

VOLUME 5: CHAPTER 7: SOILS, GEOLOGY AND WATER - ALTERNATIVE ALIGNMENT

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7. SOILS, GEOLOGY AND WATER – ALTERNATIVE ALIGNMENT

7.1 Executive Summary

- 7.1.1 An assessment has been undertaken of the potential effects on geology (including soils and peat) and the water environment (hydrology and hydrogeology) during the construction and operational phases of the Proposed Development with the Alternative Alignment (hereafter referred to as ‘the Alternative Alignment’) as described in **Volume 5: Chapter 3: The Proposed Development – Alternative Alignment**. The Proposed Development with the Proposed Alignment is assessed in **Volume 1: Chapter 9: Soils, Geology and Water** and its supporting appendices.
- 7.1.2 Information for the Study Area was compiled using baseline information from a desk study, which was verified by an extensive programme of field work. The site and the immediate area have been subject to much previous investigation and assessment and this information has been used to characterise baseline conditions. The assessment undertaken considered the sensitivity of receptors identified during the baseline study and mitigation measures incorporated in the development design. It has also considered potential future changes to baseline conditions.
- 7.1.3 The scope of the assessment was informed by existing nearby assessments, pre-application advice and scoping and consultation responses received during the route and alignment stages of the Alternative Alignment assessment.
- 7.1.4 The assessment is supported by Appendices that consider potential effects on carbon rich soils and peat (peat management plan), peat stability (peat landslide hazard risk assessment) and peatland condition. A schedule of proposed permanent watercourse crossings associated with the Alternative Alignment is also presented as an Appendix.
- 7.1.5 A detailed peatland condition assessment has been completed which has considered key hydrological, ecological and land-use based indicators of peatland condition. In summary it confirms that overall the remaining fragments of peatland appear to be hydrologically compromised by longstanding drainage, peat extraction and grazing leading to a high prevalence of vascular plants and low diversity. This has fundamentally reduced the resilience of the peatlands within this landscape as evidenced by the high severity and enduring impacts of the 2019 wildfire. The highly degraded nature of peatland and heath means that development along the Alternative Alignment, subject to use of common industry safeguards, will not impair peatland along its route.
- 7.1.6 Subject to the adoption of best practice construction techniques and a site-specific Construction Environmental Management Plan (CEMP), no significant adverse effects on geology (including soils and peat) and the water environment have been identified. The CEMP would include provision for drainage management plans which would be agreed with statutory consultees, including Scottish Environment Protection Agency (SEPA) and NatureScot, and which would be used to safeguard existing surface water and groundwater flow paths, water resources and manage flood risk. A commitment to deploy Sustainable Drainage Systems (SuDS) in these plans has been made. The CEMP would also include provision of a Pollution Prevention Plan which would also be agreed with statutory consultees including SEPA and NatureScot prior to any construction works being undertaken.
- 7.1.7 The design of the Alternative Alignment has been informed by a detailed programme of peat depth probing as required by National Planning Framework 4 (NPF4) and it has been shown that wherever possible areas of deep peat have been avoided. The assessment of peat and carbon rich soils has considered all of the proposed infrastructure, including temporary and permanent access tracks, as well as temporary diversions of the existing Strathly North 132 kV OHL required to facilitate construction of the Alternative Alignment. A project specific peat

management plan has been prepared which confirms the soils disturbed by the development are limited in volume and that these soils can be readily and beneficially reused in restoration works.

- 7.1.8 Notwithstanding these safeguards, a programme of baseline and construction phase water quality monitoring is proposed which would be used to confirm that the Alternative Alignment does not have a significant effect on the water environment. Further, additional site investigation is proposed as part of the detailed design stage of the project to ensure ground stability risk is not increased as a consequence of the Alternative Alignment. A geotechnical risk register and monitoring is proposed. It is proposed that the monitoring programmes are agreed with statutory consultees.

7.2 Introduction

- 7.2.1 This Chapter considers the potential effects of the Alternative Alignment on geology (including soils and peat) and the water environment (hydrology and hydrogeology) during the construction and operation of the Alternative Alignment and dismantling of the existing trident 'H' wood pole overhead line (OHL). Where likely significant effects are predicted appropriate mitigation measures are proposed, and the significance of predicted residual effects are assessed.
- 7.2.2 The assessment should be read in conjunction with **Volume 5: Chapter 5: Ecology – Alternative Alignment** as information contained in that Chapter and assessment are used to complete the assessment of habitats (such as peat and Groundwater Dependent Terrestrial Ecosystems (GWDTEs)) and ecological receptors (such as designated sites) that are sustained by water.
- 7.2.3 Further, as part of this Chapter, site specific peat depth probing and a peatland condition assessment has been undertaken, the findings of which are presented in the following Appendices:
- **Volume 4: Appendix V5-7.1:** Peat Landslide Hazard Risk Assessment (PLHRA).
 - **Volume 4: Appendix V5-7.2:** Outline Peat Management Plan (PMP).
 - **Volume 4: Appendix V5-7.4:** Detailed Peatland Condition Assessment (PCA).
- 7.2.4 The findings of these detailed assessments summarised in this Chapter.

Statement of Qualifications

- 7.2.5 This assessment has been carried out by SLR Consulting Ltd (SLR) and overseen and reviewed by Gordon Robb (BSc, MSc, MBA, C.WEM, FCIWEM). Gordon is a Technical Director (Hydrology and Hydrogeology) and has more than 30 years' experience assessing renewable energy and electrical infrastructure projects and specifically their potential effects on soils, geology and the water environment. He is based in Scotland and has worked throughout Scotland, including on sites in similar environments to the Alternative Alignment. He has also prepared and given expert witness testimony for renewable and electrical infrastructure projects.
- 7.2.6 The peatland condition assessment has been prepared by Dr. Chris Marshall, a Principal Consultant at SLR Consulting Limited. Chris holds a BSc (Hons) Environmental Geology, an MSc in Geochemistry and a PhD in Earth Sciences, with 10 years of experience in peatland condition and restoration monitoring and assessment including peer reviewed scientific papers, policy documents, governmental reports and membership of scientific and technical advisory groups. He has conducted surveys of Peatland Condition and Fire Impact at the Proposed Development site since 2018.
- 7.2.7 A table presenting relevant qualifications and experience of key staff involved in the preparation of this Chapter is included in **Volume 4: Appendix V1-5.1: EIA Team Details**.

