preliminary FRA (**Appendix 10-9**), flood risk associated with artificial sources is considered to be low. Conversely, there is the potential for some impact on groundwater flood risk as a result of below-ground development, in particular the Bradford West Cable Corridor, where below-ground works will be

required across areas where groundwater is anticipated to be relatively shallow. Further assessment of the potential impacts of the Proposed Development on groundwater flooding is ongoing. However, it is likely that mitigation may be required to stop the potential for groundwater to travel along the Export Cable and emerge elsewhere. The results of the ongoing groundwater assessment and any associated mitigation measures will be presented within the ES.

10.8.102 Receptors for any change in flood risk include:

- Users of the operational site (staff, members of the public using PRoW, YWS and UUW staff visiting their assets); and
- Offsite people and property (third parties).

10.8.103 Receptor sensitivity classifications have been determined based on a combination of guidance contained within the DMRB and professional experience, as summarised in **Table 10-6**. In accordance with **Table 10-17,** operational site staff are considered to have a low sensitivity, members of the public have a high sensitivity, and offsite properties have varying degrees of sensitivity (negligible to high), depending on the nature of the land use.

10.8.104 The likely effects are based upon an understanding of the activities during the operational and maintenance phase of the Proposed Development and changes to ground levels and runoff characteristics that will be introduced as part of the development. Changes to runoff characteristics will be quantified as part of the drainage strategy, and changes in fluvial/pluvial flood risk will be quantified as part of the hydraulic modelling. The likely effects of all other sources of flood risk will be assessed qualitatively.

10.8.105 The preliminary assessment of operational fluvial / pluvial flood risk cannot be accurately completed at present in the absence of hydraulic modelling results or the completion of the drainage strategy. As a result, significant effects cannot be ruled out at this stage. However, the infrastructure layout will be developed with consideration given to good practice, policy and guidance in relation to flood risk management. In line with this, the Proposed Development will be designed to a standard by which it would remain safe and operational during flooding conditions, without increasing flood risk elsewhere. A detailed assessment of flood risk and any necessary mitigation will be provided as part of the ES. If the pluvial modelling and wider flood risk assessment prove that flood risk is not increased outside of the PEIR Boundary, effects are not anticipated to be **significant**.

Additional Mitigation

10.8.106 The potential requirement for additional environmental measures to be incorporated will be confirmed following completion of the hydraulic modelling study and outline

drainage strategy. If found to be required, mitigation measures may comprise localised ground reprofiling, or the creation of flood storage areas could be incorporated into the design.

Residual Effects

10.8.107 At this stage, the residual effects remain unchanged from the pre-additional mitigation effect outlined above (i.e. significant effects cannot be ruled out). However, the effects will be subject to further detailed assessment, which will be confirmed as part of the ES, once the hydraulic modelling study has been completed. It is anticipated that any environmental measures would remove the potential for residual effects.

Potential Pollution Events associated with the Generation of Foul Water Onsite

10.8.108 As stated for the construction period, any foul water on site will be captured and taken offsite for appropriate treatment, subject to agreement with the relevant bodies. Therefore, foul water will be within a closed system within the substation compound. Therefore, the effects will be **not significant**.

Additional Mitigation

10.8.109 None required.

Residual Effects

10.8.110 The residual effects remain unchanged from the pre-additional mitigation effects outlined above (e.g. **not significant**).

Next Steps

10.8.111 The results of the hydraulic modelling study will be provided at the ES stage and used to inform the assessment of fluvial and pluvial risk during operation and maintenance. The model will also be used to evaluate the design and any necessary environmental measures for fluvial / pluvial flood risk.

10.8.112 Additional site surveying and layout adjustment will be undertaken for the ES to reduce works within the watercourse buffer zones of more sensitive water bodies.

10.8.113 Discussions with UUW will be conducted to understand their concerns regarding the Proposed Development and to find whether an agreed methodology for working can be developed. This may involve adjustment of the track alignment, design specification for the track and drainage arrangements, monitoring during construction and timing of works around climatic conditions.

10.8.114 Peat Depth data will be used to inform further iterative layout design and refine infrastructure placement, track routes and construction methodologies. Opportunities to reduce earthworks footprints will be further explored to reduce excavation volumes. The current PPLHRA will be used to inform future infrastructure locations. A full runout and associated consequence assessment will be undertaken for the ES and documented in an updated hazard risk assessment. Peat re-use measures will be tailored to the more established and commonly used methods at the expense of more innovative methods (e.g. the peat storage area).

10.8.115 The drainage strategy will be developed in consultation with the LLFAs, and will set out how runoff from the Proposed Development will be managed in a sustainable manner; providing appropriate treatment and attenuation.

10.8.116 The oCEMP, oOEMP and oDEMP will be prepared to accompany the ES.

10.9 Conclusions

10.9.1 **Table 10-18** presents a summary of the preliminary assessment of likely significant effects, with further information required for full assessment to be presented in the ES. It also includes the next steps to be undertaken as part of the ES.

Table 10-18: Summary of Preliminary Assessment of Likely Significant Effects

Element	Residual Effect
Construction Phase	
Erosion and sedimentation	Minor adverse / Not Significant
Alteration of flow, natural drainage patterns / runoff volumes and rates – groundwater flows	Significant effects cannot be ruled out
Potential pollution events affecting groundwater and surface water quality	Minor adverse / Not Significant
Peat instability	Significant effects cannot be ruled out
Loss of peat / carbon loss	Significant effects cannot be ruled out
Risk of flooding from all sources to site users and off-site people and property	Minor adverse / Not Significant
Potential pollution events associated with the generation of foul water onsite	Not Significant
Operational and Maintenance Phase	
Erosion and sedimentation	Minor adverse / Not Significant

Element	Residual Effect
Alteration of flow, natural drainage patterns / runoff volumes and rates – groundwater flows	Significant effects cannot be ruled out
Potential pollution events affecting groundwater and surface water quality	Minor adverse / Not Significant
Risk of flooding from all sources to site users and off-site people and property	Significant effects cannot be ruled out
Potential pollution events associated with the generation of foul water onsite	Not Significant
Decommissioning Phase	
Erosion and sedimentation	Minor adverse / Not Significant
Alteration of flow, natural drainage patterns / runoff volumes and rates – groundwater flows	Significant effects cannot be ruled out
Potential pollution events affecting groundwater and surface water quality	Minor adverse / Not Significant
Peat instability	Significant effects cannot be ruled out
Loss of peat / carbon loss	Significant effects cannot be ruled out
Risk of flooding from all sources to site users and off-site people and property	Minor adverse / Not Significant
Potential pollution events associated with the generation of foul water onsite	Not Significant

Calderdale
energy park