Eastern Green Link 4:
Scottish Onshore Scheme

Volume 4: Appendices
Appendix 8.3: Flood Risk Assessment

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1. Introduction

1.1 Commission

AECOM have been commissioned by SP Energy Networks (hereafter referred to as the 'Applicant') to undertake a Flood Risk Assessment (FRA) for the development of the Scottish Onshore Scheme of Eastern Green Link 4 (EGL4) (the Project). The Project is a High Voltage Direct Current (HVDC) link between Westfield in Fife, Scotland and Walpole in Norfolk, England.

This FRA has been prepared to assess the flood risk to and from the Scottish Onshore Scheme only. In order to support the planning application and comply with national policy, this FRA has been prepared in accordance with the National Planning Framework (NPF4)[1].

1.2 The Project

EGL4 is a major reinforcement of the National Electricity Transmission System (NETS) which will provide additional north-south transmission capacity across transmission network boundaries between Scotland and England ensuring that renewable energy is transported from where it is produced to where it is needed. The Project comprises the following components:

- **Scottish Onshore Scheme**: A new converter station in Westfield in Fife, Scotland will be connected to the existing NETS via the new 400kV Westfield Substation by approximately 800 m of underground High Voltage Alternating Current (HVAC) cables. From the converter station approximately 16.2 km of underground HVDC cable will be installed to a landfall north of Kinghorn with a number of jointing bays positioned along the route. A temporary haul road will be required along the HVDC cable route to enable cable installation. Construction of the Scottish Onshore Scheme is anticipated to last for up to 6 years. The anticipated operational life of the converter station is approximately 40 years.
- **Marine Scheme**: comprising subsea Direct Current cable route from the landfall at Kinghorn on the Fife coast, where it connects to the Scottish Onshore Scheme through the North Sea to a landfall on the Lincolnshire Coast where it connects to the English Onshore Scheme.
- **English Onshore Scheme**: comprising a converter station connected to the NETS via a new Walpole Substation in west Norfolk as well as underground Direct Current cables from the converter station to a landfall on the Lincolnshire coast where it connects to the Marine Scheme.

The FRA specifically assesses the flood risk to and from the proposed converter station and underground cable route. A map showing the Scottish Onshore Scheme and surrounding area is available in **Figure 1.3 Scottish Onshore Scheme Location Plan, Volume 2 Main Report** of the Environmental Impact Assessment Report (EIAR). The operational lifetime of the Scottish Onshore is proposed to circa 40 years, after which it would be recommissioned

[1] National Planning Framework (2024) Scottish Government

or decommissioned. Full details of the Scottish Onshore Scheme are available in **Chapter 2 Project Description, Volume 2** of the EIAR.

1.3 Aims and Objectives

The aim of this FRA is to assess the flood risk posed to the Scottish Onshore Scheme and identify the need for mitigation and/or design measures. This will allow the Scottish Onshore Scheme to be safe from flooding throughout its lifetime, without increasing risk of flooding elsewhere ensuring alignment with the NPF4. In order to achieve this aim, the following objectives have to be satisfied:

- Collection and review of existing flood risk data, topographic data, and available planning policy documents.
- Assessment and interpretation of available information to identify potential sources of flood risk from fluvial, coastal, surface water, groundwater, sewers, and artificial sources.
- Review the Scottish Onshore Scheme design in light of identified flood risks and propose flood risk mitigation measures, where applicable, to reduce any residual flood risk to acceptable levels.
- Provide a high-level assessment of construction risks from flood risk.
- Provide an overview of the proposed management of surface water for the Scottish Onshore Scheme.
- Produce and FRA in accordance with NPF4 to inform the EIAR for the Scottish Onshore Scheme.

This FRA is based on the flood risk information available at the time of writing, including:

- Scottish Environmental Protection Agency (SEPA) Flood Risk Map[2].
- SEPA Reservoir Map[3].
- Scottish National Flood Risk Assessment (NFRA)[4].
- British Geological Survey (BGS) Geology Viewer[5]
- BGS GeoIndex[6].
- Existing / project ground investigations.
- Scotland's aquifers and groundwater bodies[7].

1.4 Assumptions and Limitations

The following assumptions and limitations have been noted when preparing the FRA:

[2] Flood Map (2025) SEPA
[3] Reservoirs Map (2022) SEPA
[4] NFRA (2018) SEPA
[5] Geology Viewer (2025) British Geological Survey
[6] GeoIndex Onshore (2020) BGS
[7] Scotland's aquifers and groundwater bodies (2015) British Geological Survey and Scottish Environmental Protection Agency

- It is assumed that the design, as described in **Volume 2 Chapter 2 Project Description,** is the final design for the purposes of this assessment.
- The exact alignment of the underground cable is unknown therefore this FRA has assumed that the cable will be laid centrally within the underground cable route. Where risk is present, an assessment in the wider area (limited to the underground cable route boundary) was undertaken.
- Jointing bays will be required along the underground cable route however no design or spatial information was available at the time of writing; therefore it has been assumed that they will be located outside of a flood zone and will be constructed so they are watertight.

2. Site Description

2.1 Location

The landfall site (National Grid Reference (NGR): NT 27586 87524) is located on agricultural land between the settlements of Kinghorn to the south and Kirkcaldy to the north. The underground cables from the landfall site extend approximately 16.2 km north-west of the proposed converter station in Westfield, Fife. The converter station is located in an agricultural field approximately 0.2 km east of the existing Westfield Substation (NGR: NT 19378 97612). **Volume 2 Main Report, Chapter 2 Project Description, Figure 2-2 Cable Route and Converter Station** of the EIAR displays the Scottish Onshore Scheme.

2.2 Local Water Features

Figure 8.1 Surface Water Receptors, within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report,** of the EIAR displays the local water features. The underground HVDC route connecting the landfall to the proposed converter station crosses 16 watercourses including:

- 10 unnamed watercourses (COA2, COA4, TIE3, TIE5, DRO2, DEN2, ORE2, ORE11, ORE14, ORE18).
- River Ore (ORE1).
- Gelly Burn (DEN1).
- Dronachy Burn (DRO1).
- Tiel Burn (TIE1).
- Tyrie Burn (COA3).
- Banchory Burn (COA1).

The underground HVAC route connecting the converter station to the new 400kV Westfield Substation crosses four unnamed watercourses (ORE26, ORE29, ORE30, ORE31).

The following watercourses will be crossed via Horizontal Directional Drilling (HDD) as depicted in **Figure 8.5 Watercourse Crossings** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**:

- DRO2.
- DEN2.
- ORE1.
- ORE8.
- ORE11.

The remaining watercourses will be crossed via open trench methods.

Within close proximity to the Scottish Onshore Scheme are a number of lochs including Loch Gelly, Camilla Loch and two unnamed lochs.