7.3 Scope of Assessment

Study Area

- 7.3.1 The Study Area encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this Chapter. This includes a buffer of 500 m to all the proposed works and access tracks that would be used during construction and operation of the Alternative Alignment and a section of the existing OHL which would be dismantled.

7.4 Consultation and Scoping

- 7.4.1 Full details of the consultation process and responses are included in **Volume 1: Chapter 4: Scope and Consultation** and associated appendices.
- 7.4.2 Further details on consultation and scoping responses specific to soils, geology and the water environment, which are common to both the Proposed Alignment and Alternative Alignment of the Proposed Development are summarised in **Table V1-9.1 of Volume 1: Chapter 9: Soils, Geology and Water**.

Potential Impacts Assessed in Full

- 7.4.3 The potential impacts which have been assessed are the same as detailed with **Section 9.4.3 of Volume 1: Chapter 9: Soils, Geology and Water**, with the exception of the Alternative Alignment and associated Study Area being considered rather than the Proposed Alignment.

Issues Scoped Out of Assessment

- 7.4.4 The issues scoped out of the assessment are the same as detailed within **Section 9.4.4 of Volume 1: Chapter 9: Soils, Geology and Water**, with the exception of the Alternative Alignment and associated Study Area being considered rather than the Proposed Alignment.

7.5 Legislation, Policy and Guidance

- 7.5.1 This assessment has been undertaken with reference to relevant national and local legislation, policy and guidance, which are set out in **Section 9.5 of Volume 1: Chapter 9: Soils, Geology and Water**.

7.6 Methodology

Desk Study

- 7.6.1 The desk study methodology is set out in **Section 9.6 of Volume 1: Chapter 9: Soils, Geology and Water**.

Field Survey

- 7.6.2 The field study methodology is set out in **Section 9.6 of Volume 1: Chapter 9: Soils, Geology and Water**.

Assessment of Effects

- 7.6.3 The significance of effects of the Alternative Alignment have been assessed by considering two factors: the sensitivity of the receiving environment and the potential magnitude of impact, should that effect occur.
- 7.6.4 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of likely effects presented by the Alternative Alignment.
- 7.6.5 Criteria for determining the significance of effect are provided in **Table V1-9.2, Table V1-9.3 and Table V1-9.4 of Volume 1: Chapter 9: Soils, Geology and Water**.

Cumulative Assessment

- 7.6.6 The assessment considers the potential cumulative effects associated with other material developments within 5 km from the nearest element of the Alternative Alignment infrastructure and within the same surface water catchment as the Alternative Alignment. A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Alternative Alignment in combination with other developments. A 5 km buffer is used as beyond this any potential effects are unlikely to be demonstrable.

Limitations to the Assessment

- 7.6.7 Details on the limitations to the assessment are provided in **Section 9.6 of Volume 1: Chapter 9: Soils, Geology and Water.**

7.7 Baseline Conditions

- 7.7.1 This section outlines the baseline soils (including peat), geology and water environment conditions within the Study Area. The Study Area is shown on **Volume 2: Figures V5-7.1 to V5-7.8.**

Designated Sites

- 7.7.2 Review of NatureScot Sitelink confirms that approximately 250 m of the Alternative Alignment is within the western edge of the West Halladale Site of Special Scientific Interest (SSSI) which is also part of the larger Caithness and Sutherland Peatlands Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site, as shown on **Volume 2: Figure V5-7.1.** The SSSI, SAC, SPA and Ramsar site has been designated for breeding bird assemblage, otters, marsh saxifrage and various freshwater and upland habitats including blanket bog habitats. The qualifying or notified features of the designated sites are sensitive to changes in peat and water quality.
- 7.7.3 The Alternative Alignment is located in the northern extent of the Flow Country World Heritage Site (WHS) (see **Volume 2: Figure V5-7.1**). The Outstanding Universal Value (OUV) of the WHS includes:
- most extensive near continuous example of natural, actively accumulating blanket bog ecosystem found globally;
 - bog macroform diversity;
 - carbon sequestration and storage;
 - ongoing scientific and educational use;
 - water filtration and the impact on water quality of associated riverine habitats; and
 - diverse and genetic range of biodiversity, birds and plants associated with the blanket bog habitats.
- 7.7.4 It is evident that the habitats within the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and Flow Country WHS are highly regarded and protected at national and international level. Blanket bog and peat habitats are water dependent. Therefore, the Caithness and Sutherland Peatlands SAC, SPA and Ramsar sites (including the West Halladale SSSI) and the Flow Country WHS have been considered further in this assessment. Potential effects as a consequence of the Alternative Alignment on the designated sites are also considered in **Volume 5: Chapter 5 – Ecology – Alternative Alignment.**
- 7.7.5 The Strathly Coast SSSI at Portskerra abuts the northern boundary of the Study Area and is designated for a range of coastal habitats and its vascular plant assemblage. Whilst the SSSI is downstream of the Alternative Alignment no intrusive works are proposed within 500 m of the SSSI and given the size and extent of the Pentland Firth compared to the scale of the Alternative Alignment any potential effects on the SSSI would not be discernible and it is not considered further in this assessment.
- 7.7.6 No other designated sites are recorded within the Study Area.

Soils and Geology

Soils and Made Ground

7.7.7 An extract of the 1:250,000 National Soil Map of Scotland is presented as **Volume 2: Figure V5-7.2**, which indicates that the Alternative Alignment is generally underlain by peat, peaty gleys and peaty podzols. Mineral podzols are recorded within the eastern extent of the Study Area, near the Halladale River.

7.7.8 The Highland Council (THC) record the presence of an historic landfill (Melvich Landfill) to the immediate west of an existing access track south of proposed tower A13 (see **Volume 2: Figure V5-7.1**). The landfill is no longer used and is likely to have been used to restore small historic mineral workings. The materials within the landfill are unknown. No development is proposed within the landfill footprint.

