BERWICK BANK WIND FARM
ONSHORE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Chapter 11: Geology, Hydrology, Soils & Flood Risk

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11. GEOLOGY, HYDROLOGY, SOILS & FLOOD RISK

11.1. INTRODUCTION

1. This chapter presents the assessment of the likely significant effects on the environment of the Berwick Bank Wind Farm onshore transmission works (OnTW) (the Proposed Development) on Geology, Hydrology, Soils & Flood Risk. Specifically, this chapter considers the potential impact of the Proposed Development landward of Mean Low Water Springs (MLWS) during the construction, operational and maintenance, and decommissioning phases.

2. This chapter summarises information contained within Volume 4, Appendix 11.1 (Berwick Bank Wind Farm: Flood Risk Assessment) and Appendix 11.2 (Berwick Bank Wind Farm: Drainage Strategy).

11.2. PURPOSE OF THIS CHAPTER

3. This chapter:

- Presents the existing environmental baseline established from desk studies, site-specific surveys and consultation with stakeholders;
- Identifies any assumptions and limitations encountered in compiling the environmental information;
- Presents the potential environmental impacts on geology, hydrology, soils & flood risk arising from the Proposed Development, and reaches a conclusion on the likely significant effects on geology, hydrology, soils & flood risk based on the information gathered and the analysis and assessments undertaken; and
- Highlights any necessary monitoring and/or mitigation measures recommended to prevent, minimise, reduce or offset the likely significant adverse environmental effects of the Proposed Development on geology, hydrology, soils & flood risk.

11.3. STUDY AREA

4. The geology, hydrology, soils & flood risk study area will cover the Proposed Development site and any potential effects up to 1 km from the site (refer to Volume 4, Figure 11.1). It is considered that this geology, hydrology, soils & flood risk typical study area buffer distance is appropriate considering the size of the development and allows potential effects on downstream receptors to be identified. The geology, hydrology, soils & flood risk study area includes the intertidal area and considers potential effects on offshore receptors that may arise as a result of the upgradient works.

11.3.1. INTERTIDAL AREA

5. The planning application boundary for the Application extends to MLWS. The infrastructure to be located between Mean High Water Springs (MHWS) and MLWS consists of cables to be installed via trenchless technology (e.g. horizontal directional drilling (HDD)). Impacts associated with this infrastructure have been assessed in the Offshore EIA Report (Volume 2, Chapter 7), although given the commitment to use trenchless technology no likely significant effects have been predicted.

6. The Offshore EIA Report is available online at the Berwick Bank Wind Farm website; www.berwickbank.com. An electronic copy has been submitted to East Lothian Council Planning Department.

7. The potential effects of the onshore infrastructure located above MHWS on the intertidal area have been assessed in this chapter.

11.4. POLICY AND LEGISLATIVE CONTEXT

8. A summary of the policy provisions relevant to Geology, Hydrology, Soils & Flood Risk are provided in Table 11.1 below. A summary of the relevant legislative provisions are provided in Table 11.2 below.

Table 11.1: Summary of Scottish Policy and East Lothian Policy (Local Development Plan (LDP) 2018) Relevant to Geology, Hydrology, Soils & Flood Risk

Relevant Policy	Summary of Relevant Policy Framework	How and Where Considered in the Onshore EIA Report
National Planning Framework 4 (Scottish Government, 2023)	Policy 2: Climate mitigation and adaptation Policy 4: Natural Places Policy 10: Coastal Development Policy 22: Flood risk and water management Policy 33: Minerals	Throughout this chapter
PAN 79: Water and Drainage (Scottish Executive, 2006)	provides guidance on the approach to be taken to ensure that proposals for water and wastewater of any development will meet the requirements of environmental legislation.	Throughout this chapter
PAN 51: Planning, Environmental Protection and Regulation (Scottish Executive, 2006)	provides guidance on environmental protection regimes with respect to the planning system.	Throughout this chapter
Planning Advice Note 61: Planning and Sustainable Urban Drainage Systems (Scottish Executive, 2001)	provides guidance to developers for sustainable urban drainage systems and their design and implementation.	Volume 4, Appendix 11.2
Scottish Government Online Planning Advice on Flood Risk (2015)	provides guidance and the framework on the assessment and sustainable management of flood risk for developments.	Volume 4, Appendix 11.1
East Lothian Council LDP Policy MIN1: Protection of Mineral Reserves	provides guidance on site selection to avoid the sterilisation of minerals reserves.	Throughout this chapter
East Lothian Council LDP Policy NH2: Protection of Sites of Special Scientific Interest and Geological Conservation Review Sites	provides guidance on circumstances where development can impact such features.	Throughout this chapter
East Lothian Council LDP Policy NH3: Protection of Local Sites and Areas	provides guidance on circumstances where development can impact such features.	Throughout this chapter
East Lothian Council LDP Policy NH5: Biodiversity and Geodiversity Interests, including Nationally Protected Species	provides guidance on circumstances where development can impact such features.	Throughout this chapter
East Lothian Council LDP Policy NH6: Geodiversity Recording and Alternative Exposures	provides guidance on the recording of geological features which cannot be preserved.	Throughout this chapter
East Lothian Council LDP Policy NH9: Water Environment	provides guidance on the protection of the water environment and promotion of enhancements	Throughout this chapter
East Lothian Council LDP Policy NH10: Sustainable Drainage Systems	provides guidance on the implementation of Sustainable Urban Drainage System (SUDS).	Volume 4, Appendix 11.2
East Lothian Council LDP Policy NH11: Flood Risk	provides guidance on the applicability of development types in	Volume 4, Appendix 11.1

Relevant Policy	Summary of Relevant Policy Framework	How and Where Considered in the Onshore EIA Report
	certain flood risks areas and how flood risk should be assessed.	
SESPlan Strategic Development Plan, 2013, Policy 4: Minerals	Provides guidance on use of minerals.	Throughout this chapter
SESPlan Strategic Development Plan, 2013, Policy 15: Water and Flooding	Provides guidance on water and flooding.	Throughout this chapter

Table 11.2: Summary of Legislative Provisions Relevant to Geology, Hydrology, Soils & Flood Risk

Relevant Legislation	Summary of Relevant Legislative Framework	How and Where Considered in the Onshore EIA Report
European Union (EU) 2000/60/EC Water Framework Directive (WFD)	Implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003 (WEWSA). This Act introduced a regulatory system for the water environment with SEPA as the lead authority working alongside the public, private and voluntary sectors. The Act ensures that all human activities with the potential to cause a harmful effect on the water environment can be controlled by establishing a framework for co-ordinated controls on water abstraction and impoundment, engineering works affecting watercourses, and discharges to the water environment.	Throughout this chapter
European Commission (EC)'s Groundwater Directive	Provides specific measures to protect groundwater against pollution and deterioration. This Directive is implemented through the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) (as amended), introduced under WEWSA to provide the main regulatory controls for protecting the water environment from harm. CAR introduced specific controls for activities affecting watercourses and waterbodies (both surface water and groundwater).	Throughout this chapter
The Water Resources (Scotland) Act 2013	Makes provision for the development of Scotland's water resources.	Throughout this chapter
The Water Environment (Controlled Activity) (Scotland) Regulations 2011 (as amended) (Scottish Government, 2013)	Controls engineering works in the vicinity of inland surface waters as well as point source discharges, abstractions and impoundments, supporting implementation of the WFD (2006/60/EC) in Scotland.	
The Flood Risk Management (Scotland) Act 2009	Provides a coordinated approach to manage flood risk at a national and local level.	Throughout this chapter
The Private Water Supplies (Scotland) Regulations 2006	Ensures the provision of clean drinking water from private sources	Throughout this chapter

11.5. CONSULTATION

9. A summary of the key issues raised during consultation activities undertaken to date specific to geology, hydrology, soils & flood risk is presented in Table 11.3 below, together with how these issues have been considered in the production of this Geology, Hydrology, Soils & Flood Risk chapter. Further detail is presented within Volume 1, Chapter 2 of the Onshore EIA Report and the Pre-Application Consultation (PAC) Report.

Table 11.3: Summary of Key Consultation Undertaken for the Proposed Development Relevant to Geology, Hydrology, Soils & Flood Risk

Date	Consultee and Type of Consultation	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
Consultation of the Proposed Development: Scoping Opinion			
Oct 2020	Scottish Environment Protection Agency (SEPA) Planning Officer - Scoping Opinion	SEPA consider that the following key issues must be addressed in the Environmental Impact Assessment process: • Map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment and details of any related CAR applications. • Map and assessment of impacts upon groundwater abstractions and buffers. • Map of proposed waste water drainage layout. • Map of proposed surface water drainage layout.	Noted and included within assessment (Appendix 11.1 and 11.2 and relevant Figures)
Relevant Consultation Undertaken to Date			
10th December 2020	SEPA Planning Officer – meeting	Meeting to discuss Onshore Scoping Opinion with SEPA. The Applicant confirmed the following (with respect to Chapter 11): • The Private Water Supply (PWS) study area will be 500 from the application boundary. • Applications for CAR licences will be submitted post consent at detailed design as required. • A detailed pollution prevention plan will be provided post consent at detailed design. • A detailed table of volumes and timings of groundwater abstractions will be provided post consent following detailed design. • Impacts on coastal processes will be assessed within the offshore EIA Report, which will be shared with SEPA.	Noted and included within the assessment where applicable (PWS study included within Section 11.7) noting that some matters will be dealt with post-consent.