2.3 Topography

A review of LiDAR data across the Scottish Onshore Scheme as depicted in **Figure 6.1 Topography,** within **Chapter 6 Landscape and Visual Amenity, Volume 2 Main Report,** shows that topography ranges from around 100 m Above Ordnance Datum (AOD) to sea level. The highest elevations are present at the northern end of the Scottish Onshore Scheme where the converter station is located (approximately at 100 m AOD) with elevations generally decreasing towards the southern end of the Scottish Onshore Scheme to sea level at Kinghorn. There is a gradual fall southeast along the underground cable route with the landfall location at approximately -2 m AOD. There are some natural high and low points along the underground cable route which generally align with where the cable route crosses watercourses.

2.4 Geology and Hydrogeology

Bedrock Geology

Converter Station

The bedrock geology across the converter station is depicted in **Figure 12.2 Bedrock Geology** within **Chapter 12 Geology and Ground Conditions, Volume 2 Main Report**. The British Geological Survey (BGS) Geology Viewer[5] indicates that the bedrock beneath the converter station consists of two parts of the Clackmannan Group: the Passage Formation in the eastern half and the Upper Limestone Formation in the western half. The Passage Formation comprises sandstones, mudstones, coal seems, marine beds and seatearths. The Upper Limestone Formation comprise mudstone, siltstone, deltaic and marine limestones.

Ground investigation[8] was undertaken at the converter station site and identified Passage Formation in the southeast of the Site between depths of 11.7 and >43.2 m below ground level (bgl). In the northwest of the Site Passage Formation was identified between depths of between 1.8 and 3.5 m bgl, and Upper Limestone Formation was identified between depths of between 0.9 – 7.3 m bgl.

The available information on groundwater on Site indicates a shallow groundwater table across the converter station site with levels ranging between 0.9 and 6.5 m bgl.

Underground cable route

The bedrock geology across the underground cable route is depicted in **Figure 12.2 Bedrock Geology** within **Chapter 12 Geology and Ground Conditions, Volume 2 Main Report.**

The British Geological Survey (BGS) Geology Viewer[5] indicates that the strata in the southern and central extents of the underground cable route are predominantly volcanic and typically comprise of basaltic tuff and lava flows. Some sedimentary sequences are also noted. The stratum in the northern extent is predominantly sedimentary and typically comprise limestone or cyclic mudstone and siltstone, with sandstones and seatearth bands present within. Limestones are recorded across the Scottish Onshore Scheme as part of the Strathclyde Group and the Clackmannan Group.

[8] Geotechnical Interpretive Report (2025) Mott Macdonald

Locally, the bedrock also includes igneous strata belonging to the sill complexes described as microgabbro, quartz-microgabbro and trace basalt and olivine analcime-microgabbro.

Oil Shale associated with the Sandy Craig Formation is shown in the southern section of the underground cable route.

Ground investigation was not undertaken along the underground cable route. As no site-specific groundwater information is available, it is assumed that there is potential for shallow groundwater along the underground cable route as shallow groundwater was identified during ground investigation of the converter station site.

Superficial Geology

Converter Station

The superficial geology across the converter station is depicted in **Figure 12.1 Drift Geology** within **Chapter 12 Geology and Ground Conditions, Volume 2 Main Report**. This indicates that the superficial deposits across the converter station are predominantly Glacial Till with some presence of Peat in the north-west.

Underground Cable Route

The superficial geology across the underground cable route is depicted in **Figure 12.1 Drift Geology** within **Chapter 12 Geology and Ground Conditions, Volume 2 Main Report**. This indicates that the superficial deposits across the underground cable route are predominantly Glacial Till. Glaciofluvial Ice Contact Deposits (gravel, sand and silt) are shown to the south of the A82 road. Alluvium (clay, silt, sand and gravel) is locally present in the vicinity of watercourses. Peat deposits are also locally recorded predominantly towards the northern extent of the Scottish Onshore Scheme, with smaller isolated deposits present in the southern half of the Scottish Onshore Scheme.

Aquifers

Scotland's aquifers and groundwater bodies report indicates that there are 5 aquifer groups underlying the Scottish Onshore Scheme:

- The Clackmannan Group is located towards the centre and north of the Scottish Onshore Scheme. It is designated as a moderately productive aquifer with low yields except where disturbed by mining.
- There is one area of the Strathclyde Group towards the centre of the Scottish Onshore Scheme. It is designated as a moderately productive aquifer.
- The Unnamed Extrusive Rocks (Dinantian) aquifer is situated on the southeastern side of the Scottish Onshore Scheme and is designated as a low productivity aquifer.
- There are three areas of the Unnamed Igneous Intrusion (Carboniferous to Permian) throughout the Scottish Onshore Scheme. Two areas are situated towards the centre of the Scottish Onshore Scheme, and one area is towards the north of the Scottish Onshore Scheme. It has been designated as a low productivity aquifer.
- The Unnamed Extrusive Rocks (Dinantian) and the Unnamed Igneous Intrusion (Carboniferous to Permian) are within the Igneous/Sedimentary aquifer. The properties of

groundwater in this aquifer depends on the local proportion of sedimentary and igneous rocks.

Soils

According to the National Soil Map of Scotland on the Scotland's Soils map viewer[9], the soil types present across the Scottish Onshore Scheme are brown earths and noncalcareous gleys. The ground investigation at the converter station site identified brown sandy clayey soils across the converter station site.

[9] National Soil Map of Scotland (2024) Scotland's environment

3. Planning Policy and Guidance

3.1 National Policy

Under the Flood Risk Management Act (Scotland) 2009[10], SEPA are designated the strategic flood risk management authority in Scotland.

National Planning Framework

The NPF4 sets out statutory national planning policies to inform part of the statutory development plan in Scotland. The NPF4 defines flood risk areas as land which has 0.5% Annual Exceedance Probability (AEP) event with climate change consideration, and states that development should be avoided in flood risk areas at first principle. The NPF4 also promotes the use of natural flood risk management and blue green infrastructure where possible.

Policy 22 is a flood risk and water management policy which states that development proposals at risk of flooding or in a flood risk area will only be supported for a set of specific listed instances, including where the location of essential infrastructure is required for operational reasons, water compatible uses, redevelopment of an existing building, or redevelopment of previously used sites in built up areas where the Local Development Plan has identified a need to bring these into positive use. It notes that the applicant must demonstrate that:

- All risks of flooding are understood and addressed.
- There is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes.
- The development remains safe and operational during floods.
- Flood resistant and resilient materials and construction methods are used.
- Future adaptations can be made to accommodate the effects of climate change.

Policy 22 also states that development proposals will not increase the risk of surface water flooding to others, or itself be at risk and will manage rain and surface water through Sustainable Drainage Systems (SuDS).

The SEPA Flood Map[2] shows flood extents for future day rivers (fluvial), coastal and surface water flooding taking into account the projected effects of climate change. The river and coastal future flood maps are generally based on the UK Climate Projections 2009 (UKCP09) high emissions scenario and as such have an applied uplift of 35% for the River Tay River Basin Region. This was the best available information for the UK at the time the national river and coastal flood modelling was carried out in 2011-2013. The surface water and Ordinary Watercourse future flood map is based on UKCP18 Representative Concentration Pathway (RCP) 8.5. The climate change allowances were applied to the medium probability extent (0.5% AEP). These maps are discussed in more detail with regards to the Scottish Onshore Scheme in Section 4 of this FRA.