Superficial Deposits (including Peat)

7.7.9 An extract of BGS superficial deposit mapping is presented as **Volume 2: Figure V5-7.3**.

7.7.10 Superficial geological mapping shows that the western extent and very eastern extent of the Alternative Alignment, near the River Strathy and the Halladale River, is underlain by alluvial and glaciofluvial deposits. The remainder of the Alternative Alignment is shown to be underlain by peat and hummocky glacial deposit which comprise of sand gravel and boulders.

7.7.11 Peatland classification mapping (refer to **Volume 2: Figure V5-7.4**) indicates that most of the Alternative Alignment and Study Area is located within Class 1 and Class 2 peatland. Class 1 and Class 2 peatlands are considered nationally important carbon rich soils, deep peat and priority peatland habitats with high conservation and restoration value. Most of the proposed access tracks (except tracks across land to the east of the Study Area), and towers 19, 20, 22, 26, 29 to 31, A1 to A11, A26 to A27, 47 to 49, and 54 are located in mapped Class 1 peatland. The CSE compound, underground cable (UGC) and towers 23 to 25, 27, 28, A12, A15 to A24, 51, 55 to 61, and 64 are located in mapped Class 2 peatland.

7.7.12 With the exception of the Halladale River valley, **Volume 2: Figure V5-7.4** shows the remainder of the Alternative Alignment is mapped as being underlain by Class 5 peat, whereby soil information takes precedence over vegetation data. In the very east of the Alternative Alignment, adjacent to the Halladale River, mineral soil is recorded.

7.7.13 As part of the baseline assessment a peat probing and characterisation exercise has been undertaken, the results of which are presented in full in **Volume 4: Appendix V5-7.1, Appendix V5-7.2 and Appendix V5-7.4**. In summary the investigations undertaken have confirmed:

- more than 10,000 peat probes were advanced (to the full depth of the soil / peat);
- approximately 80% of the probe locations recorded a peat depth of <1m;
- approximately 60% of the peat probes recorded a peat / soils depth of <0.5m;
- where present, the peat was recorded as fibrous to pseudo fibrous;
- no amorphous peat was recorded;
- the peat was sampled (using an auger) at four locations – logs and photographs are presented in **Volume 4: Appendix 9.1**; and
- the shallow peat deposits are classified as H2 – 3, B2 using the von Post classification.

7.7.14 There are localised deep peat deposits situated across the Alternative Alignment. However, these deposits are generally situated across flatter expanses and in minor topographic lows. Extensive deep peat is rare, generally confined by topography and rarely situated across slopes.

- 7.7.15 Artificial drainage and peat cuttings are frequently observed on aerial photography and were confirmed during site visit and confirmed to be generally associated with the existing tracks to within the east and west of the Alternative Alignment. In addition, historic peat cuttings have been identified predominantly in the northern areas near Towers 28 to 29 and A7 to A13. Peat cuttings are also present in the west near to Tower 19 and Tower 47.
- 7.7.16 No areas of instability relating to artificial drainage and peat cuttings were observed across the Proposed Development.
- 7.7.17 The peatland condition assessment (see **Volume 4: Appendix V5-7.4**) presents a thorough evaluation of peatland condition along the Alternative Alignment and examines key hydrological, ecological, and land-use indicators. The Alternative Alignment has generally shallow peat depth, with sporadic deep peat surrounded by very shallow organic-rich and mineral soils, suggesting conditions for peat formation that favour dry heath over peat.
- 7.7.18 Extensive peat extraction and drainage have further diminished peat depths, often resulting in complete loss in many areas. As a result, dense and dry peat is prevalent along the Alternative Alignment indicating significant subsidence and compaction, with only isolated areas of softer peat in the west. Grazing by sheep and deer has further degraded peatland condition. In the eastern part of the Alternative Alignment, heath and isolated peat bodies have been converted to rough and improved grazing or targeted for native and plantation forestry, disrupting peat structure and favouring non-peatland species. The 2019 Flow Country wildfire severely impacted the Alternative Alignment area, with limited recovery observed in the central and eastern parts. Charcoal and smouldering evidence are common, and the peat surface shows hydrophobicity due to burning. Vegetation recovery has been slow, with *Calluna vulgaris* being the primary colonizer, although it appears stunted in many areas. Sphagnum and other mosses, present before the fire, are now rare or absent along the Alternative Alignment. Bare peat between stunted heather is now the primary ground cover, with sphagnum only persisting in a few wetter locations that should be avoided through micro-siting within the Limit of Deviation (LoD).
- 7.7.19 Overall, the remaining peatland fragments are hydrologically compromised by longstanding drainage, peat extraction, and grazing, leading to a monoculture of *Calluna vulgaris* and low biodiversity. This has significantly reduced the resilience of peatlands in this landscape, as evidenced by the severe and lasting impacts of the 2019 wildfire, while other areas to the south in better condition have recovered. It is likely that this area has reached a tipping point and is on a trajectory towards long-term decline, with colonisation by low-diversity dry heath and scrub, and the total loss of the peat resource. The highly degraded nature of the peatland and heath suggests that development along the Proposed Alternative Alignment is unlikely to impair peatland.

Bedrock Geology

- 7.7.20 An extract of BGS bedrock and linear features geology mapping is presented as **Volume 2: Figure V5-7.5**.
- 7.7.21 From west to east the Alternative Alignment is underlain by; gneiss bedrocks of the Strathy Complex, metamorphic bedrocks of the Kirtomy Gneisses which comprises semipelites and gneissose, sedimentary bedrocks of the Bighouse Formation which comprises sandstone, conglomerate and argillaceous rocks; the Lower Old Red Sandstone Group which comprises interbedded conglomerate and sandstone, igneous bedrocks of the Strath Halladale Granite which comprises granite and biotite, metamorphic rocks of the Portskerra Psammite Formation which comprises migmatitic psammite with migmatitic semipelite, and finally igneous bedrocks of the Badanloch Granite Sheets which comprises granite and foliated-biotite.
- 7.7.22 Several inferred faults, trending north to south, and south-west to north-east, are recorded within the Study Area, see **Volume 2: Figure V5-7.5**.