Date	Consultee and Type of Consultation	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
2nd March 2021	ELC Planning Service Manager, ELC Planner, ELC Policy Planner, ELC Landscape Officer – meeting	Meeting to discuss Onshore Scoping Opinion with ELC. The Applicant confirmed the following (with respect to Chapter 11): • Landfall infrastructure will be assessed for flood risk.	A Flood Risk Assessment has been undertaken and included in Volume 4, Appendix 11.1
21st September 2021	SEPA Planning Officer - Email	Email correspondence to discuss outcome of coastal flooding assessment and proposed watercourse crossing of the Braidwood Burn.	Addressed within Volume 4, Appendix 11.1
24th March 2022	SEPA Planning Officer – meeting	Meeting to provide update on proposal and discuss the approach to coastal flood risk and watercourse crossings. SEPA confirmed in email response, received 21st June 2022, that if formally consulted, they would have no objection to the application on the grounds of flood risk.	No action required.

11.6. METHODOLOGY TO INFORM BASELINE

10. This section sets out a summary of the methodology to inform the analysis of the baseline within the geology, hydrology, soils & flood risk study area.

11. A desk-based assessment has been undertaken to establish the catchments' characteristics and baseline geological and hydrological conditions of the geology, hydrology, soils & flood risk study area. As part of the desk-based assessment, information regarding Private Water Supplies (PWS), historic landfill sites, water quality and flood risk data, abstraction licences and monitoring locations have been obtained to inform the assessment. Where available, classification of waterbodies has been referenced as determined by SEPA through River Basin Management Planning, under the Water Framework Directive.

12. Site surveys have been undertaken to further assess baseline conditions from information gathered from the desk-based assessment. Site surveys included a hydrological / geological walkover, watercourse assessments and flood risk assessments.

11.6.1. DESKTOP STUDY

13. Information on geology, hydrology, soils & flood risk within the geology, hydrology, soils & flood risk study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 11.4 below.

Table 11.4: Summary of Key Desktop Studies & Datasets

Title	Source	Year	Author
Online Geology of Britain Viewer	http://mapapps.bgs.ac.uk/geologyofbritain/home.html	2020	British Geological Survey (BGS)
Online GeoIndex Onshore	https://www.bgs.ac.uk/map-viewers/geoindex-onshore/	2020	BGS

Title	Source	Year	Author
Scotland's Environment Web Map	https://map.environment.gov.scot/sewebmap/	2022	SEPA
SEPA Flood Maps	https://map.sepa.org.uk/floodmaps	2022	SEPA
Flood Estimation Handbook (FEH) Web Service	https://fehweb.ceh.ac.uk/GB/map	2022	UK Centre for Ecology and Hydrology.
Geological Conservation Review Dataset	https://apps.snh.gov.uk/sitelink-api/v1/sites/153/documents/3	2011	SNH
Ground Investigation Report	Raeburn Drilling	2021	Raeburn Drilling
Baseline Confluence Nested Catchments	https://www.sepa.org.uk/environment/environmental-data/	2001	SEPA
Water Classification Hub	https://www.sepa.org.uk/data-visualisation/water-classification-hub/	2020	SEPA
National Soil Map of Scotland	https://soils.environment.gov.scot/maps/soil-maps/national-soil-map-of-scotland/	2017	SEPA

11.6.2. SITE-SPECIFIC SURVEYS

14. To inform the Geology, Hydrology, Soils & Flood Risk chapter, site-specific surveys were undertaken. A summary of the surveys undertaken to inform the geology, hydrology, soils & flood risk assessment of effects is outlined in Table 11.5 below.

Table 11.5: Summary of Site-Specific Survey Data

Title	Extent of Survey	Overview of Survey	Survey Contractor	Date	Reference to Further Information
Hydrological / Geological Survey	Scoping stage Search Area for the Site Boundary (desk-based study included wider study area)	Hydrological survey of watercourses and waterbodies to record key features and characteristics, potential watercourse crossing locations, potential flood risk from unmapped watercourses, overland flow paths / routes, potential flood risk mitigation opportunities, details to inform surface water and foul water drainage strategies and outfall configurations. Assessment of geological outcrops where available and any hydrogeological observations.	ITPEnergised	September 2020	Information gathered during survey has been used to inform the baseline against which the effect of the Proposed Development are assessed.
Additional Hydrological Survey	Various Locations within Site	Hydrological survey undertaken to assess proposed cable crossing of the Braidwood Burn and inform hydraulic analysis of proposed crossing in comparison to predicted flows within watercourse. Hydrological survey of unnamed watercourse adjacent to onshore substation to assess potential impact of proposed drainage discharge strategy to downstream receptors. Assessment of downstream culverts was undertaken.	ITPEnergised	February 2022	Volume 4, Appendix 11.1 and 11.2
Topographic Survey	Site-wide ground survey	Ground survey included survey of watercourses within the site boundary such as; Dry Burn and Innerwick Burn.	UTEC	September 2020	Volume 4, Appendix 11.1 and 11.2

11.7. BASELINE ENVIRONMENT

11.7.1. OVERVIEW OF BASELINE ENVIRONMENT

15. This section sets out a summary of relevant baseline data for the geology, hydrology, soils & flood risk study area under the following headings:

- Hydrology;
- Water Resources;
- Hydrogeology;
- Flood Risk;
- Geology;
- Soils; and
- Other Designated Sites.

Hydrology

Surface Water Catchments

16. The geology, hydrology, soils & flood risk study area is situated within six surface water catchments as shown in SEPA's Baseline Confluence Nested Catchments data file;

- East Lothian Coastal between Dry Burn and Spott Burn (ID 12575);
- Dry Burn @ mouth (ID 18113);
- East Lothian Coastal between Thornton Burn and Dry Burn (ID 12687);
- Thornton Burn @ mouth (ID 13453);
- East Lothian Coastal between Dunglass Burn and Thornton Burn (ID 19745); and
- Dunglass Burn @ mouth (ID 16994).

17. An overview of the surface water catchments is provided in Volume 2, Figure 11.2.

18. Of the above catchments "East Lothian Coastal between Dry Burn and Spott Burn" and "Dunglass Burn @ mouth" are outwith the site and not hydraulically connected with the Proposed Development.

19. The "Dry Burn @ mouth" catchment is approximately 19 km^2 and the Dry Burn watercourse is classified by SEPA as being of 'Moderate' status (SEPA, 2020). The north western extents of the Proposed Development are located within the "Dry Burn @ mouth" catchment. A small number of minor unnamed tributaries to the Dry Burn are located within the geology, hydrology, soils & flood risk study area.

20. The "East Lothian Coastal catchment between Thornton Burn and Dry Burn" is approximately 4km^2. The main watercourse in this catchment is unnamed and originates from the agricultural land to the west of Innerwick and flows to the settlement of Skateraw. The watercourse (hereafter referred to as the Innerwick Burn) is not classified by SEPA. The Innerwick Burn has been surveyed for the purpose of informing the drainage strategy for the onshore substation and it has been identified that it is heavily modified with multiple culverts and discharges to the Dry Burn to the north of the settlement of Skateraw. The onshore substation is located within this catchment area. No other watercourses are located within this catchment.

21. The "Thornton Burn @ mouth" catchment is approximately 14 km^2 and is classified by SEPA as being of 'Good' status (SEPA, 2020). The main watercourse within the catchment is known as the Thornton Burn within the downstream reaches. Within the geology, hydrology, soils & flood risk study area, the Thornton Burn is also known as the Braidwood Burn (predominant watercourse) and the Ogle Burn (tributary to the Braidwood Burn) is located

further upstream near to Thorntonloch. The southern extents of the Proposed Development are located within this catchment.

22. The "East Lothian Coastal between Dunglass Burn and Thornton Burn" catchment is approximately 17 km^2 with no named watercourses present. Several minor unnamed watercourses are present draining the catchment area to the coastline. The southern extents of the site are located within this catchment but no Proposed Development is located within this catchment with the exception of a short section of access track to the proposed Branxton grid substation. This short section of track is located within the western extents of the catchment.

23. The coastal waters at the site are classified by SEPA under the Barns Ness to Wheat Stack coastal water body and are considered to be of Good status (SEPA, 2020).

24. Thorntonloch Beach is a Bathing Waters protected area, classified as being of Excellent status (SEPA, 2020). No Proposed Development infrastructure is located in the vicinity of the Bathing Waters but development is located within the catchment of the Thornton Burn which drains to the Bathing Waters.