[10] Flood Risk Management Act (Scotland) (2009) Scottish Government

The SEPA Flood Map[2] shows that the Scottish Onshore Scheme is partially located within future fluvial, coastal and surface water flood extents, however as the Project is essential infrastructure (grid transmission and distribution infrastructure) located in a flood risk area required for operational regions, it is considered acceptable in line with NPF4. This FRA will provide evidence for how the Scottish Onshore Scheme meets the requirements which are to be demonstrated by the Applicant for development in an area of flood risk in line with NPF4.

3.2 Local Policy

Although SEPA are the strategic flood risk authority in Scotland, under Section 56 of the Flood Risk Management Act (2009)[10], Fife council also has general powers to manage flood risk within its retrospective boundary if deemed necessary. The Scottish Onshore Scheme lies within the boundary of Fife Council which holds the role of Local Planning Authority (LPA).

Local Plan

The relevant Local Development Plan for the Scottish Onshore Scheme is FIFEplan[11] (Fife's Local Development Plan) which was adopted in September 2017. The relevant policies relating to flood risk and drainage are:

<u>Policy 12 – Flooding and the Water Environment</u>

Development proposals will only be supported where they can demonstrate that they will not, individually or cumulatively:

1. *Increase flooding or flood risk from all sources (including surface water drainage measures) on the site or elsewhere;*
2. *reduce the water conveyance and storage capacity of a functional flood plain;*
3. *detrimentally impact on ecological quality of the water environment, including its natural characteristics, river engineering works, or recreational use;*
4. *detrimentally impact on future options for flood management;*
5. *require new defences against coastal erosion or coastal flooding; and*
6. *increase coastal erosion on the site or elsewhere.*

To ascertain the impact on flooding, developers may be required to provide a flood risk assessment addressing potential sources of flooding and the impact on people, properties, or infrastructure at risk.

In medium to high flood risk areas – an annual probability of flooding greater than 0.5% (1:200 years) – a flood risk assessment is required.

In low to medium flood risk areas – annual probability of coastal or watercourse flooding is between 0.1% and 0.5% (1:1,000 to 1:200 years) – a flood risk assessment may be required at the upper end of the probability range, and for essential infrastructure and the most vulnerable uses.

Flood risk assessments should:

[11] FIFEplan (2017) Fife Council

- *highlight the measures proposed to mitigate the flood risk and the timescales to implement those measures; and*
- *include an assessment of potential impacts on water quality and the water environment.*

Drainage Assessments, proportionate to the development proposal and covering both surface and foul water, will be required for areas where drainage is already constrained or otherwise problematic, or if there would be off-site effects.

Policy 3 – Infrastructure and Services

Development must be designed and implemented in a manner that ensures it delivers the required level of infrastructure and functions in a sustainable manner. Where necessary and appropriate as a direct consequence of the development or as a consequence of cumulative impact of development in the area, development proposals must incorporate measures to ensure that they will be served by adequate infrastructure and services. Such infrastructure and services may include:

- *Foul and surface water drainage, including Sustainable Urban Drainage Systems (SUDS).*
- *Green infrastructure complying with specific green infrastructure and green network requirements contained in the Making Fife's Places Supplementary Guidance and settlement proposals.*

Making Fife's Places

Making Fife's Places[12] is a guidance document setting out the council's expectations for the design of development in Fife. This guidance document goes into greater detail around how green infrastructure and SuDS should be utilised to comply with Policy 3 in the Local Plan. For example, the guidance states that SuDS should be designed within the context of an overall landscape plan to reinforce local landscape character and work with existing hydrology and habitats.

Fife Flooding and Surface Water Drainage Guidance

Fife Council's Design Criteria Guidance on Flooding and Surface Water Drainage Requirements[13] sets out Fife Council's planning requirements in relation to flooding and surface water management. This guidance document states that Fife Council will not permit development which has the potential to increase flood risk, in line with the Flood Risk Management Scotland Act 2009. There is also a presumption against development within a site where flooding occurs during 0.5% AEP event (plus current allowances for climate change). Additionally, where the floodplain is close to development, the 0.5% AEP flood level must be 600 mm below the lowest property finished floor level.

Climate Change Guidance

The SEPA published 'climate change allowances for flood risk assessment in land use planning version 6'[14] in 2025 which sets out required allowances for climate change that must be used in FRAs in line with NPF4.

[12] Making Fife's Places (2018) Fife Council
[13] Design Criteria Guidance on Flooding and Surface Water Drainage Requirements (2025) Fife Council
[14] Climate change allowances for flood risk assessment in land use planning Version 6 (2025) SEPA

The Scottish Onshore Scheme is located within the Tay River Basin Region. The relevant climate change uplift values can be seen in **Table 1: Climate change allowances for Tay River Basin Region**.

Table 1: Climate change allowances for Tay River Basin Region

Source	Allowance
River	Total change to 2100: 53%
Sea	Cumulative rise from 2017 to 2100 in meters: 0.85. Additional 0.15 m per decade to be applied after 2100.
Rainfall intensity	Total change to 2100: 39%

4. Flood Risk – To Development

4.1 Overview

NPF4 requires that all potential flood sources that could affect a development be considered as part of an FRA. This section includes consideration of flooding from fluvial and coastal sources, directly from rainfall on the ground surface, rising groundwater, overwhelmed sewers, and drainage systems. Flooding from reservoirs, canals, lakes, and other artificial sources are also considered. The assessment has been undertaken considering the flood risk to the underground cable routes and also to the converter station.

The SEPA Flood Maps provide a representation of rivers (fluvial), coastal and surface water flooding across Scotland. Flood extents are provided for the following events for each of the flood sources for present day:

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

The Flood Maps also provide flood extents for future day fluvial, coastal and surface water flooding taking into account the projected effects of climate change for a single future climate scenario.

4.2 Historic Flood Events

A review of the SEPA NFRA was undertaken to identify historical flood events in the location of the Scottish Onshore Scheme. This showed no historic flood events at the location of the converter station or along the underground cable route. At the landfall site, several historic flood events were identified including in 2006, 2007 and 2008, however the source of this flooding is not specified. The Fife Stage 1 Strategic Flood Risk Assessment (SFRA)[15] reports on historical flood events in Fife and notes that coastal flooding has been recorded at Kirkcaldy in 1958 and 2010, however the location of the Scottish Onshore Scheme is not listed as an area which has experienced flooding historically.

4.3 Flood Risk to the Underground Cable Routes

This section assesses flood risk to the underground cable routes and associated infrastructure such as the temporary construction compounds, haul road, attenuation basins, and jointing bays.