Hydrogeology

Groundwater Levels and Flow

- 7.7.23 Review of SEPA's environmental data website indicates that no groundwater level monitoring is undertaken within the Study Area.
- 7.7.24 An extract of the BGS 1:625,000 scale Hydrogeological Map of Scotland and 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets are presented in **Volume 2: Figure V5-7.6** and **Figure V5-7.7** respectively.
- 7.7.25 **Volume 2: Figure V5-7.6** confirms that the majority of the Alternative Alignment is underlain by rocks classified as a low productivity aquifer whereby small amounts of groundwater are expected in near surface weathered zones and secondary fractures. The sedimentary rocks beneath the Alternative Alignment are classified as moderately productive aquifer whereby flow is virtually all through fractures and other discontinuities, providing a locally important multi-layered aquifer.
- 7.7.26 The Aquifer Productivity and Groundwater Vulnerability dataset classifies the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Review of **Volume 2: Figure V5-7.7** indicates that the bedrock aquifer underneath the Alternative Alignment is considered to be a low or very low productivity aquifer generally without groundwater except at shallow depths and with flow almost entirely through fractures and other discontinuities. The sedimentary bedrock is recorded as a moderate productivity aquifer where groundwater flow can occur in fractures and by intergranular flow through the rock matrix.
- 7.7.27 The peat and hummocky glacial superficial deposits within the Study Area are not considered significant aquifers. The glaciofluvial deposits in the River Strathy and Halladale River valleys, are moderate to high productivity aquifers with intergranular flow; groundwater within these deposits are likely to be in hydraulic conductivity with adjacent watercourses.
- 7.7.28 Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. The Alternative Alignment is shown to be underlain by groundwater vulnerability Classes 5, 4a and 4b. The highest vulnerability is noted where no or shallow superficial deposits are recorded, and thus little attenuation of potential pollutants prior to entry to groundwater. Groundwater is less vulnerable where overlain by superficial deposits.

Groundwater Quality

- 7.7.29 All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas (DWPA) under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2011 and require protection for their current use or future potential as drinking water resources.
- 7.7.30 SEPA has identified that the Alternative Alignment is underlain by the Northern Highlands groundwater body (SEPA ID: 150701) which in 2023 (the latest reporting cycle) was classified with a Good overall status and no pressures have been identified.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

- 7.7.31 An NVC habitat mapping exercise was conducted as part of the ecology baseline assessment, and this has been used to identify potential areas of GWDTEs. The methodology and results of the NVC habitat mapping exercise are discussed in detail within **Volume 5: Chapter 5: Ecology – Alternative Alignment** and **Volume 4: Appendix V1-7.3: Habitat Technical Report**. Areas of potential GWDTE are shown on **Volume 2: Figure V5-7.8**.

7.7.32 The location and potential GWDTE and their likely dependency on groundwater is discussed in **Table V5-9.1**.

Table V5-9.1: Site Specific Groundwater Dependent Terrestrial Ecosystem Assessment

NVC Community	GWDTE Potential	Location and Distribution on Site, and Assessment of Potential Groundwater Dependency
M6	High	M6 dominant polygons are generally recorded across the Study Area, adjacent to existing watercourses. A larger M6 dominant polygon is recorded within the eastern extent of the Study Area, near the Halladale River, which is underlain by igneous bedrock and glaciofluvial and river terrace deposits adjacent to the Halladale River. The habitat is either located adjacent to watercourses, underlain by low permeability deposits or underlain by superficial deposits where groundwater will be in hydraulic conductivity with the adjacent river. It is therefore considered that the M6 habitats are predominately sustained by surface water, runoff and waterlogging of soils rather than by groundwater.
M15	Moderate	M15 dominant polygons are recorded across the Study Area, with larger extents across the north of the Study Area. The habitat is underlain by several geological deposits including; peat, river terrace deposits, hummocky glacial deposits, glaciofluvial deposits and across metamorphic, sedimentary, and igneous bedrock. The habitat is not rare and is present across large areas of Scotland. The distribution in the Study Area is not typical of that by emergent groundwater but rather by surface water runoff and water logging of soils.
M23	High	M23 dominant polygons are noted in linear polygons adjacent to the banks of watercourses within the centre of the Study Area or located near the banks of the River Strathy and the Halladale River and underlain by alluvium, river terrace and glaciofluvial deposits. Groundwater within these deposits will likely be in hydraulic conductivity with the adjacent rivers and sustained by water in the rivers. It is therefore considered that these habitats are sustained by surface water and waterlogging of soils rather than by groundwater.
M25	Moderate	M25 dominant polygons are located along the banks of a tributary of the River Strathy with the western extent of the Study Area and near tributaries of the Allt na n Eaglaise within the eastern extent of the site. The polygon within the eastern extent of the Study Area is underlain by hummocky glacial superficial deposits. The low permeability hummocky glacial deposits will facilitate local water logging of soils in response to rainfall. Given this distribution, it is considered that these habitats are sustained by rainfall, surface water runoff and waterlogging of soils rather than by groundwater.
MG9	Moderate	A MG9 dominant polygon is recorded along the banks of the Allt na n Eaglaise within the eastern extent of the Study Area. It is therefore considered that this habitat is sustained by surface water, in connection with the adjacent watercourse, rather than by groundwater.
MG10	Moderate	MG10 dominant polygons are either recorded in linear polygons within the northern extent of the Study Area, along the banks of watercourses, bounding the A836 or within the western extent near the Halladale River. The habitat in the northern extent of the Study Area is underlain by peat and hummocky glacial deposits whilst the habitat in the eastern extent is underlain by alluvium, river terrace and glaciofluvial deposits. The low permeability peat and hummocky glacial deposits will facilitate local water logging of soils in response to rainfall. Groundwater within the alluvium, river terrace and glaciofluvial deposits will be hydraulically connected to the Halladale River. It is therefore considered that these habitats are sustained

NVC Community	GWDTE Potential	Location and Distribution on Site, and Assessment of Potential Groundwater Dependency
		by rainfall, surface water runoff and waterlogging of soils rather than by groundwater.
W1	Moderate	W1 dominant polygons are recorded within the southwestern extent of the Study Area, near the banks of the Uidh nan Con Luatha (a tributary of the River Strathy). It is therefore considered that the W1 habitats are sustained by surface water, in connection with the adjacent watercourse, rather than by groundwater.
W4	High	W4 dominant polygons are noted near banks of a tributary of the River Strathy within the southwestern extent of the Study Area. The habitat is underlain by glaciofluvial and river terrace deposits whereby groundwater will be in hydraulic connectivity with the River Strathy. It is therefore considered that the W4 habitats are predominantly sustained by surface water rather than by groundwater.