Water Resources

Public Water Supplies

25. In the scoping response, Scottish Water confirmed there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, within the geology, hydrology, soils & flood risk study area. The geology, hydrology, soils & flood risk study area is located within a groundwater Drinking Water Protected Area (DWPA) – as is the case for the majority of Scotland with the exception of the Scottish Borders and Dumfries and Galloway council areas.

Private Water Supplies

26. In response to a Freedom of Information (FOI) consultation request ELC provided the details of PWS within 5 km of the coordinates X 374080, Y 673982 (the centre of the site). ELC identified nine PWS supplies serving a total of 28 properties and one factory.

27. All supplies are located outside of the geology, hydrology, soils & flood risk study area, inland and therefore upgradient of the site. The closest PWS is located over 1.4km from the site.

SEPA CAR Abstractions

28. In the scoping response ELC note "*The nearest SEPA licensed groundwater abstractions (CAR/S/1014268) is ~320m north of the proposed Skateraw and Crowhill substation locations on the opposite side of the railway line and trunk road. The next nearest licensed or registered groundwater abstractions are over 2km away at Dunbar Cement Works.*" CAR/S/1014268 is recorded by SEPA as a "pumping test" in the received information from the FOI and is located within the geology, hydrology, soils & flood risk study area and site. The Dunbar Cement Works is not located within the geology, hydrology, soils & flood risk study area.

29. Locations of PWSs and abstraction locations are provided in Volume 2, Figure 11.3.

Hydrogeology

Aquifer Classification

30. The geology, hydrology, soils & flood risk study area is situated within Torness (bedrock) and Torness Coastal (superficial) aquifers. The aquifers are classified as having Good status (SEPA, 2020).

Aquifer Productivity

31. The geology, hydrology, soils & flood risk study area is underlain by moderately productive aquifers.

32. Aquifer flow within the geology, hydrology, soils & flood risk study area is described as virtually all through fractures and other discontinuities.

33. A summary of the hydrogeology within the geology, hydrology, soils & flood risk study area is provided in Volume 2, Figure 11.4.

Groundwater Dependent Terrestrial Ecosystems

34. The geology, hydrology, soils & flood risk study area does not contain any peatlands or wetlands. Therefore no Groundwater Dependent Terrestrial Ecosystems (GWDTE) are present.

Flood Risk

35. A Flood Risk Assessment (FRA) has been carried out and included as Volume 4, Appendix 11.1.

36. All potential sources of flooding to the site have been considered with respect to the following Proposed Development permanent infrastructure:

- Landfall,
- Cable Route and
- Onshore Substation.

37. Assessment of flood risk to the landfall is confirmed to be overall at ‘no risk’ or ‘low risk’ of flooding from all sources. Following initial screening, further assessment was undertaken to accurately determine the coastal flood extent in relation to the landfall which was found to be at ‘low risk’ from coastal flooding.

38. Assessment of flood risk to the cable route is confirmed to be overall at ‘no risk’ or ‘low risk’ of flooding from all sources. Following initial screening, further assessment was undertaken to determine the fluvial flood risk in relation to the cable route watercourse crossings which were found to be at ‘negligible risk’ from fluvial flooding.

39. Assessment of flood risk to the onshore substation is confirmed to be, with mitigation applied, overall at ‘low risk’ of flooding from land or from sewers / artificial drains, and at ‘no risk’ of flooding from all other sources (see Volume 4, Appendix 11.2).

Geology

Bedrock Geology

40. Review of the BGS 1:50k geological mapping indicates the very west of the geology, hydrology, soils & flood risk study area is underlain by Great Conglomerate Formation

consisting of conglomerate and sandstone and Stratheden Group and Inverclyde Group consisting of sandstone and argillaceous rocks in the very south west.

41. The majority of the southern and central area of the geology, hydrology, soils & flood risk study area is underlain by the Ballagan Formation consisting of Sandstone, Siltstone and Dolomitic Limestone.

42. The bedrock geology in the north of the geology, hydrology, soils & flood risk study area is dominated by various limestone units including Hurlet Limestone, Lower Limestone Formation (consisting of Limestone, Argillaceous Rocks and Subordinate Sandstone), Blackhall Limestone and Main Hosie Limestone.

43. Several faults are recorded across the geology, hydrology, soils & flood risk study area, predominantly in the northern areas and along the western and southern extents.

44. An overview of the bedrock geology within the geology, hydrology, soils & flood risk study area is provided in Volume 2, Figure 11.5.

Superficial Geology

45. Review of the BGS 1:50k geological mapping indicates the very west of the geology, hydrology, soils & flood risk study area is underlain by predominantly Till deposits with some areas of Alluvial deposits along watercourse extents.

46. Glaciofluvial Deposits - Gravel, Sand and Silt is the dominating superficial deposit across the remainder of the geology, hydrology, soils & flood risk study area in addition to Alluvial deposits along watercourse extents and Raised Marine deposits Of Holocene Age - Sand and Gravel, Marine Beach Deposits - Gravel, Sand and Silt and Blown Sand along areas of the coastline.

47. Areas of no superficial deposits are also recorded, primarily at the steep sides of watercourses.

48. Review of the BGS 1:50k geological mapping indicates the intertidal area is underlain by Marine Beach Deposits - Gravel, Sand and Silt and Blown Sand along areas of the coastline and Raised Marine Deposits Of Holocene Age - Sand and Gravel, as well as areas where no superficial deposits are recorded.

49. An overview of the superficial geology within the geology, hydrology, soils & flood risk study area is provided in Volume 2, Figure 11.6: Superficial Geology.

Review of Ground Investigation Information

50. A site-wide ground investigation was undertaken in September 2020 (report published January 2021) to inform the Proposed Development layout and design. The results of the ground investigation broadly concur with the published geology from BGS. Bedrock was generally encountered at depths between 3 – 10m and its nature varied dependent on the location, similar to the BGS findings. Superficial deposits were confirmed to be Glaciofluvial in nature, generally with considerable clay content and poor infiltration capacity. No ‘made ground’ was encountered and no indication of any ground contamination. A potential source of contamination has been identified at the area defined as the ‘Skateraw Borrow Pit’. Further ground investigation undertaken in 2022 identified pulverised fuel ash (PFA) within the subsoil. Further chemical composition testing of the PFA will be undertaken to determine the level of contamination. This further analysis will inform the approach to manage the contamination, which will be determined post consent and agreed with ELC and other relevant stakeholders prior to the commencement of construction.

Mineral Reserves

51. Existing and historic quarries are present across ELC for the extraction of hard rock, limestone and sands and gravels. Skateraw quarry lies within the geology, hydrology, soils & flood risk study area, previously used for extraction of sands and gravels. Planning permission was originally granted in 2001 with an extension in 2011. The planning consent for the quarry expired in 2017.

52. No hard rock or limestone quarries are present within the geology, hydrology, soils & flood risk study area.

53. The superficial deposits and bedrock geology underlying the Proposed Development are widely present within the geology, hydrology, soils & flood risk study area and beyond.

Geologically Designated Sites

54. The landfall passes through the Barns Ness Coast Site of Special Scientific Interest (SSSI) and Geological Conservation Review Site. This is designated for the presence of biologically important habitats and for Lower Carboniferous Limestone which is rich in fossils. This geology is of particular interest as there is an exposed almost complete, though heavily faulted, section through the whole lower limestone group. The Landfall location avoids the 'crucial areas' of the feature (a term defined in the EIA Scoping Opinion (Volume 4, Appendix 2.2).

55. The use of trenchless technology (e.g. HDD) from offshore to onshore transition allows for the landfall site and transition pits to be located inland of the Barns Ness Coast SSSI. In addition, the use of trenchless technology will ensure that the works will pass underneath the SSSI as agreed within the EIA Scoping Opinion (Volume 4, Appendix 2.2).

56. The Local Geodiversity Site at Thorntonloch is located within the geology, hydrology, soils & flood risk study area, and is a very good example of rock coast landforms in sedimentary rocks. The Local Geodiversity Site is not within the site boundary and no Proposed Development works will be undertaken near to this location.

57. Locations of the relevant designated sites are provided in Volume 2, Figure 11.7 Designated Sites.

Soils

58. The geology, hydrology, soils & flood risk study area is located in predominantly agricultural land. Impacts on agriculture are included in Land Use, Tourism and Recreation Volume 1, Chapter 14.

59. Soils within the geology, hydrology, soils & flood risk study area are predominantly classified within the generalised soil type of Brown Soils, with isolated areas of mineral gleys and alluvial soils.

60. Topsoil compaction risk within the geology, hydrology, soils & flood risk study area (Volume 2, Figure 11.9) is predominantly moderate, interspersed with areas of high risk.

61. Subsoil compaction risk within the geology, hydrology, soils & flood risk study area (Volume 2, Figure 11.10) ranges from moderate to extreme. Areas of extreme vulnerability are predominantly within the area of the site around the A1 and East Coast Main Line, and along the Braidwood Burn.

62. Soil runoff risk within the geology, hydrology, soils & flood risk study area (Volume 2, Figure 11.11) is predominantly low to moderate.