[15] Fife Stage 1 SFRA (2024) JBA Consulting

Coastal

Coastal flood sources include the sea and estuaries. Coastal flooding occurs when dry and low-lying land is flooded by seawater. When consulting the SEPA flood maps the underground cable route, landfall location, temporary compounds, haul road, attenuation basins and jointing bays are shown to fall outside of any area at risk of coastal flooding for both the present day (see **Figure 8.3a Present Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**) and future day (see **Figure 8.3b Future Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**) scenarios.

Based on this information, coastal flood risk along the underground cable route during construction and operation is considered to be negligible.

Fluvial

Fluvial flooding generally occurs when a river exceeds its capacity following sustained or intensive rainfall. According to the SEPA Flood Maps for present day or in the future, the majority of the underground cable route is not located within areas likely to experience fluvial flooding.

When consulting the SEPA river flooding and surface water and small watercourse flood maps, fluvial flood extents are shown to be largely constrained to watercourse corridors along the underground cable route (with the exception being at crossing locations ORE1, TIE1 and TIE5) where there is more extensive out of bank flooding) and as such where open cut techniques are proposed (as discussed in Section 2.2) there is a high likelihood of fluvial flooding at these locations as shown in **Figure 8.3a Present Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**). When considering future fluvial flooding, the fluvial flood extents are slightly greater (see **Figure 8.3b Future Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**). Where HDD is proposed (as discussed in **Section 2.2 Local Water Features**) the likelihood of fluvial flooding is low given this is a trenchless method which directs the cable underneath the watercourses. Any works near, on, under, or over a watercourse would need relevant consent (Controlled Activities Regulations (CAR) license) prior to commencement of the works.

The temporary haul road will cross the following 11 watercourses. Details of which are shown in **Appendix 8.4 Watercourse Crossings (Volume 4 Appendices)**:

- COA2.
- COA3.
- COA4.
- TIE3.
- TIE5.
- TIE1.
- DRO1.
- DEN1.
- ORE2.
- ORE7.
- ORE14.

The number of crossings differs to that stated within the Cable Route Drainage Strategy (**Annex D Scotland Onshore Cable Route Drainage Strategy (Mott Macdonald, March 2025**) due to the method of cable installation under watercourse ORE1 been HDD rather than open cut and as such no haul road is required over this watercourse. Generally, the temporary haul road is not located in areas where fluvial flooding is likely, however where the haul road crosses watercourses, there is a high likelihood of fluvial flooding according to the SEPA river flooding and surface water and small watercourse flood maps. At locations ORE1 and TIE5, where the flood extent extends beyond the watercourse channel, more of the haul road either side of the main watercourse crossing is located within the flood extent. Either side of the haul road is expected to be bunded with soil excavated from the installation of the underground cables. The design of these bunds will be confirmed during detailed design, and the bunds will be avoided within any high likelihood of fluvial flooding extents.

Three additional watercourses will be crossed via a haul road as part of the HVAC cable route. These are ORE26, ORE29 and ORE30. They are also located in an area shown to have a high likelihood of flooding.

Eight temporary attenuation basins proposed to manage surface water flooding along the temporary haul road are to be located within areas deemed to have a high and/or medium likelihood of fluvial flooding. However, the exact design and location of these will be refined at the detailed design stage to be located outside of any flood extents. Below is a list of attenuation basins and the retrospective likelihood area:

- AP Temp 08 – medium likelihood.
- AP Temp 09 – high likelihood.
- AP Temp 16 – high likelihood.
- AP Temp 17 – medium likelihood.
- AP Temp 18 – high likelihood.
- AP Temp 25 – medium likelihood.
- AP Temp 31 – high likelihood.
- AP Temp 46 – high likelihood.

Both entry and exit pits, jointing bays and temporary construction compounds will be located outside of any fluvial flood extent and therefore the likelihood of flooding to these features is low.

Based on this information, fluvial flood risk during construction to the underground cable routes is considered to be medium where open cut techniques are proposed and mitigation measures will be required which is discussed further in Section 6. Fluvial flood risk during construction to the underground cable routes is considered to be low where HDD crossings are proposed. Fluvial flood risk to the temporary haul road during construction and operation is considered to be medium and mitigation measures will be required which is discussed further in **Section 6 Embedded Mitigation and Residual Risk**. Fluvial flood risk during operation to the underground cable routes is considered to be low as the cables will be buried and therefore will not be impacted by above ground flood sources.

Surface Water

Surface water runoff is defined as water flowing over or ponding upon the ground that has not yet entered a watercourse, drainage channel or sewer system. An intense period of rainfall which exceeds the infiltration capacity of the ground or the capacity of sewers results in surface water runoff or ponding. Typically, runoff occurs on sloping land or where the ground surface is relatively impermeable. The ground can be impermeable, either naturally through the soil type, geology or ground saturation, or unnaturally due to development, which places large areas of impervious material over the ground surface (e.g. paving and roads).

The SEPA Flood Maps[2] indicate that there are a number of isolated areas along the underground cable routes that are at high, medium and low likelihood of surface water flooding in the present day, as shown in **Figure 8.3a Present Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**. When considering the likelihood of future surface water flooding, the surface water flood extents are slightly greater (see **Figure 8.3b Future Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**).

Entry and exit pits, jointing bays and temporary construction compounds will be located outside of areas with a likelihood of surface water flooding. The majority of the temporary haul road is not located within areas with a likelihood of surface water flooding; however, where temporary crossings are proposed, it is shown that they have a high likelihood of flooding. This however is likely to be a representation of fluvial flood risk and as such has been assessed as a fluvial risk.

Seven temporary attenuation basins are to be located within areas deemed to have a high and/or medium likelihood of surface water flooding. Below is a list of attenuation basins and the retrospective likelihood area:

- AP Temp 02 – high likelihood.
- AP Temp 11 – high likelihood.
- AP Temp 12 – medium likelihood.
- AP Temp 13 – high likelihood.
- AP Temp 22 – high likelihood.
- AP Temp 30 – high likelihood.
- AP Temp 47 – medium likelihood.

Based on this information, surface water flood risk during construction associated with the underground cable routes is considered to be medium and mitigation measures will be required which is discussed further in **Section 6 Embedded Mitigation and Residual Risk**. Surface water flood risk to the underground cable itself during operation is considered to be low as the cable will be buried and therefore will not interact with above ground flood sources.

Groundwater

Groundwater flooding occurs when water levels in the ground rise above the ground surface. The geology has a major influence on where this type of flooding takes place; it is most likely to occur in low-lying areas underlain by permeable rocks (aquifers).

When consulting the SEPA Flood Maps[2], they only highlight areas with a low likelihood of groundwater flooding, with no medium or high-risk areas indicated on the map. The underground cable routes are not shown to be located within an area where groundwater emergence is likely. The nearest area indicated with a low likelihood of groundwater flooding is located approximately 3 km to the northwest of the underground cable routes. From a review of the BGS GeoIndex[6], there are numerous borehole records along the underground cable routes but the majority of these do not provide information on groundwater. One borehole (BGS ID: 899010), 4.15 m in depth, was identified within the HVDC underground cable route where the route crosses the A92 which indicated that the borehole was dry.