7.7.33 Review of **Table V5-9.1** shows that the potential high and moderate GWDTE are located on ground which is underlain by low bulk permeability deposits, adjacent to watercourses or underlain by deposits which are hydraulically connected to the adjacent watercourse. This distribution is not typical of a habitat sustained by groundwater but rather it is likely to be supported by rainfall, surface water runoff and water logging of soils.

7.7.34 Buffers to areas of potential GWDTE specified in SEPA guidance therefore do not apply, but safeguards to maintain these habitats, and the surface water sources to these habitats would need to be maintained during construction and operation of the Alternative Alignment, details of which are included in Section 7.8.

Hydrology

Local Hydrology

7.7.35 The local hydrology is shown on **Volume 2: Figure V5-7.1**.

7.7.36 The Alternative Alignment is located within three main surface water catchments: River Strathy surface water catchment to the west, the Halladale River surface water catchment to the east, and the Tongue Coastal catchment to the north.

7.7.37 The River Strathy flows northwards within the western extent of the Study Area before discharging to the sea at Strathy Bay, approximately 1.4 km north of the Study Area. The Alternative Alignment would not cross the River Strathy. The Halladale River flows northwards within the eastern extent of the Study Area before discharging to the sea at Melvich Bay, approximately 2.7 km north of the Study Area. Only conductors associated with the Alternative Alignment would cross over the Halladale River at NGR NC 90159 59579 (between towers 63 and 64, no track crossing of the river is proposed). The Alternative Alignment crosses a number of watercourses that drain northwards to the coast.

7.7.38 The Study Area is drained by the following sub catchments:

- Bowside Burn sub catchment of the River Strathy which drains a small area to the south west of the Study Area. The burn flows generally westwards before discharging into the River Strathy approximately 420 m downstream of the Alternative Alignment. The Alternative Alignment would cross the burn at NGR NC 83133 60994 (between towers 21 and 22, no track is proposed to cross the burn) and poles associated with the existing OHL would also be dismantled within this surface water catchment; and,

- Allt na n Eaglaise sub catchment of the Halladale River which drains a large area to the south and southeast of the Study Area. Allt na n Eaglaise flows generally northwards, through the eastern extent of the Study Area, before discharging into the Halladale River approximately 680 m downstream of the Study Area. The Alternative Alignment will cross Allt na n Eaglaise at NGR NC 88565 60876 (between towers 53 and 54). There are several tributaries of Allt na n Eaglaise within the Study Area.

7.7.39 The surface water catchment of the Bowside Burn has been designated as a Drinking Water Protected Area (DWPA), as shown on **Volume 2: Figure V5-7.1**. Tower 21, 54 m of permanent access track and 60 m of an existing track which is proposed to be upgraded and one pole associated with the existing 132 kV OHL which would be dismantled are the only elements of the Alternative Alignment within this catchment. It is understood that the DWPA was identified to safeguard water abstraction used to provide a water supply to Bowside Cottage, The Bothy and Bowside Lodge. Best practice measures to safeguard the quantity and quality of water shed to the Bowside Burn are presented in Section 7.8.

7.7.40 The Alternative Alignment crosses Scottish Water infrastructure at 11 locations (see **Volume 2: Figure V5-7.1**) including:

- two points associated with the proposed UGC;
- six locations at a proposed new permanent track and two locations at a proposed temporary track; and
- adjacent to an existing pole which would be dismantled as part of the Proposed Development with the Proposed Alignment or Alternative Alignment.

Rainfall and Surface Water Flow

7.7.41 SEPA has provided precipitation data for Strathy Bridge rainfall gauge (station number 234319) which is located approximately 860 m north of the Study Area. In 2023 an annual rainfall of 972 mm was recorded.

7.7.42 The National Flow Archive records stream flow in the River Strathy at Strathy Bridge, downstream of the Study Area (located at NGR NC 835 651, approximately 800 m north of the Study Area) and reports a mean flow of 2.63 m³/s. The National Flow Archive also records stream flow in the Halladale River at Halladale, upstream of the Study Area (located at NGR NC 891 560, approximately 3.2 km north of the Study Area) and reports a mean flow of 4.97 m³/s.

Surface Water Quality

7.7.43 The River Strathy, the Halladale River, and Allt na n Eaglaise are all monitored by SEPA and were classified in 2023 (the latest reporting cycle). A summary of the SEPA classifications is shown in **Table V5-9.2**

Table V5-9.2: SEPA Surface Waterbody Classifications (2023)

Waterbody ID (SEPA ID)	Overall Status	Overall Ecology	Physico-Chemical	Hydromorphology	Pressures
River Strathy – The Uair to sea (20610)	Good	Good	High	Good	None
Halladale River - d/s Forsinain Burn (20614)	Good Ecological Potential	Poor	Good	Poor	Heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.
Allt na n Eaglaise (20616)	Good Ecological Potential	Moderate	High	Moderate	

Flood Risk

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

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

7.7.45 SEPA has also produced reservoir inundation maps for those sites currently regulated under the Reservoirs (Scotland) Act 2011.

7.7.46 A summary of the potential sources of flooding and a review of the potential risks posed by each source is presented in **Table V5-9.3**.