11.7.2. FUTURE BASELINE SCENARIO

63. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, require that a "*a description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution thereof without development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge*" is included within the Onshore EIA Report.

64. In order to ensure that the Proposed Development is assessed against a realistic baseline scenario, i.e. what the baseline conditions are likely to be once the Proposed Development is operational, a description of the likely future baseline conditions is provided within this section.

65. The relevant climate change projections using the UK Climate Change Projections 2018 (UKCP18) are:

- winter rainfall is projected to increase and summer rainfall is most likely to decrease; and
- an increase in frequency of winter storms over the UK.

66. Increased winter rainfall and increased frequency of winter storms may increase the probability of flood risk and drainage systems may require increased capacity.

67. Decrease in summer rainfall may affects water supplies dependent on local rainfall, surface water and / or groundwater.

68. SEPA's most recent climate change allowances guidance published in 2022 are partially based on UKCP18 findings and provides climate change allowances for sea level rise, rainfall intensity and river flows for Scotland. Relevant allowances for all types of flooding described have been used within the assessment and in the FRA and surface water drainage design.

69. The relevant climate change allowances for the Proposed Development which is situated in the Forth River Basin are:

- Peak river flow allowance: Total change to 2100 – 56%
- Seal level rise allowance: Cumulative rise from 2017 to 2100 in metres – 0.86
- Peak rainfall intensity allowance: Total change to 2100 – 39%

11.7.3. DATA ASSUMPTIONS AND LIMITATIONS

70. Data limitations include:

- No water quality or flow monitoring has been undertaken to date. Baseline water quality monitoring is typically undertaken 12 months prior to commencement of construction (i.e., post consent).
- The Flood Estimation Handbook (FEH) Web service, used for determining catchment characteristics, only analyses catchments greater than 0.5 km^2 and does not account for any in-channel artificial modifications to watercourses (i.e. culverting, weirs etc).
- SEPA do not provide flood risk mapping for watercourses with a total catchment area of less than 3km^2 or water framework directive (WFD) classification for watercourses with a total catchment area of less than 10km^2 (unless they require specific management).

11.8. KEY PARAMETERS FOR ASSESSMENT

11.8.1. MAXIMUM DESIGN SCENARIO

71. The maximum design scenario(s) summarised here have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in Volume 1, Chapter 5 of

the Onshore EIA Report. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here, be taken forward in the final design scheme.

72. The geology, hydrology, soils & flood risk assessment has been based on the maximum Proposed Development footprint and areas of temporary infrastructure along with a construction programme of 40 months. Assessment of flood risk has been on 1 in 200 year return period flood events with associated climate change uplifts.

73. This assessment has considered the following potential impacts:

- temporary direct impacts to statutory designated sites due to the maximum temporary footprint of the Proposed Development during construction;
- changes to natural drainage patterns due to construction activities;
- temporary increase in erosion of soils due to construction activities;
- increase in flood risk due to construction activities and the maximum temporary and permanent infrastructure footprint;
- pollution of watercourses and waterbodies due to surface water runoff during construction, operation, and decommissioning; and
- indirect impacts on private and public water supplies.

11.8.2. IMPACTS SCOPED OUT OF THE ASSESSMENT

74. Impacts scoped out of the assessment were agreed with key stakeholders through consultation within the Scoping Opinion or through the additional information provided in the Section 11.7 Baseline Environment within this chapter. Section 11.7 summarises the Baseline Environment specific to areas of Proposed Development, therefore enabling an assessment of potential pathways to be undertaken and more accurately determine potential impacts in comparison to the Scoping Report (which was assessed on the full site boundary). These, together with a justification, are presented in Table 11.6.

Table 11.6: Impacts Scoped Out of the Assessment for Geology, Hydrology, Soil and Flood Risk (tick confirms impacts scoped out)

Potential Impact	Phase[1]			Justification
	C	O	D	
Impacts on Private Water Supplies	✓	✓	✓	All supplies are located upgradient and significantly distanced from the Proposed Development with the closest PWS located over 1.4km from the site boundary.
Impacts on Public Water Supplies (Surface Water)	✓	✓	✓	There are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, within the geology, hydrology, soils & flood risk study area.
Impacts on Hydrogeology		✓	✓	Bedrock aquifers within the geology, hydrology, soils & flood risk study area are of moderate productivity and overlain by superficial deposits with poor infiltration capacity and thus negligible likelihood for transmittal of pollutants into groundwater. Ground investigation results indicate that the Proposed Development will not interact with groundwater. An existing abstraction point has been identified in which construction enabling works are located within the 250m abstraction buffer, as such, potential impacts during construction are considered

[1] C = Construction, O = Operational and maintenance, D = Decommissioning

Potential Impact	Phase[1]			Justification
	C	O	D	
				within the assessment. A short section of cable route is also located within the 250m buffer but on the opposite side of the Innerwick Burn to the abstraction point. The Innerwick Burn will act as a hydraulic barrier, preventing any pathway between the Proposed Development and the abstraction point.
Impacts on GWDTE	✓	✓	✓	No GWDTEs present within geology, hydrology, soils & flood risk study area.
Impacts on Flood Risk			✓	Flood risk within the study geology, hydrology, soils & flood risk study area has been shown to be at 'no risk' or 'low risk' of flooding from all sources (with mitigation applied where applicable – see Volume 4, Appendix 11.1). The decommissioning phase will be short term / temporary and not subject to the long-term flood risk outcomes that have been assessed.
Impacts on Geology	✓	✓	✓	General geology within the geology, hydrology, soils & flood risk study area (with the exception of specific designations shown below) is not considered to be at risk from the Proposed Development given that excavations will be predominantly limited to the superficial geology (with the exception of the landfall location considered below within the Barns Ness Coast Geological Conservation Review Site).
Impacts on Mineral Reserves	✓	✓	✓	The superficial deposits and bedrock geology underlying the Proposed Development are widely present within the geology, hydrology, soils & flood risk study area and beyond. No mineral reserves of high value or sparse in nature will therefore be sterilised from extraction due to the Proposed Development.
Impacts on Barns Ness Coast Geological Conservation Review Site		✓		Site design ensures that the landfall location will be located inland of the conservation site and the offshore cables will pass beneath the conservation site.
Impact on Local Geodiversity Site at Thorntonloch	✓	✓	✓	This site is located out with the site boundary and no Proposed Development will be undertaken at this location.

11.9. METHODOLOGY FOR ASSESSMENT OF EFFECTS

11.9.1. OVERVIEW

75. The geology, hydrology, soils & flood risk assessment of effects has followed the methodology set out in Volume 1, Chapter 2 of the Onshore EIA Report. Specific to the assessment of geology, hydrology, soils & flood risk, the following guidance documents have also been considered:

- Pollution Prevention Guidelines (PPGs) are a series of documents developed by the Environment Agency for England and Wales, the Northern Ireland Environment Agency (NIEA) for Northern Ireland, and SEPA for Scotland. A review plan for PPGs is currently underway, resulting in a replacement guidance series, titled Guidance for Pollution Prevention (GPPs). GPPs provide good practice guidance for the whole of the UK, and environmental regulatory guidance to Scotland, Wales and Northern Ireland. The following PPGs and GPPs have been considered to be of particular relevance as part of this assessment:
  - PPG1: General guide to the prevention of pollution (EA, SEPA & EHSNI, 2013);
  - GPP2: Above ground oil storage tanks (EA, SEPA & EHSNI, January 2018);
  - GPP5: Works and maintenance in or near water (EA, SEPA & EHSNI, January 2017);

  - PPG6: Working at construction and demolition sites (EA, SEPA & EHSNI, 2012); and
  - GPP21: Pollution incidence response planning (EA, SEPA & EHSNI, 2017).

- SEPA Supporting Guidance (SAT-SG-75) – Sector specific guidance: construction sites (SEPA, 2018);
- SEPA (2010) Engineering in the Water environment: Good Practice Guide, River Crossing, 2nd Edition;
- SEPA Guidance Note 2a: Development Management Guidance on Flood Risk (2018)
- SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017);
- SEPA Policy 19: Groundwater Protection Policy for Scotland (Version 3, 2009);
- SEPA Policy 41: Planning Authority Protocol - Development at Risk of Flooding: Advice and Consultation (2016);
- Technical Flood Risk Guidance for Stakeholders - SEPA Requirements for Undertaking a Flood Risk Assessment (Version 12, 2019);
- Special Requirements for Civil Engineering Contracts for the Prevention of Pollution v2 (SEPA, 2006);
- CIRIA C532: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (CIRIA, 2001);
- CIRIA (2015) The SuDS Manual, Report C753;
- SEPA (2014) Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems, Version 5.2; and
- IEMA (2022) A New Perspective on Land and Soil in Environmental Impact Assessment.