Detailed GI (**Annex A Geotechnical Interpretive Report (Mott McDonald, September 2025**)) has been undertaken along the cable route which indicates the groundwater conditions vary with depths ranging from 0.6 m to >6 mbgl. Shallow groundwater is identified across large sections of the cable route therefore there is a high likelihood of groundwater interaction during construction and operation. The entry and exit chambers for the HDD during construction and any jointing bays are likely to come into contact with groundwater and measures would be needed to ensure a dry working area is available.

The drainage attenuation basins associated with the temporary haul road may be impacted by shallow groundwater which may ingress into the attenuation basins reducing their ability to function as designed.

Based on this information, the risk of flooding from groundwater to the underground cable routes is considered to be medium during construction and operation, mitigation measures will be required as a conservative approach which is discussed further in Section 6. It is recommended that groundwater investigations are undertaken prior to construction to understand the groundwater regime and how it may impact any below ground infrastructure.

Sewer and Water Supply Infrastructure

Sewer flooding can occur as a result of infrastructure failure, for example blocked sewers or failed pumping stations. It can also occur when the system surcharges due to the volume or intensity of rainfall exceeding the capacity of the sewer, or if the system becomes blocked by debris or sediment. Flood risk from water supply infrastructure is associated with bursts or leaks from water supply mains.

Sewer or water supply infrastructure information was not available to inform this assessment however it is likely that sewer infrastructure within urban roads would be present especially if located within urbanised/residential areas.

Based on available information obtained for this desktop study the risk of sewer infrastructure and water supply flooding to the underground cable route is considered to be low during construction and operation. Further consultation with Scottish Water should be undertaken at detailed design stage to identify any water supply and sewer infrastructure.

Artificial Sources

Artificial flood sources include raised channels such as canals or storage features such as ponds and reservoirs. The SEPA Reservoirs Map[3] shows the indicative area that may flood from an uncontrolled release of water from all possible dam failure scenarios for a particular reservoir. Reservoirs have been designated with low, medium or high risk, based on the risk to human health, economic activity, the environment and cultural heritage if water from the reservoir was to be released. The reservoirs map shows that the majority of the underground cable route is not located within a reservoir inundation extent. A small part of the underground cable route is located within high-risk area of flooding from the Lochore Meadows reservoir where it crosses the River Ore.

Reservoir flooding is extremely unlikely due to regular monitoring and maintenance enforced by SEPA, and although consequences from a reservoir failure could be severe, this is a worstcase prediction. There has been no loss of life from reservoir flooding in the UK since 1925, and all large reservoirs are managed in accordance with the Reservoirs (Scotland) Act 1975[16] and as such are actively maintained. Based on this, it is considered that the flood risk from artificial sources during construction and operation to the underground cables routes is low.

4.4 Flood Risk to the Converter Station

Coastal

According to the SEPA Flood Maps, the proposed converter station is not located within an area where there is likelihood of coastal flooding during the present day or in the future (see **Figure 8.3a Present Day Flood Risk** and **Figure 8.3b Future Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**). Therefore, the flood risk from coastal sources to the converter station during construction, operation and is considered to be negligible.

Fluvial

According to the SEPA Flood Maps, the majority of the proposed converter station is not located within an area where there is likelihood of fluvial flooding during present day or in the future (see **Figure 8.3a Present Day Flood Risk** and **Figure 8.3b Future Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report** respectively). An area to the west is shown to have significant out of bank flooding from ORE32 which is likely a result of the culvert underneath the B9097 throttling flows casing headwater levels to rise. Consulting with SEPA on 07/08/2025 identified the culvert had been represented in the national modelling however, actual dimensions where not known therefore default values for a 'standard culvert' were used.

When consulting the SEPA surface water and small watercourse flood maps, the proposed landform bunds are currently located along the medium likelihood flood extent. This extent is slightly larger when considering the future scenario. As the design is currently outline at the time of writing, cut and fill volumes are not fully understood, however the final design will be such that the landform bunds will not protrude into these flood extents.

According to the SEPA Flood Maps[2], there are areas which have a high, medium and low likelihood of flooding from small watercourses at the entrance to the proposed access road which could hinder access and egress in a flood event. Mitigation will be implemented to manage this risk which is discussed further in **Section 6 Embedded Mitigation and Residual Risk**.

Therefore, the flood risk from fluvial sources to the converter station during construction and operation is considered to be low.

Surface Water

According to the SEPA Flood Maps[2], the majority of the converter station is not located within an area where there is likelihood of surface water flooding during present day or in the future (see **Figure 8.3a Present Day Flood Risk** and **Figure 8.3b Future Day Flood Risk** within **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report**). There is a very

[16] Reservoirs (Scotland) Act 1975 Scottish Government

small, isolated area of low likelihood of surface water flooding located in the centre of the proposed permanent converter station in the future day.

The SEPA surface water and small watercourses flood map highlights areas which have a medium to low likelihood of flooding propagating south to north across the temporary construction compound for the converter station which appears to be originating from an unnamed field drain to the south of the converter station site in the present day. This flow path becomes more widespread during the future scenario.

Therefore, the flood risk from surface water to the converter station during construction and is considered to be medium. During operation, the flood risk from surface water is considered to be low.

Groundwater

According to ground investigations undertaken at the converter station site (**Annex B Geotechnical Interpretive Report (Mott McDonald, 2025)**) between July and August 2024, groundwater strikes were predominately recorded at depths of between 0.9 m and 4 m depth, indicating possible perched groundwater in the superficial deposits (predominately glacial till, with small areas of peat). Groundwater monitoring undertaken over a 6 week period in September and October 2024 indicated that groundwater levels generally ranged between 2-3 m bgl at their shallowest. It is possible that the buried HVAC cable route, and attenuation basins and swales associated with the drainage could come into contact with groundwater.

Considering the above, the flood risk from groundwater to the converter station during construction and operation and is considered to be medium. Mitigation measures will be required which is discussed further in **Section 6 Embedded Mitigation and Residual Risk.**

Sewer & Water Supply Infrastructure

As the proposed converter station is located in a rural area, there are unlikely to be any sewer connections which could pose a flood risk. The nearest sewer is located approximately 1 km to the west of the converter station. Therefore, it is considered that sewer flood risk during construction, operation and to the converter station is low.

Artificial Sources

According to the SEPA Reservoirs Map[3], the converter station is not located within a reservoir inundation extent if a reservoir was to fail. Therefore, the flood risk from artificial sources to the converter station during construction, operation and is considered to be low.

4.5 Summary

Table 2 Summary of flood risk to the underground cable routes and **Table 3: Summary of flood risk to the converter station** provide a summary of the assessment of flood risk from all sources during the construction and operation phases for the underground cable routes and converter station respectively.