Table V5-9.3: Flood Risk Screening Assessment

Potential Source	Potential Flood Risk to Alternative Alignment	Justification
Coastal Flooding	No	SEPA coastal flood mapping highlights that there is low to high likelihood of flooding along the Halladale River and downstream reach of the Allt na n Eaglaise to the east of the Study Area. With the exception of existing access tracks to be upgraded, the Alternative Alignment is located out with the coastal floodplain. It is therefore considered that the Alternative Alignment is not at risk from coastal flooding.
River Flooding	No	SEPA river flood mapping highlights that there is low to high likelihood of flooding along the River Strathy, the Halladale River, Allt na n Eaglaise, and Allt na Clèite within the Study Area. The area delineated as being at risk of flooding is wider than the immediate river channels particularly within the eastern extent of the Study Area. With the exception of existing access tracks to be

Potential Source	Potential Flood Risk to Alternative Alignment	Justification
		upgraded, the Alternative Alignment is located out with the floodplain. SEPA flood maps do not show flooding associated with smaller watercourses within the Study Area, however, floodplains associated with these are likely to be limited and confined to the watercourse corridors. With the exception of watercourse crossings no permanent development has been proposed within 20 m of watercourses. It is therefore considered that the Alternative Alignment is not at risk from fluvial flooding.
Surface Water Flooding	Yes (minor)	SEPA records several small, isolated areas at risk of surface water flooding across the Study Area, especially to the east of the Study Area on land adjacent to the Halladale River. It is noted that the mapped flood risk is small and localised and does not form large, linked areas or flood flow paths, unless associated with watercourse corridors or local low points on the ground surface where water can pond / accumulate. Surface water flooding is not considered to present a development constraint, and potential effects can be mitigated by good site design.
Groundwater Flooding	No	SEPA groundwater flood mapping highlights the Study Area is not at risk of groundwater flooding.
Flooding due to dam or reservoir failure	No	SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act. Review of the SEPA Inundation Mapping highlights that the eastern extent of the Study Area, along the corridor of the Halladale River is at risk of flooding associated with the potential failure of three reservoirs: Loch Nam Breac (NGR NC 82634 47957), Loch Saird (NGR NC 94563 51958), and Loch Sainn (NGR NC 93029 52607). Loch Saird and Loch Sainn have a risk designation of High, whilst Loch Nam Breac has a risk designation of Medium. With the exception of existing access tracks to be upgraded, the Alternative Alignment is located out with the indicated inundation area. Given the safeguards provided by the Reservoirs Act, the Alternative Alignment and use of the access tracks are not considered at flood risk.
Flood Defence Breach (failure)	No	The Alternative Alignment is remote from any flood defences.
Flooding from artificial drainage systems	No	No significant artificial drainage systems are present near to the Alternative Alignment.

7.7.47 SEPA also publish potential future flood extents which account for the potential uplift in rainfall depths and intensities, and sea level rise as a consequence of climate change (based on projections for a single future scenario for the 2080s). An extract of this mapping is shown on **Volume 2: Figure V5-7.1** and confirms that with exception of existing access tracks to be upgraded, the Alternative Alignment is not located within the predicted floodplain extents.

Watercourse Crossings

7.7.48 The Alternative Alignment OHL and a section of the existing trident 'H' wood pole OHL which would be dismantled cross several watercourses however construction activities would not be required within or near watercourses as the OHL (e.g. not tracks) would span the crossings.

7.7.49 The Alternative Alignment has sought to use existing tracks and access routes wherever possible. However, one temporary watercourse crossing, six new permanent watercourse crossings, 18 existing crossings on tracks which are scheduled to be upgraded would be required and two crossings for the UGC would be required. The locations of the proposed crossings along the Alternative Alignment are shown on **Volume 2: Figure V5-7.1** and a schedule of these crossing points, which includes photographs and dimensions of each crossing, is presented in **Volume 4: Appendix V5-7.3**.

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

7.7.50 Consultation with The Highland Council (THC) and SEPA has been conducted regarding records of registered and licenced water abstractions and discharges. Recorded private water supplies (PWS) and SEPA Controlled Activity Regulation (CAR) registrations / licences are shown on **Volume 2: Figure V5-7.1** and are discussed below.

7.7.51 A review of the THC data and previous assessments within the Study Area indicates that there are two PWS's within the Study Area:

- Bowside. The PWS is sourced from Bowside Burn, approximately 125 m upstream of the Alternative Alignment. Abstracted water is used to supply a holiday let; classified as a commercial PWS. At this location, the only element of the Alternative Alignment within 50 m of Bowside Burn is the OHL, which would span the watercourse above ground. As such, there is no potential pathway which could impact the PWS source. Therefore, this PWS is not considered further in the assessment.
- Kirkton Farm. The PWS is sourced from a surface watercourse, with abstracted water used to supply Kirkton Farm, Kirkton Cottage and Ar Dachaidh. The abstraction is taken from the watercourse which discharges from Lochan Coulbackie. The exact location of the PWS abstraction is unknown however it is thought to be located west of the existing commercial forestry in this area, which is noted upstream of the Alternative Alignment. The OHL and an existing track which is scheduled to be upgraded would cross the watercourse and therefore it is considered that the pipework between the PWS source and the properties might be affected by the Alternative Alignment. Mitigation measures are provided in Section 7.8.

7.7.52 26 authorisations under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) at 17 locations, have been identified within the Study Area:

- one point source discharge of other effluent, one discharge for new sewage treatment to land, and nine discharges for private sewage disposal; and
- 15 engineering activities for culverts, bridges, green bank reinforcement and pipeline cable crossings.

Future Baseline

7.7.53 Due to consent being sought in perpetuity, the temporal scope requires the consideration of the potential for climate change to impact on future baseline conditions. Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside higher average temperatures. This suggests that there is likely to be greater pressures on water supplies and water levels in summer months in the future. In addition, summer storms are predicted to be of greater intensity. Therefore, peak fluvial flows associated with extreme storm events may also increase in volume and velocity.

Summary of Sensitive Receptors

7.7.54 **Table V5-9.4** outlines the receptors identified as part of the baseline study, and their sensitivity based upon the criteria contained in **Table V1-9.2** of **Volume 1: Chapter 9: Soils, Geology and Water**. These receptors form the basis of the assessment, and as per the previously introduced methodology, are used in conjunction with an estimate of the magnitude of an effect to determine significance.