76. In addition, the assessment of geology, hydrology, soils & flood risk has considered the legislative framework as defined by:

- Directive 2007/60/EC on the assessment and management of flood risks (EC, 2007);
- 2000/60/EC Water Framework Directive (EC, 2000);
- The EC Groundwater Directive (Directive 2006/118/EC);
- The Control of Pollution Act 1974 (COPA), as amended;
- Environment Act 1995 (UK Government, 1995);
- Flood Prevention and Land Drainage (Scotland) Act 1997 (Scottish Executive, 1997);
- The Water Environment and Water Services (Scotland) Act 2003 (WEWSA);
- Flood Risk Management (Scotland) Act 2009 (Scottish Government, 2009);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended (Scottish Government, 2011);
- The Private Water Supplies (Scotland) Regulations 2006;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- The Water Resources (Scotland) Act 2013 (Scottish Government, 2013); and
- The Private and Public Water Supplies (Miscellaneous Amendments) (Scotland) Regulations 2015.

11.9.2. IMPACT ASSESSMENT CRITERIA

77. Determining the significance of effects is a two-stage process that involves defining the magnitude of the potential impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 2 of the Onshore EIA Report.

78. The criteria for defining magnitude in this chapter are outlined in Table 11.7 below.

Table 11.7: Definition of Terms Relating to the Magnitude of an Impact

Magnitude of Impact	Definition
High	Total loss of, or alteration to, key features of the baseline resource such that post development characteristics or quality would be fundamentally and irreversibly changed.
Medium	Loss of, or alteration to, key features of the baseline resource such that post development characteristics or quality would be partially changed.
Low	Small changes to the baseline resource, which are detectable but the underlying characteristics or quality of the baseline situation would be similar to pre-development conditions.
Negligible	A very slight change from baseline conditions, which is barely distinguishable, and approximates to the 'no-change' situation.

79. The criteria for defining sensitivity in this chapter are outlined in Table 11.8 below.

Table 11.8: Definition of Terms Relating to the Sensitivity of the Receptor

Value (Sensitivity of the Receptor)	Description
Very High	Highly permeable superficial deposits allowing free transport of contaminants to groundwater underlain by nationally important aquifers. Waterbody designated as a DWPA. Areas within functional flood plain.
High	Areas containing geological, geomorphological or hydrological features considered to be of national interest, for example, Aquatic Natura 2000 Sites, SACs, SSSIs. Highly permeable superficial deposits allowing free transport of contaminants to groundwater and surrounding surface waters. Waterbody of High or Good Status. High risk of flooding (in accordance with SEPA Flood Maps). Soils extremely vulnerable to compaction or erosion.
Medium	Areas containing features of designated regional importance, for example, Regionally Important Geological and Geomorphological Sites (RIGS) considered worthy of protection for their educational, research, historic or aesthetic importance. Moderately permeable superficial deposits allowing some limited transport of contaminants to groundwater and surrounding surface waters. Waterbody of Moderate Status. Medium risk of flooding (in accordance with SEPA Flood Maps). Soils very vulnerable to compaction or erosion.
Low	Geological features not currently protected and not considered worthy of protection. Low permeability superficial deposits likely to inhibit the transport of contaminants. Waterbody of Poor or Bad Status.

Value (Sensitivity of the Receptor)	Description
	Low risk of flooding (in accordance with SEPA Flood Maps). Soils moderately vulnerable to compaction or erosion.
Negligible	Impermeable superficial deposits which inhibit the transport of contaminants. Waterbody of no classification. No risk of flooding (in accordance with SEPA Flood Maps). Soils not particularly vulnerable to compaction or erosion.

80. The significance of the effect upon geology, hydrology, soils & flood risk is determined by correlating the magnitude of the impact and the sensitivity of the receptor, as outlined in Table 11.9 below.

Table 11.9: Matrix Used for the Assessment of the Significance of the Effect

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

11.10. PRIMARY & TERTIARY MITIGATION

81. As part of the Proposed Development design process, a number of measures have been proposed to reduce the potential for impacts on geology, hydrology, soils & flood risk (see Table 11.10). These include measures which have been incorporated as part of the Proposed Development's design (referred to as 'primary mitigation') and measures which will be implemented regardless of the impact assessment (referred to as 'tertiary mitigation'). As there is a commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development and have therefore been considered in the assessment presented in Section 11.11 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 11.10: Measure Adopted as Part of the Proposed Development (Primary & Tertiary Mitigation)

Measures Adopted as Part of the Proposed Development (Primary & Tertiary Mitigation)	Justification
Where reasonably practicable a 50m buffer will be implemented around all watercourses considered to have continuous flow throughout the year. Where it is not reasonably practicable to maintain a 50 m buffer e.g. where a watercourse will require to be crossed, these works will be regulated under the Controlled Activities Regulations (CAR) licensing regime and necessary licences will be sought from SEPA prior to construction works.	Implementation of the 50m buffer reduces potential of adverse impact on the quality and / or quality of watercourses. Where watercourse crossings are required, crossing designs have been undertaken with consideration of watercourse type and estimated design flows to ensure proposed designs are in accordance with SEPA River Crossing guidance.
A Construction Environmental Management Plan (CEMP) will be in place to control potentially polluting activities to reduce adverse impact to downstream persons, properties and environment during the construction phase so far as reasonably practicable.	Measures will be adopted to control potentially polluting activities to reduce adverse impact to downstream persons, properties and environment during the construction phase so far as reasonably practicable. These will likely include: - abidance of standard industry practise, - Implementation of temporary SUDS, - Management of run-off and discharge water from the excavation sites and watercourse crossing construction areas, - Management of dewatering activities through dewatering permits and method statements, - Appropriate construction compounds design, - Careful consideration will be given to the location of topsoil and subsoil storage areas, - Appropriate management / remediation of potentially contaminated ground, - Full training on spill kits and absorbent materials, - Regular checks of vehicles for leakages and maintenance undertaken offsite, and - method statement for the laying of concrete foundations.
A Water Quality Monitoring Programme (WQMP) will be implemented before, during and after construction to monitor water quality conditions. The WQMP requirements will be agreed with key stakeholders (SEPA / ELC) at the relevant development stage.	To reduce deterioration of water quality occurring during construction so far as reasonably practicable. Any adverse impacts on the quality of the water environment can be identified and appropriate response made.
The CEMP will contain a Soils Management Plan.	Measures will be adopted to ensure soil losses are reduced and reused so far as reasonably practicable. These will likely include: - Earthmoving works carried out in accordance with BSI Code of Practice for Earth Works BS6031:2009, earthworks method statement where more than 50 m3 of spoil is to be excavated, - Management, segregation and correct disposal of any contaminated soils. - Avoid stripping soil following periods of heavy rainfall, - Reduce areas of exposed ground so far as reasonably practicable, - Segregate top and subsoil stockpiles, - Careful handling of soils, - Protect stockpiles to reduce erosion losses so far as reasonably practicable where storage is longer

Measures Adopted as Part of the Proposed Development (Primary & Tertiary Mitigation)	Justification
	than 6 months and protect stockpiles from flooding, - Keep traffic off soil stockpiles so far as reasonably practicable, - Avoid reinstating soils following periods of heavy rainfall where practicable, - Reinstate subsoil to maintain natural drainage patterns and avoid settlement, - Reinstate topsoil by rendering into a loose and workable condition as well as contouring to maintain the profile with the adjacent undisturbed area, - Implement effective temporary and / or permanent soil erosion control measures, - Implement and maintain suitable, adequate and effective control measures to prevent run-off from stockpiles contaminating surface waters, - Disturbed areas and mounds of topsoil/subsoil will be re-graded to blend with the surrounding landform.
Preparation of a surface water drainage strategy to include appropriate SuDS measures to manage surface water runoff from the permanent infrastructure.	Mitigating increased discharge rates and flood risk, as well as meeting the water quality criteria set out in the SuDS Manual.
Preparation of a foul water drainage strategy to safely manage foul water arisings from the operational development.	So far as reasonably practicable, any foul arising from the development is to be properly managed, treated and discharged safely in accordance with SEPA guidance.
Preparation and undertaking of Ground Investigation (GI) campaign to inform site design.	To enable the identification of any geological or hydrogeological risks to the design and to provide site-specific data.
A contaminated land assessment will be undertaken of the potential contaminated land at Skateraw prior to construction commencing.	To assess any potential risks and inform appropriate management measures. Provision and implementation of the CEMP will put in place appropriate measures to limit the likelihood of any such impact from the disturbance of potentially contaminated soils. Further chemical composition testing of the PFA will be undertaken to determine the level of contamination. This further analysis will inform the approach to manage the contamination which will be detailed in the CEMP. Any identified contamination which poses a risk to human health and / or the environment will be managed accordingly, likely either through remediation or disposal of the contaminated soil at a licenced landfill.
A Decommissioning Plan will be in place in the event of permanent cessation of the installed infrastructure.	To ensure decommissioning of the required infrastructure follows standard industry practice.

11.11. ASSESSMENT OF SIGNIFICANCE

82. The potential impacts arising from the construction, operational and maintenance and decommissioning phases of the Proposed Development, along with the maximum design scenario against which each impact has been assessed is given below.

83. An assessment of the likely significance of the effects of the Proposed Development on geology, hydrology, soils & flood risk receptors caused by each identified impact is given below.