Table 2 Summary of flood risk to the underground cable routes

Flood source	Risk during construction	Risk during operation	Mitigation required?
Coastal	Negligible	Negligible	No

Flood source	Risk during construction	Risk during operation	Mitigation required?
Fluvial	Medium	Low	Yes (for construction)
Surface water	Medium	Low	Yes (for construction)
Groundwater	Medium	Medium	Yes (for construction and operation)
Sewer and Water Supply Infrastructure	Low	Low	No
Artificial sources	Low	Low	No

Table 3: Summary of flood risk to the converter station

Flood source	Risk during construction	Risk during operation	Mitigation required?
Coastal	Negligible	Negligible	No
Fluvial	Low	Low	No
Surface water	Medium	Low	Yes (for construction)
Groundwater	Medium	Medium	Yes (for construction and operation)
Sewer and Water Supply Infrastructure	Low	Low	No
Artificial sources	Low	Low	No

5. Flood Risk – From Development

5.1 Overview

Built development often increases the area of impermeable surfaces thereby promoting rapid runoff to surface water sewers or watercourses rather than infiltration into the ground. This has the effect of increasing both the total and peak water flows, potentially increasing the risk of flooding at other locations downstream.

5.2 Underground Cable Route

Coastal

The **Scottish** Onshore Scheme falls outside of the coastal flood extent for both present- and future-day scenarios. As such there will be no interaction with this flood source and therefore the risk of coastal flooding from the **Scottish** Onshore Scheme is considered to be negligible.

Fluvial

Construction activities such as the excavation of trenches in which to bury the underground cables, as well as the creation of site compounds, storage facilities and temporary attenuation basins, if undertaken on the floodplain, could alter the dynamics of overland flow and disrupt the continuity of flow within the watercourses, and therefore could lead to an increase in fluvial flood risk. The proposed underground cable routes cross 16 watercourses and therefore has the potential to impede the continuity of flow within these watercourses. The proposed temporary haul road will be constructed at existing ground level so will not impede existing flowpaths. However, the proposed temporary haul road crosses 12 watercourses and has the potential to impede continuity of flow within these watercourses. Based on this, fluvial flood risk from the **Scottish** Onshore Scheme is considered to be medium. Embedded mitigation measures to manage this risk are discussed in Section 6.

Surface Water

Sections of the underground cable routes also cross areas of surface water flood risk which could impact on overland flow routes and increase flood risk elsewhere. The temporary haul road for cable installation will be constructed from granular materials which will become compacted due to vehicle tracking and will become an impermeable surface. This has the potential to increase surface water runoff and increase flood risk. As noted in **Section 4 Flood Risk – To Development**, several drainage attenuation basins along the temporary haul road are located within surface water flood risk areas and therefore could alter flow paths. However, the location of these attenuation basins will be revised at the detailed design phase so that they are located outside of any surface water flood extent. Based on this, surface water flood risk from the Scottish Onshore Scheme is considered to be medium. Embedded mitigation measures to manage this risk are discussed in **Section 6 Embedded Mitigation and Residual Risk**.

Groundwater

Construction activities such as the excavation of trenches in which to bury the underground cables could alter groundwater flow locally. The underground cable route is within green open space and where it is in urban areas, the impermeable surfacing will prevent groundwater emergence. The scale of works with respect to the lateral extent of aquifers is very small and is unlikely to have any impact on local groundwater regimes. Therefore, any local increases in groundwater are unlikely to affect vulnerable receptors. Based on this, the groundwater flood risk from the **Scottish** Onshore Scheme is considered to be low.

Sewer/Artificial Sources

No sewer or artificial sources have been identified which could be impacted by the **Scottish** Onshore Scheme and no new connections would be made; therefore, the sewer/artificial sources flood risk from the **Scottish** Onshore Scheme is considered to be low.

5.3 Converter Station

Fluvial

The proposed landform bunds and attenuation basin have the potential to alter fluvial flow paths, however at the detailed design stage, the location of the proposed landform bunds and attenuation basin will be revised so that they are located outside of any fluvial flood extent. As such the risk of fluvial flooding from the converter station is considered low.

Surface Water

Increased areas of impermeable land at the location of the proposed converter station could increase surface water runoff and increase flood risk. Based on this, the surface water flood risk from the **Scottish** Onshore Scheme is considered to be medium. The proposed management of surface water from the converter station is discussed in Section 6.

Other sources

The converter station is not located in an area identified to be at risk of coastal, groundwater, sewer or artificial sources of flooding and therefore the impact of the **Scottish** Onshore Scheme on flood risk from these sources is considered to be low.

5.4 Summary

Table 4: Summary of flood risk from the underground cable routes and **Table 5: Summary of flood risk from the converter station** provide a summary of the assessment of flood risk from the underground cable routes and Converter Station respectively.

Table 4: Summary of flood risk from the underground cable routes

Flood source	Risk from Scottish Onshore Scheme	Mitigation required?
Coastal	Negligible	No
Fluvial	Medium	Yes
Surface water	Medium	Yes
Groundwater	Low	No
Sewer and Water Supply Infrastructure	Low	No
Artificial sources	Low	No

Table 5: Summary of flood risk from the converter station

Flood source	Risk from Scottish Onshore Scheme	Mitigation required?
Coastal	Negligible	No
Fluvial	Low	No
Surface water	Medium	Yes
Groundwater	Low	No

Flood source	Risk from Scottish Onshore Scheme	Mitigation required?
Sewer and Water Supply Infrastructure	Low	No
Artificial sources	Low	No

6. Embedded Mitigation and Residual Risk

Embedded mitigation and design measures are required to mitigate the flood risks identified in Sections 4 and 5.

6.1 Embedded Mitigation Measures

As shown in **Table 2 Summary of flood risk to the underground cable routes** and **Table 3: Summary of flood risk to the converter station** , the following sources of flood risk require mitigation and are considered further in this section:

- Fluvial.
- Surface water.
- Groundwater.

This section will describe the embedded flood risk mitigation measures which will be employed to mitigate the flood risk to and from the **Scottish** Onshore Scheme.

6.2 Underground Cable Routes Mitigation Measures

Construction

Fluvial

The underground cable routes cross a total of 16 watercourses, and therefore there is considered to be a level of fluvial flood risk associated with construction within or close to these watercourses.

Mitigation measures proposed to minimise the risk of flooding impacts during construction at the watercourse crossing locations will be detailed within a Construction Environmental Management Plan (CEMP) or similar prior to construction. Construction compounds will be located outside of areas identified on the SEPA Flood Maps[2]with a likelihood of fluvial flooding during present day and in the future. The drainage attenuation basins for the temporary haul road will be finalised at detailed design and where possible will be located outside of any fluvial flood extents.

Open-cut trench methods will likely be employed to cross minor non-sensitive watercourses using a bypass flume/temporary dam to enable ducts to be installed between dry bed. For major or sensitive watercourses, a trenchless method (i.e. HDD) will be employed.