Table V1-9.4: Sensitivity of Receptors

Receptor	Sensitivity	Reason for Sensitivity
Water Dependent or Geological Statutory Designated Sites	High	The Alternative Alignment is located within part of the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS, which include qualifying features that are water dependent.
Peat and Carbon Rich Soils	High	Presence of peat and carbon rich soils have been confirmed by site investigation and are also considered nationally and internationally important deposits. These are important carbon stores and need to be safeguarded.
Superficial and Bedrock Geology	Not sensitive	Deposits have been shown to be common regionally and have no rarity value. No geological designated sites are recorded within the Study Area.
Groundwater	High	Groundwater has been classified by SEPA as Good and vulnerability is classified as Moderate to High.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. It has been shown that these habitats are not sustained by groundwater but by surface water. Measures will be required to sustain existing surface water flow paths to these habitats.
Surface Water	High	The principal watercourses which drain the catchments in which the Alternative Alignment is located have been classified by SEPA with Good overall status.
Flooding	Moderate	Floodplains have been identified adjacent to the larger watercourses, particularly the River Strathy and the Halladale River.
Drinking Water Protected Areas	High	There is a DWPA associated with the Bowside Burn located in the west of the Alternative Alignment and measures will be required to safeguard water quality and flows in this surface water catchment.
Private Water Supplies	High	It has been confirmed in the west that the Bowside Burn provides a PWS source and in the east the PWS pipework to Kirkton Farm (and associated properties) would be crossed by the Alternative Alignment and associated infrastructure.
Authorised Sites	Not sensitive	26 third-party licenced authorisations have been identified at 17 locations within the Study Area. However, the licensed sites are related to engineering activities and private sewage discharges which are not at risk from the Alternative Alignment.

7.8 Embedded Mitigation and Mitigation by Design

7.8.1 Mitigation has been developed as the project design has progressed through the route and alignment selection, and EIA stages of the project. The impact assessment and mitigation process has been iterative and therefore mitigation has been developed for the design to be as specific as possible and as an assumed part of the OHL and associated infrastructure. This process has included, for example, using existing access tracks where possible, siting infrastructure generally in areas that avoid ecologically and hydrologically sensitive areas where

practicable. In addition to the mitigation embodied in the design and routing of the project, best practice construction measures have also been developed to ensure that disturbance and pollution during construction is avoided.

- 7.8.2 A description of all elements of the Alternative Alignment is given in **Volume 5: Chapter 3: The Proposed Development - Alternative Alignment**. Embedded mitigation and mitigation by design relevant to soils, geology and the water environment, which are common to both the Proposed Alignment and Alternative Alignment, are presented in **Section 9.8 of Volume 1: Chapter 9: Soils, Geology and Water**. Further measures relevant to the Alternative Alignment, are presented below.

OHL Wood Pole Construction (for the Temporary Diversions)

- 7.8.3 The following measures are proposed to mitigate the effects of temporary wood pole foundation construction on the water environment:
- poles would be located and excavated wherever possible in the driest locations with well consolidated superficial geology, and wetland areas such as deep peat would be avoided. Wherever possible, poles would not be located within 20 m of waterbodies or watercourses;
 - wherever possible, poles would be located out with floodplains to reduce potential effects on flooding;
 - where excavations for poles encounter localised limited quantities of groundwater or become flooded due to surface water runoff or heavy rainfall, appropriate treatment of dewatering would be instigated under direction of the site EnvCoW;
 - no dewatering discharge would be permitted directly adjacent to watercourses;
 - unless directed otherwise by the site EnvCoW, dewatering discharge would drain across buffer areas of vegetation (e.g. grassland, heather) of at least 20 m width, which would provide for natural attenuation and dispersal of the flow and removal of silt;
 - where no suitable vegetation is available for natural treatment of dewatering, the discharge would be passed through on-site settling tanks/lagoons prior to discharge by soakaway or to watercourse;
 - the requirement for dewatering would be minimised in all locations by timely and efficient excavation of the foundation void and subsequent backfilling;
 - excavated soils would be used to restore each foundation and be placed in the order they were removed from the foundation;
 - turves would be used to dress the restored foundations; and
 - all procedures for dewatering would be agreed by the Principal Contractor with SEPA, THC and NatureScot in the CEMP.

Protection of Scottish Water and PWS Distribution Pipework

- 7.8.4 It has been confirmed that the Alternative Alignment would cross the Scottish Water infrastructure at 11 locations and is also likely to cross the PWS distribution pipework at Kirkton Farm (and associated properties). As part of the detailed design stage of the Alternative Alignment the location of the pipework at these locations will be confirmed and clearly marked. If necessary, protection measures would be agreed with Scottish Water and the properties at Kirkton to ensure the integrity of their infrastructure is maintained.

7.9 Potential Effects

- 7.9.1 The assessment of effects is based on the Alternative Alignment description outlined in **Volume 5: Chapter 3** and is structured as follows:
- construction effects of the Alternative Alignment (which includes dismantling a section of the existing 132kV OHL and construction of the temporary wood poles to allow construction of the Alternative Alignment); and

- operational effects of the Alternative Alignment.

Construction Effects

- 7.9.2 Potential construction impacts on soils, geology and the water environment have been identified with reference to relevant guidance, through consultation and project team discussions, through targeted research on hydrological and water quality effects and by considering the information provided by the project engineers on infrastructure and construction methods.
- 7.9.3 During the construction phase, the Alternative Alignment has the potential to result in the effects outlined in **Paragraph 9.9.3 of Volume 1: Chapter 9: Soils, Geology and Water**, without appropriate controls or mitigation.