IMPACTS ON HYDROLOGY

84. During the construction phase, there is potential for pollution to enter watercourses (and Thorntonloch Bathing Waters indirectly) as a consequence of runoff from construction areas, chemical / fuel spills and untreated foul water discharge. Provision and implementation of the CEMP including construction drainage measures seeks to put in place appropriate measures to limit the likelihood of any such impact on watercourses local to the Proposed Development. In addition, a minimum buffer of 50m to all classified watercourses has been maintained except where watercourse crossings are required (see Volume 4, Appendix 11.1) and a small section around the Landfall Location. In addition, a WQMP would be implemented to monitor the quality of local watercourses before, during and after construction that are in hydraulic continuity with the Proposed Development.

85. During the operational and maintenance phase, there is potential for pollution to enter the Innerwick Burn adjacent to the onshore substation as a consequence of runoff from the onshore substation. Provision of a permanent surface water drainage strategy seeks to provide appropriate treatment for the Proposed Development runoff prior to discharge to the watercourse. There is potential for pollution to enter local watercourses during maintenance of the cable route (e.g., cable replacement). Any maintenance works of the cable route would mimic the construction phase processes albeit in a more minor and short-term fashion and the relevant appropriate measures will be undertaken following a specific method statement maintenance events.

86. During the decommissioning phase, there is potential for pollution to enter watercourses as a consequence of decommissioning activities (similar to the construction phase but to a lesser degree).

Construction phase

Magnitude of impact

87. The impact is predicted to be of local spatial extent across watercourse extents downstream of construction areas and coastal waters adjacent to landfall, medium term duration, intermittent and high reversibility (given the relatively small near coast catchment areas). It is predicted that the impact will affect the receptor directly. Considering the tertiary measures in place to control drainage during construction within the CEMP, the magnitude is therefore considered to be negligible.

Sensitivity of the receptor

88. The watercourses within the assessment range from high to negligible sensitivity based on their classification. The Thornton Burn is of high sensitivity (due to Good Status Classification), the Dry Burn of medium sensitivity (due to Moderate Status Classification), other unnamed watercourses of negligible sensitivity (due to being unclassified) and the Barness to Wheat Stack coastal water body is of high sensitivity (due to Good Status Classification. The overall sensitivity is considered to be high.

Significance of the effect

89. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be up to high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

90. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Operation and maintenance phase

Magnitude of impact

91. The impact is predicted to be of local spatial extent of watercourse extents downstream of the Proposed Development, long term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. Considering the tertiary measures in place to control drainage during the operational and maintenance phase through the implementation of the surface water drainage strategy, the magnitude is therefore considered to be negligible.

Sensitivity of the receptor

92. The Innerwick Burn adjacent to the onshore substation is heavily modified and unclassified therefore is considered to be of negligible sensitivity. All other watercourses within the study area will not be impacted during the operational phase as the remaining Proposed Development outwith the Innerwick Burn catchment will be below ground (i.e., cable routes).

Significance of the effect

93. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be negligible. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

94. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

95. The magnitude of impact for the decommissioning phase is assumed to be equivalent to the construction phase due to similar processes of plant use, excavation and stockpiling. The magnitude is therefore considered to be negligible.

Sensitivity of the receptor

96. The watercourses within the assessment range from high to negligible sensitivity based on their classification. The Thornton Burn is of high sensitivity, the Dry Burn of medium sensitivity and other unnamed watercourses of negligible sensitivity. The overall sensitivity shall be considered high.

Significance of the effect

97. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be up to high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

98. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

IMPACTS ON HYDROGEOLOGY

99. During the construction phase, there is potential for pollution transmittal through the geology into the underlying aquifers as a consequence of runoff from construction areas, chemical / fuel spills and untreated foul water discharge. Provision and implementation of the CEMP including construction drainage measures seeks to put in place appropriate measures to limit the likelihood of any such impact on underlying aquifers and the Skateraw abstraction. In addition, a 250 m buffer around the Skateraw abstraction has been maintained with the exception of some enabling works (down gradient) and a minimal encroachment of the cable route to west that is located on the opposite side of the Innerwick Burn, thus not in hydraulic continuity with the abstraction point. The abstraction source would be included within the WQMP for monitoring before, during and after construction. The clay content observed within the superficial deposits over the geology, hydrology, soils & flood risk study area indicates the likelihood for transmittal of pollutants into the groundwater to be negligible. Ground investigation results and primary mitigation within the onshore substation earthworks design indicate that groundwater will not be encountered during construction and therefore no interaction with the groundwater DWPA is expected.

Construction phase

Magnitude of impact

100. The impact is predicted to be of local spatial extent (within vicinity of Skateraw abstraction), medium term duration, intermittent and medium reversibility (due to the anticipated recharge rates of this local abstraction source). It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of the receptor

101. The Skateraw abstraction is deemed to be of medium vulnerability, medium recoverability and medium value. The abstraction is controlled under a simple licence and therefore less than 2,000m^3/day and used for non-domestic purposes. The sensitivity is therefore considered to be medium.

Significance of the effect

102. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

103. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

INCREASE IN FLOOD RISK

104. During the construction phase, the removal of soil may increase runoff and downstream fluvial and surface water flood risk if unmitigated. A CEMP will be in place during construction and will include a detailed drainage strategy outlining temporary drainage measures to control increase in surface runoff. The CEMP will also outline the methodology for the construction of watercourse crossings to avoid an increase in flood risk to downstream receptors.

105. During the operational and maintenance phase, if unmitigated the runoff from the onshore substation has the potential to increase flood risk downstream. The permanent surface water drainage strategy will ensure that the runoff from developed areas will be properly managed and attenuated prior to discharge to the water environment to seek to maintain the pre-development runoff rates / hydrological regime. The proposed drainage strategy has the additional benefit of managing runoff from a catchment area that is partially related to a pre-existing flooding issue. This pre-existing flooding issue will be reduced through the implementation of attenuated runoff from the area and formally discharging to the nearby watercourse. For the duration of the operation of the onshore substation, the maintenance of the drainage strategy will be the responsibility of the substation site owner.

Construction phase

Magnitude of impact

106. The impact is predicted to be of local spatial extent downgradient / downstream of all construction areas, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. Considering the tertiary measures in place to control drainage during construction within the CEMP, the magnitude is therefore considered to be negligible.

Sensitivity of the receptor

107. Fluvial and surface water flood risks in the area are low and thus the sensitivity of the receptor is low.

Significance of the effect

108. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

109. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Operation and maintenance phase

Magnitude of impact

110. The impact is predicted to be of local spatial extent downgradient and downstream of the onshore substation location, long term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. Considering the tertiary measures in place to control drainage during the operational and maintenance phase through the implementation of the surface water drainage strategy and the benefit of reducing a localised pre-existing flooding issue, the magnitude is therefore considered to be low.

Sensitivity of the receptor

111. Fluvial and surface water flood risks in the area are low and thus the sensitivity of the receptor is low.

Significance of the effect

112. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **minor** beneficial significance.

Secondary mitigation and residual effect

113. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

IMPACTS TO STATUTORY GEOLOGICALLY DESIGNATED SITES

114. During the construction phase, the landfall will be installed in the location of the Barns Ness Coast SSSI and Geological Conservation Review Site. It avoids the 'crucial areas' of the SSSI feature. Trenchless technology (e.g., HDD) will be used as opposed to open cut trenching which enables the cable transition pits and trenchless technology construction compound to be located out with (inland of) the SSSI boundary. The cables will be installed in ducted boreholes that are drilled, at depth to pass underneath the SSSI. The use of trenchless technology will therefore pose a minimal risk of disturbance to the SSSI. During the decommissioning stage, the cables will either remain in-situ and be pulled out from the landfall location. Given the works will pass underneath the SSSI at depth, the decommissioning phase will pose a minimal risk of disturbance to the SSSI.

Construction phase

Magnitude of impact

115. The impact is predicted to be of local spatial extent within the geological conservation area, short term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. However, considering the use of trenchless technology (e.g. HDD) and avoidance of damage to the SSSI due to the depth of the cable, the magnitude is therefore considered to be negligible.

Sensitivity of the receptor

116. The Barns Ness Coast SSSI is an area containing geological features considered to be of national interest. Barns Ness Coast Geological Conservation Review site is an area

containing features of designated regional importance. Taking the higher sensitivity receptor, the SSSI, the geological site is deemed to be of high national geological value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

117. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

118. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

119. The impact is predicted to be of local spatial extent within the geological conservation area, short term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. However, considering the use of trenchless technology (e.g. HDD) and avoidance of damage to the SSSI due to the depth of the cable, the magnitude is therefore considered to be negligible.