For construction of the temporary haul road, 12 watercourses will be required to be crossed. The preferred method to cross these watercourses will be via clear-span bridges. Where this is not possible, culverts will be proposed. Where culverts are required, these will be bottomless, to preserve the natural riverbed, or box type with natural substrate within the base of the culvert. Where bridges are used, these will be temporary clear-span bridge crossings. Culverts and bridges will be designed to maintain the existing watercourse capacity so that there is no increase in flood risk. Culverts and bridges will be maintained throughout the lifetime of the development. Further detail of the watercourse crossings is available in **Appendix 8.4 Watercourse Crossings (Volume 4 Appendices)** of the EIAR. The design of the temporary crossings will be agreed with the LPA during detailed design based on the lifetime of the temporary haul road.

The temporary haul road will be constructed at ground level with no significant change to existing levels and consequently flowpaths will not be impacted.

Following the implementation of the above mitigation measures, the fluvial flood risk to the underground cable route and temporary haul road during construction is considered to be low.

Surface Water

A limited number of surface water flood risk areas exist along the underground cable routes as discussed in Section 4.2. The following embedded mitigation measures are proposed to reduce the level of flood risk from surface water flooding in these areas:

- Where possible, work will be planned to be completed during months with lower rainfall levels.
- Mobile equipment when not required will be stored outside of areas of identified surface water flood risk.
- Cleaning of existing field drains and culverts will be completed prior to construction to reduce drainage blockages or restrictions.
- Mitigation measures to maintain existing surface water flow should be implemented to prevent direct impacts on the hydrology of surface flow paths. Standard settlement management methods should be used, if appropriate. For further information on mitigation measures, please refer to **Chapter 8 Water Environment and Flood Risk, Volume 2 Main Report** of the EIAR.

These mitigation measures will be detailed within a CEMP or similar prior to construction.

The Drainage Strategy for the underground cable route[17] (**Annex D Scotland Onshore Cable Route Drainage Strategy (Mott Macdonald, March 2025**) details the proposed method to manage surface water runoff from the temporary haul road including channel drains along the edges of the haul road which will discharge into the proposed attenuation basins located along the underground cable route. There will be clean drainage and dirty drainage systems which will be accommodated by separate temporary systems. The drainage design includes pollution controls such as check dams and sediment traps to treat runoff prior to discharge. Attenuation basins will discharge into the nearest watercourse with discharge rates restricted in line with Fife Council requirements. Where it is not feasible or desirable to discharge into a watercourse, multiple dispersion points will be used to avoid concentrating flow and preventing an increase in flood risk downstream. The haul road temporary attenuation basins will be finalised at detailed design and where possible located outside of any surface water flood extents.

Construction compounds for the underground cable route will be located outside of areas identified on the SEPA Flood Maps[2] with a likelihood of surface water flooding during present day or in the future. The Drainage Strategy for the underground cable route notes that to

[17] Scotland Onshore Cable Route Drainage Strategy (2025) Mott MacDonald

manage runoff from the construction compounds along the cable route, attenuation will be provided in the sub-base with downstream attenuation basins where necessary. Attenuation basins will discharge into the nearest watercourse with discharge rates restricted in line with Fife Council requirements and will attenuate for the 10% AEP event in line with CIRIA C649 - Control of water pollution from linear construction projects Site guide. No allowance for climate change has been made due to the temporary nature of the construction works.

Groundwater

Groundwater could be encountered during construction of the underground cable routes. Therefore, groundwater encountered shall be managed through suitable pumping arrangements, storage, pollution control measures and a controlled discharge into the nearest watercourse. Temporary cut-off drains will be installed parallel to the proposed trenches to prevent soil and groundwater entering the trenches. The temporary attenuation basins along the temporary haul road will be lined to prevent groundwater ingress. Further details will be included in a CEMP prior to construction.

Other Mitigation Measures

Weather warnings will be monitored during the construction works and appropriate action taken in the event of adverse weather conditions e.g. closing of the temporary haul road and pausing construction works.

Operation

Groundwater

Due to the potential risk of shallow groundwater across the underground cable routes, the underground cables, cable ducting and jointing bays will be designed to prevent water ingress.

6.3 Converter Station Mitigation Measures

Construction and

Surface Water

The Drainage Strategy for the converter station[18] (**Annex C Westfield Converter Station Drainage Strategy (Mott Macdonald, March 2025**) will manage surface water appropriately during the construction of the converter station including the use of SuDS. Runoff from the temporary construction compound for the converter station will be attenuated in a basin to the north of the compound prior to discharge into the unnamed watercourse which borders the north of the site. Upon completion of the works, the construction compound will be reinstated to existing conditions. The attenuation basin will remain in place as it will continue to receive surface water runoff from the converter station site. Further details regarding the management of surface water during construction will be included in a CEMP prior to construction.

Groundwater

Groundwater could be encountered during construction of the converter station site. Therefore, groundwater encountered shall be managed through suitable pumping

[18] EGL4 – SPEN – Drainage Strategy, Westfield Converter Station Drainage Strategy (2025) Mott MacDonald

arrangements, storage, pollution control measures and a controlled discharge into the nearest watercourse. Further details will be included in a CEMP prior to construction.

Operation

Fluvial

The entrance to the proposed converter station access road is located within a flood extent identified on the SEPA surface water and small watercourses flood map[2]. Therefore, during operation weather warnings will be monitored and appropriate action taken in the event of adverse weather conditions e.g. preventing access to the site.

Surface Water

The converter station will increase the impermeable area through the construction of hard standing land at the proposed converter station site. Without suitable mitigation measures this is likely to increase surface water runoff rates and volumes. The management of surface water will comply with planning policy so that there is no increase in flood risk to the Scottish Onshore Scheme or to third parties. Runoff rates will be attenuated to not exceed the existing natural runoff into the local watercourses. The details of how surface water will be managed are detailed within the Drainage Strategy for the converter station[18] and are summarised as follows:

- The proposed surface water drainage rate will not be greater than 4.0 l/s/ha as per the standard set by Fife Council.
- Runoff from the converter station will be intercepted via swales and routed to the attenuation basin located to the north-east of the converter station, prior to discharge to an outfall into the unnamed watercourse to the north of the site.
- Critical equipment has been designed to be protected up to and including the 0.1% AEP event.
- A swale located parallel to the southern boundary of the converter station site will intercept overland flow, diverting it westwards where it will discharge into the unnamed watercourse (ORE24). This swale will be designed to accommodate the 0.1% AEP + 39% climate change event due to the land sloping towards the in-cut section of the converter station platform. A swale will also be located to the eastern side of the converter station site which will discharge into the unnamed watercourse.
- The attenuation basin has been designed to accommodate the 0.5% AEP event plus 39% climate change.
- During an exceedance event, water will flow northwards away from the converter station and into existing drainage ditches.
- A maintenance schedule has been developed which will be adhered to ensuring the drainage system operates at full capacity.

Groundwater

There is potential for groundwater ingress into the proposed drainage features associated with the converter station such as the attenuation basin and swales. The attenuation basin will be lined with an impermeable liner to prevent groundwater ingress. As there is the potential for perched groundwater at 0.9 m depth, the proposed swales will be a maximum of 0.75 m deep to prevent contact with groundwater.