Sensitivity of the receptor

120. The Barns Ness Coast SSSI is an area containing geological features considered to be of national interest. Barns Ness Coast Geological Conservation Review site is an area containing features of designated regional importance. Taking the higher sensitivity receptor, the SSSI, the geological site is deemed to be of high national geological value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

121. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

122. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

IMPACTS TO SOILS

123. During the construction phase, there is potential for increased compaction, erosion and loss of soils as a consequence of construction traffic, disturbance, creation of construction areas and excavations. Provision and implementation of the CEMP including a Soil Management Plan will ensure standard industry practice measures are followed with respect to stripping of soils, stockpiling, backfilling and reinstatement. Loss of soils from the operational phase

will be predominantly from the construction of Proposed Development areas (and thus captured in the construction phase assessment) with potential minor impacts as described above relating to any maintenance works. Any maintenance works will be undertaken following a specific method statement.

124. During the decommissioning phase, there is potential for increased compaction, erosion and loss of soils as a consequence of decommissioning activities (similar to the construction phase but to a lesser degree). Provision and implementation of the Decommissioning Programme will ensure standard industry practice measures are followed with respect to stripping of soils, stockpiling, backfilling and reinstatement.

Construction phase

Magnitude of impact

125. The impact is predicted to be of local spatial extent across all construction areas and immediately downgradient, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. However, considering the tertiary mitigation in place through implementation of the CEMP, the magnitude is considered to be low.

Sensitivity of the receptor

126. Soils within proximity to the Proposed Development are predominantly able to support arable agriculture (Class 1, 2 and 3.1) and are predominantly moderately to highly vulnerable to compaction and erosion. The sensitivity is therefore considered medium.

Significance of the effect

127. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

128. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Operation and maintenance phase

Magnitude of impact

129. The impact is predicted to be of local spatial extent across all Proposed Development areas, short term duration (maintenance works), intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be low.

Sensitivity of the receptor

130. Soils within proximity to the Proposed Development are predominantly able to support arable agriculture (Class 1, 2 and 3.1) and are predominantly moderately to highly vulnerable to compaction and erosion. The sensitivity is therefore considered medium.

Significance of the effect

131. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

132. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

133. The magnitude of impact for the decommissioning phase is assumed to be equivalent to the construction phase due to similar processes of plant use, excavation and stockpiling. Therefore, the magnitude is considered to be low.

Sensitivity of the receptor

134. Soils within proximity to the Proposed Development are predominantly able to support arable agriculture (Class 1, 2 and 3.1) and are predominantly moderately to highly vulnerable to compaction and erosion. The sensitivity is therefore considered medium.

Significance of the effect

135. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

136. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

11.11.1. PROPOSED MONITORING

137. Proposed monitoring measures are outlined in Table 11.11 below.

Table 11.11: Monitoring Commitments for Geology, Hydrology, Soils and Flood Risk

Potential Environmental Effect	Monitoring Commitment	Means of Implementation
Impacts on Hydrology	Water Quality Monitoring of watercourses before, during and after construction	Preparation and implementation of WQMP
Impacts on Hydrogeology and Abstractions	Water Quality Monitoring of abstraction source before, during and after construction	Preparation and implementation of WQMP

138. Water quality monitoring of watercourses within the Proposed Development Area and the Skateraw abstraction source is proposed to monitor the quality of these areas during and after construction. Pre-construction monitoring is proposed to develop a baseline water quality dataset for which the construction and post-construction quality can be compared

against to assess any potential impacts. Water quality monitoring allows for ongoing monitoring of water quality and to enable a suitable response to be implemented in the unlikely event that effects on the water environment are observed.

11.12. CUMULATIVE EFFECTS ASSESSMENT

11.12.1. METHODOLOGY

139. The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Proposed Development together with other relevant local plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource. Please see Volume 1, Chapter 2 of the Onshore EIA Report for detail on CEA methodology.

140. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 4, Appendix 2.4). Each project or plan has been considered on a case by case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

141. The specific projects scoped into the CEA for geology, hydrology, soils and flood risk, are outlined in Table 11.12.

Table 11.12: List of Other Projects Considered Within the CEA for Geology, Hydrology, Soils & Flood Risk

Project/Plan	Status [i.e. Application, Consented, Under Construction, Operational]	Distance from Study Area (km)	Description of Project/Plan	Dates of Construction (If Applicable)	Dates of Operation (If Applicable)	Overlap with the Proposed Development [e.g. Project Construction Phase Overlaps with Proposed Development Construction Phase]
Tier 1						
N/A – no likely cumulative impacts with Berwick Bank Offshore Infrastructure.						
Tier 2						
Scottish Power Energy Networks Branxton Grid Substation	Application	Within study area	New 400kV Electricity Substation and associated works in fields to the south of Thornton Bridge Sealing End Compound Branxton, Dunbar	2023-2026	From 2026	Potential for all development phases to overlap
Scottish Power Energy Networks Eastern Link Project	Application	Within study area	Construction of converter station and associated development including a landfall at Thorntonloch and connecting buried cabling, all in association with the Scottish Power Eastern Link 1 project, for a new subsea High Voltage Direct Current (HVDC)	2024-2027	From 2027	Potential for all development phases to overlap

11.12.2. MAXIMUM DESIGN SCENARIO

142. The maximum design scenarios summarised here have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the details provided in Volume 1, Chapter 5 of the Onshore EIA Report as well as the information available on other projects and plans, to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope, to that assessed here, be taken forward in the final design scheme.

143. The cumulative assessment has been undertaken assuming the potential for construction programmes to overlap and the maximum footprint of the Proposed Development and cumulative projects.

11.12.3. CUMULATIVE EFFECTS ASSESSMENT

144. An assessment of the likely significance of the cumulative effects of the Proposed Development upon geology, hydrology, soils and flood risk receptors arising from each identified impact is given below.

Tier 1

145. There are considered to be no likely significant cumulative impacts with the Berwick Bank offshore infrastructure.

Tier 2

CUMULATIVE IMPACT ON HYDROLOGY

146. There is potential for the construction phase of the Proposed Development to coincide with the construction phase of the cumulative projects stated above. This creates a potential for cumulative water quality impacts to occur.

147. There is potential for the operation and maintenance phase of the Proposed Development to coincide with the operation and maintenance phase of the cumulative projects stated above. The proposed onshore substation is to be located within the surface water catchment of the Innerwick Burn, no above ground development from the cumulative projects stated above is proposed within the Innerwick Burn catchment and thus there is no risk of cumulative impact. However, it is possible that ongoing maintenance works from the Proposed Development and cumulative projects could occur simultaneously and within the same surface water catchment.

148. There is potential for the decommissioning phase of the Proposed Development to coincide with the decommissioning phase of the cumulative projects stated above. This creates a potential for cumulative water quality impacts to occur.

149. Cumulative projects are assumed to be subject to similar tertiary mitigation as the Proposed Development in that, provision and implementation of the CEMP including construction drainage measures would be required to limit the likelihood of any such impact to the water environment given this is standard practice for projects of this scale. In addition, any maintenance works will be subject to specific method statements for undertaken the proposed works and decommissioning of project will be undertaken in accordance with a Decommissioning Programme.

Construction phase

Magnitude of impact

150. The cumulative impact is predicted to be of local spatial extent within individual surface water catchments, short term duration, intermittent and high reversibility (given the relatively small near coast catchment areas). It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible.

Sensitivity of receptor

151. The watercourses within the assessment range from high to negligible sensitivity based on their classification. The Thornton Burn is of high sensitivity (due to Good Status Classification), the Dry Burn of medium sensitivity (due to Moderate Status Classification), other unnamed watercourses of negligible sensitivity (due to being unclassified) and the Barness to Wheat Stack coastal water body is of high sensitivity (due to Good Status Classification. The overall sensitivity is considered to be high.

Significance of effect

152. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

153. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Operation and maintenance phase

Magnitude of impact

154. The cumulative impact is predicted to be of local spatial extent within individual surface water catchments, short term duration, intermittent and high reversibility (given the relatively small near coast catchment areas). It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible.

Sensitivity of receptor

155. The watercourses within the assessment range from high to negligible sensitivity based on their classification. The Thornton Burn is of high sensitivity (due to Good Status Classification), the Dry Burn of medium sensitivity (due to Moderate Status Classification), other unnamed watercourses of negligible sensitivity (due to being unclassified) and the Barness to Wheat Stack coastal water body is of high sensitivity (due to Good Status Classification. The overall sensitivity is considered to be high.

Significance of effect

156. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

157. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

158. The cumulative impact is predicted to be of local spatial extent within individual surface water catchments, short term duration, intermittent and high reversibility (given the relatively small near coast catchment areas). It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible.

Sensitivity of receptor

159. The watercourses within the assessment range from high to negligible sensitivity based on their classification. The Thornton Burn is of high sensitivity (due to Good Status Classification), the Dry Burn of medium sensitivity (due to Moderate Status Classification), other unnamed watercourses of negligible sensitivity (due to being unclassified) and the Barness to Wheat Stack coastal water body is of high sensitivity (due to Good Status Classification. The overall sensitivity is considered to be high.

Significance of effect

160. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

161. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

CUMULATIVE IMPACT ON HYDROGEOLOGY

162. There is no potential cumulative impact on hydrogeology as the cumulative projects stated above do not fall within 250 m of the Skateraw abstraction point.