Upon application of the mitigation measures the risk of river, surface water and groundwater flooding to and from the **Scottish** Onshore Scheme is considered to be low.

Residual Risk

Temporary Attenuation Basin Breach (converter station and cable route)

The likelihood of a breach of the temporary attenuation basins is considered medium due to them having a 1 in 10-year attenuation capacity. In the event of a breach there could be an increase in fluvial and surface water flooding. Floodwaters would flow over agricultural land and possibly impact minor B roads before flowing into the nearest watercourse, with no risk to other receptors.

Given the relatively minor consequences of a breach, no additional mitigation measures are proposed. Overall, the risk of an attenuation breach is considered low.

Permanent Attenuation Basin Breach (converter station)

The likelihood of a breach is very low given that the attenuation basins have been designed to a 0.5% AEP standard plus a 39% climate change allowance. In the unlikely event of a breach there could be an increase in fluvial and surface water flooding. Floodwaters would flow north possibly impacting the B9097 before flowing over agricultural land into the nearest watercourse, with no risk to other receptors.

Given the low likelihood of an attenuation basin breach and the relatively minor consequences of a failure, no additional mitigation measures are proposed. Overall, the risk of an attenuation breach is considered very low due to the high design standards of the attenuation basin.

Culvert Blockages

The culverts implemented to allow crossing of watercourses for the temporary haul road may become blocked which could lead to flooding on the temporary haul road or to third parties. However, these culverts will be designed to maintain existing capacity of the watercourses and will be appropriately maintained in line with the CEMP.

Given the low likelihood of culvert blockage and the relatively minor consequences of a blockage, no additional mitigation measures are proposed. Overall, the risk of culvert blockage is considered very low due to the high design standards and maintenance of the culverts.

6.4 Summary

The proposed embedded mitigation and design measures mitigate the flood risk from all sources identified in Sections 4 and 5. Therefore, when considering the embedded mitigation measures, the risk to and from the **Scottish** Onshore Scheme from all sources (coastal, fluvial, surface water, groundwater, sewer and water supply infrastructure, and artificial sources) is considered to be low.

7. Conclusion

7.1 Overview

This FRA has considered the flood risk from all sources both to and from the Scottish Onshore Scheme. Parts of the **Scottish** Onshore Scheme are located within areas at risk of flooding, however the development is essential infrastructure which is required to be located in areas at risk of flooding for operational purposes. The FRA has provided evidence to demonstrate that the development meets the requirements for development in an area of flood risk in line with NPF4.

7.2 Flood Risk to the Underground Cable Routes

The FRA has outlined that the construction phase of the underground cable route will be vulnerable to fluvial, surface water, and groundwater flooding. The greatest probability of flooding arises from the proposed open cut crossings across watercourses along the underground cable route and the temporary haul road watercourse crossings. The SEPA Flood Map identifies a limited number of sections of the underground cable routes that are in areas of fluvial and surface water flood risk. During construction and operation, there is potential for shallow groundwater.

The underground cables once fully installed, will be buried, and as result is not considered to be at risk of flooding from coastal, fluvial or surface water sources.

7.3 Flood Risk to the Converter Station

The FRA has identified that all sources of flooding pose a low risk to the converter station during operation apart from groundwater which is considered to pose a medium risk. During construction, the SEPA Flood Maps identifies a flow path over the temporary construction compound.

7.4 Flood Risk from the Underground Cable Routes

The underground cable routes once installed, will be buried and the land will be returned to existing conditions. Whilst groundwater may be shallow, the scale of the Proposed Development with regards to the lateral extent of the aquifer type is negligible. Therefore, there will be no impact on any source of flooding from the underground cable route.

7.5 Flood Risk from the Converter Station

Construction of the converter station will lead to an increase in the impermeable area, increasing surface water runoff. Surface water runoff management measures will be implemented at the converter station site so that there is no increase in flood risk to the converter station or to third parties. This is detailed within the Drainage Strategy for the converter station.

7.6 Embedded Flood Risk Mitigation Measures

The following embedded mitigation and design measures listed below will be implemented:

- Placement of construction compounds and stockpile facilities outside of areas of fluvial, coastal, and surface water flood risk.
- Storage of mobile equipment outside of areas of coastal, fluvial, and surface water flood risk, when they are not required for scheduled works.
- Maintenance of flow continuity at watercourse crossing points through the implementation of damming and over pumping.
- Where possible, work will be completed during months of lower rainfall levels.
- The crossing of watercourses will take place during periods of normal to low flow.
- Where watercourses are required to be crossed, the preferred method of crossing will be clear-span bridges. Where this is not possible, culverts will be proposed. Where culverts are required, these will be bottomless, to preserve the natural riverbed, or box type with natural substrate within the base of the culvert. Where bridges are used, these will be temporary clear-span bridge crossings.
- For major or sensitive watercourses, a trenchless method (i.e. HDD) will be employed to cross watercourses.
- Temporary cut-off drains will be installed parallel to the proposed trenches to prevent soil and groundwater entering the trenches.
- Cleaning of existing field drains and culverts will be completed prior to construction to reduce drainage blockages or restrictions.
- Groundwater encountered shall be managed through suitable pumping arrangements, storage, pollution control measures and a controlled discharge into the nearest watercourse.
- Underground cables and cable ducting will be designed to prevent water ingress.
- Management of surface water runoff during construction and operation which is detailed within the drainage strategies. The drainage strategies provide a maintenance schedule for the drainage scheme which should be adhered to.
- Weather warnings will be monitored during the construction works and appropriate action taken in the event of adverse weather conditions.

These embedded mitigation and design measures mitigate the flood risk from all sources and therefore the risk to and from the Scottish Onshore Scheme from all sources (coastal, fluvial, surface water, groundwater, sewer and water supply infrastructure, and artificial sources) is considered to be low.

Abbreviations

Abbreviation	Term
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
BGL	Below ground level
BGS	British Geological Survey
CEMP	Construction Environmental Management Plan
FRA	Flood Risk Assessment
GI	Ground Investigation
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
NETS	National Electricity Transmission Syste,
NGR	National Grid Reference
NPF4	National Planning Framework 4
SuDS	Sustainable Drainage Systems
SEPA	Scottish Environmental Protection Agency
SFRA	Strategic Flood Risk Assessment

Annex A – Cable Route Ground Investigation Report (Mott McDonald, Sept 2025)

Refer to Cable Route Ground Investigation Report submitted with the Application

Annex B – HVDC Converter Station Geotechnical Interpretive Report (Mott Macdonald, Feb 2025)

Refer to HVDC Converter Station Geotechnical Interpretive Report submitted with the Application

Annex C - Westfield Converter Station Drainage Strategy (Mott Macdonald, March 2025)

Refer to Westfield Converter Station Drainage Strategy submitted with the Application

Annex D - Scotland Onshore Cable Route Drainage Strategy (Mott Macdonald, March 2025)

Refer to Scotland Onshore Cable Route Drainage Strategy submitted with the Application