CUMULATIVE IMPACT ON FLOOD RISK

163. There is potential for the construction phase of the Proposed Development to coincide with the construction phase of the cumulative projects stated above. This creates a potential for cumulative increase of flood risk due to the removal of soils.

164. There is potential for the operation and maintenance phase of the Proposed Development to coincide with the operation and maintenance phase of the cumulative projects stated above. The proposed onshore substation is to be located within the surface water catchment of the Innerwick Burn, no above ground development from the cumulative projects stated above is proposed within the Innerwick Burn catchment and thus there is no risk of cumulative impact.

165. Cumulative projects are assumed to be subject to similar tertiary mitigation as the Proposed Development in that, provision and implementation of the CEMP including construction drainage measures would be required to limit the likelihood of any such impact to the water environment given this is standard practice for projects of this scale.

Construction phase

Magnitude of impact

166. The impact is predicted to be of local spatial extent downgradient / downstream of all construction areas, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. Considering the tertiary measures in place to control drainage during construction within the CEMP, the magnitude is therefore considered to be negligible.

Sensitivity of receptor

167. Fluvial and surface water flood risks in the area are low and thus the sensitivity of the receptor is low.

Significance of effect

168. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

169. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

CUMULATIVE IMPACT ON STATUTORY GEOLOGICALLY DESIGNATED SITES

170. From the cumulative projects stated above, there is potential for cumulative impacts relating to the proposed SPEN Eastern Link Project. The Eastern Link Project details several potential landfall locations, some of which are located within the Barns Ness Coast SSSI. In the event that the project selects a landfall location within the SSSI, there is potential for a cumulative impact on the feature from the construction phases and decommissioning phases.

171. The SPEN Eastern Link Project is assumed to be subject to similar site design, and trenchless technology (e.g. HDD) would be used as opposed to open cut trenching at the statutory site to minimise disturbance of the SSSI. Similarly, a trenchless technology approach will ensure minimal disturbance of the SSSI if the cables are to be pulled out from the landfall location during decommissioning.

Construction phase

Magnitude of impact

172. The impact is predicted to be of local spatial extent within the geologically conservation area, short term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. However, considering the use of trenchless technology (e.g. HDD) and avoidance of damage to the SSSI due to the depth of the cable, the magnitude is therefore considered to be negligible.

Sensitivity of receptor

173. The Barns Ness Coast SSSI is an area containing geological features considered to be of national interest. Barns Ness Coast Geological Conservation Review site is an area

containing features of designated regional importance. Taking the higher sensitivity receptor, the SSSI, the geological site is deemed to be of high national geological value. The sensitivity of the receptor is therefore, considered to be high.

Significance of effect

174. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

175. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

176. The impact is predicted to be of local spatial extent within the geological conservation area, short term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. However, considering the use of trenchless technology (e.g. HDD) and avoidance of damage to the SSSI due to the depth of the cable, the magnitude is therefore considered to be negligible.

Sensitivity of receptor

177. The Barns Ness Coast SSSI is an area containing geological features considered to be of national interest. Barns Ness Coast Geological Conservation Review site is an area containing features of designated regional importance. Taking the higher sensitivity receptor, the SSSI, the geological site is deemed to be of high national geological value. The sensitivity of the receptor is therefore, considered to be high.

Significance of effect

178. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

179. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

CUMULATIVE IMPACT ON SOILS

180. There is potential for the construction phase of the Proposed Development to coincide with the construction phase of the cumulative projects stated above. This creates a potential for increased compaction, erosion and loss of soils as a consequence of construction activities in areas where the Proposed Development and cumulative projects are closely located.

181. There is potential for the operation and maintenance phase of the Proposed Development to coincide with the operation and maintenance phase of the cumulative projects stated above. It is possible that ongoing maintenance works from the Proposed Development and

cumulative projects could occur simultaneously and within localised areas that could have a cumulative impact on local soils.

182. There is potential for the decommissioning phase of the Proposed Development to coincide with the decommissioning phase of the cumulative projects stated above. This creates a potential for cumulative impacts to local soils to occur.

183. Cumulative projects are assumed to be subject to similar tertiary mitigation as the Proposed Development in that, provision and implementation of the CEMP including a Soil Management Plan. In addition, any maintenance works will be subject to specific method statements for undertaken the proposed works and decommissioning of project will be undertaken in accordance with a Decommissioning Programme.

Construction phase

Magnitude of impact

184. The impact is predicted to be of local spatial extent across all construction areas and immediately downgradient, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. However, considering the tertiary mitigation in place through implementation of the CEMP, the magnitude is considered to be low.

Sensitivity of receptor

185. Soils within proximity to the Proposed Development are predominantly able to support arable agriculture (Class 1, 2 and 3.1) and are predominantly moderately to highly vulnerable to compaction and erosion. The sensitivity is therefore considered medium.

Significance of effect

186. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

187. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Operation and maintenance phase

Magnitude of impact

188. The impact is predicted to be of local spatial extent across all construction areas and immediately downgradient, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. However, considering the tertiary mitigation in place through implementation of the CEMP, the magnitude is considered to be low.

Sensitivity of receptor

189. Soils within proximity to the Proposed Development are predominantly able to support arable agriculture (Class 1, 2 and 3.1) and are predominantly moderately to highly vulnerable to compaction and erosion. The sensitivity is therefore considered medium.

Significance of effect

190. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

191. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

192. The impact is predicted to be of local spatial extent across all construction areas and immediately downgradient, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. However, considering the tertiary mitigation in place through implementation of the CEMP, the magnitude is considered to be low.

Sensitivity of receptor

193. Soils within proximity to the Proposed Development are predominantly able to support arable agriculture (Class 1, 2 and 3.1) and are predominantly moderately to highly vulnerable to compaction and erosion. The sensitivity is therefore considered medium.

Significance of effect

194. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

195. No secondary mitigation is considered necessary because the likely effect in the absence of secondary mitigation is not significant in EIA terms.

11.12.4. PROPOSED MONITORING

196. No geology, hydrology, soil and flood risk additional monitoring to test the predictions made within the assessment of likely significant cumulative effects is considered necessary.

11.13. INTER-RELATED EFFECTS

197. A description of the likely inter-related effects arising from the Proposed Development on geology, hydrology, soil and flood risk is provided in Volume 4, Appendix 15.2 of the Onshore EIA Report.

11.14. SUMMARY OF IMPACTS, MITIGATION MEASURES, LIKELY SIGNIFICANT EFFECTS AND MONITORING

198. Information on geology, hydrology, soils and flood risk within the geology, hydrology, soils and flood risk study area was collected through desktop review, site surveys and consultation.

199. Table 11.13 presents a summary of the potential impacts, mitigation measures and the conclusion of likely significant effects in EIA terms in respect to geology, hydrology, soils and flood risk. The impacts assessed include: hydrology, hydrogeology, flood risk, contaminated land, statutory geological designated sites and soils. Overall, it is concluded that there will be no likely significant effects arising from the Proposed Development during the construction, operational and maintenance or decommissioning phases.

200. Table 11.14 presents a summary of the potential cumulative impacts, mitigation measures and the conclusion of likely significant effects on geology, hydrology, soils and flood risk. The cumulative effects assessed include: hydrology, flood risk, geologically designated sites and soils. Overall, it is concluded that there will be no likely significant cumulative effects from the Proposed Development alongside other projects/plans.

Table 11.13: Summary of Likely Significant Environmental Effects, Mitigation and Monitoring

Description of Impact	Phase C	Phase O	Phase D	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Secondary Mitigation	Residual Effect	Proposed Monitoring
Hydrology	✓			Negligible	High	Minor	None	Minor	WQMP
		✓		Negligible	Negligible	Negligible	None	Negligible	WQMP
			✓	Negligible	High	Minor	None	Minor	None
Hydrogeology	✓			Low	Medium	Minor	None	Minor	WQMP
Flood Risk	✓			Negligible	Low	Negligible	None	Negligible	None
		✓		Low	Low	Minor	None	Minor	None
Statutory Geologically Designated Sites	✓			Negligible	High	Minor	None	Minor	None
			✓	Negligible	High	Minor	None	Minor	None
Soils	✓			Low	Medium	Minor	None	Minor	None
		✓		Low	Medium	Minor	None	Minor	None
			✓	Low	Medium	Minor	None	Minor	None

Table 11.14: Summary of Likely Significant Cumulative Environment Effects, Mitigation and Monitoring

Description of Impact	Phase C	Phase O	Phase D	Cumulative Impact Assessment Tier	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Secondary Mitigation	Residual Effect	Proposed Monitoring
Hydrology	✓			Tier 1	N/A					
				Tier 2	Negligible	High	Minor	None	Minor	None
Flood Risk	✓			Tier 1	N/A					
				Tier 2	Negligible	Low	Negligible	None	Negligible	None
Statutory Geologically Designated Sites	✓	✓	✓	Tier 1	N/A					
				Tier 2	Negligible	High	Minor	None	Minor	None
Soils	✓	✓	✓	Tier 1	N/A					
				Tier 2	Low	Medium	Minor	None	Minor	None

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