Peat and Carbon Rich Soils

- 7.9.4 The outline peat management plan (see **Volume 4: Appendix V5-7.2**) and peat landslide hazard risk assessment (see **Volume 4: Appendix V5-7.1**) present the result of a detailed programme of site investigation and show that areas of deeper peat and organic soils have generally been avoided by the design of the Alternative Alignment.
- 7.9.5 Further the proposed infrastructure has targeted where technically feasible areas of past peat cutting and drainage where large amounts of negative indicators of peatland condition, and few, if any, positive condition indicators are recorded. As detailed in the PCA (see **Volume 4: Appendix V5-7.4**) remaining fragments of peatland are hydrologically compromised by longstanding drainage, extraction and grazing leading to a high prevalence of vascular plants and low diversity.
- 7.9.6 The 'embedded mitigation' and best practice measures set out in Section 7.8 above, and in **Section 9.8 of Volume 1: Chapter 9: Soils, Geology and Water**, greatly reduce the potential adverse effect on peat and carbon rich soils.
- 7.9.7 Peat and organic soils are considered highly sensitive receptors. The Alternative Alignment and proposed safeguards embedded in its design reduce the magnitude of potential impact to negligible, during the construction phase. The significance of effect is therefore assessed as **Negligible** and not significant. No additional mitigation, over and above that detailed in the peat landslide hazard risk assessment (**Volume 4: Appendix V5-7.1**) and outline peat management plan (**Volume 4: Appendix V5-7.2**), is required.
- 7.9.8 The safeguards included in the Alternative Alignment design and committed best practice construction techniques would also safeguard the peat deposits which form part of the designated interests of the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS.

Surface Water and Groundwater Quality

- 7.9.9 The works would be undertaken in accordance with the Applicant's (General Environmental Management Plans) GEMPs (see **Volume 4: Appendix V1-3.4**) and relevant technical guidance, GPPs and other codes of best practice, to limit the potential for contamination of both ground and surface waters. In addition, a site-specific CEMP (see **Volume 4: Appendix V1-3.8: Outline CEMP**) would be prepared by the Principal Contractor and include a surface and groundwater quality management plan.
- 7.9.10 The above measures would significantly reduce the likelihood of pollutants, including suspended solids, being discharged to nearby watercourses or groundwater.
- 7.9.11 The safeguards included in the Alternative Alignment design and the committed best practice construction techniques would also safeguard the quality of water which sustains water dependant designated sites,

including the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS.

- 7.9.12 Surface water, groundwater and designated sites are considered highly sensitive receptors. The Alternative Alignment and proposed safeguards embedded in its design reduce the magnitude of potential impact to negligible, during the construction phase. The significance of effect is therefore assessed as **Negligible** and not significant. No additional mitigation, over and above confirmatory monitoring, is therefore required.

Surface and Groundwater Flow

- 7.9.13 No significant deep or expansive earthworks are proposed when compared to surface and groundwater catchments at any location of the Alternative Alignment and therefore there would be no significant impact on catchment scale surface water or groundwater flows. Notwithstanding this, the best practice measures listed above, and in **Section 9.8 of Volume 1: Chapter 9: Soils, Geology and Water**, would be included in the CEMP and would be used to control and manage surface and groundwater flows and maintain existing water flow paths at a local scale and be used to ensure water flow paths to water dependent habitat would be maintained.

- 7.9.14 Surface and groundwater are highly sensitive receptors. With these safeguards, the potential impact on ground and surface water flows is assessed as negligible and thus the resultant significance of effect is **Negligible** and not significant. No additional mitigation, over and above confirmatory monitoring, is required.

Flood Risk

- 7.9.15 Areas of flood risk are considered to have a moderate sensitivity. As part of the detailed site design the Principal Contractor would prepare a detailed construction method statement which would have regard to areas of known and potential flood risk. This would ensure no new permanent features which are sensitive to flooding are located within the floodplain. Moreover, as the base of the proposed steel lattice towers are water compatible and they would not be considered to be at risk of fluvial flooding nor would they increase flood risk should they be required to be located in the floodplain due to technical constraints.
- 7.9.16 It is proposed that access to the Alternative Alignment would use existing tracks and existing watercourse crossings wherever possible. Where watercourse crossings or works to existing crossings are required, the following measures would be implemented to protect surface water and groundwater quality as well as to mitigate a potential increase in flood risk:
- silt traps / check dams would be used to capture suspended solids generated during construction;
 - construction would be carried out in accordance with appropriate SEPA and CIRIA guidance; and
 - the design and capacity of the watercourse crossings would be agreed by the Principal Contractor and the project Environmental Clerk of Works (EnvCoW), and if required in consultation with SEPA as part of the detailed design.

- 7.9.17 With these safeguards the magnitude of potential impact is assessed as negligible and the resultant significance of effect is assessed as **Negligible** and not significant. No additional mitigation is required.

Designated Sites within Hydraulic Connection to the Alternative Alignment

- 7.9.18 The baseline assessment has confirmed that the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS are hydraulically connected to the Alternative Alignment. The designated sites are highly sensitive receptors.

- 7.9.19 The controls which would be adopted at site in accordance with best practice and discussed above, and in **Section 9.8 of Volume 1: Chapter 9: Soils, Geology and Water**, would be used to ensure water resources and qualifying features of the designated sites are not impaired and significant erosion and sedimentation does

not occur. This would ensure, with regard to soils, geology and water, that the potential impact on the designated sites is negligible and thus the significance of effect is **Negligible** and not significant. No additional mitigation, over and above confirmatory monitoring and mitigation measures outlined in the peat management plan (see **Volume 4: Appendix V5-7.2**), is required.

Operational Effects

- 7.9.20 During the operational phase of the Alternative Alignment, it is anticipated that routine maintenance of infrastructure and tracks would be occasionally required.
- 7.9.21 During the operational phase, the Alternative Alignment has the potential to result in the effects outlined in **Paragraph 9.9.19 of Volume 1: Chapter 9: Soils, Geology and Water**, without appropriate controls or mitigation.
- 7.9.22 Should any maintenance be required on-site which would involve construction activities, method statements would be developed and used which would adopt the best practices agreed with regulators as part of the construction phase CEMP.

Peat and Carbon Rich Soils

- 7.9.23 During the operational phase there would be no requirement to undertake earthworks which could impair peat or carbon rich soils. In an unlikely event where earthworks are required, these would be undertaken using the same controls and safeguards which would be used during the construction phase.
- 7.9.24 The likelihood, magnitude of impact and duration of works which have the potential to impair peat or carbon rich soils would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on peat and carbon rich soils is **Negligible** and not significant. No mitigation is therefore required.

Surface Water and Groundwater Quality

- 7.9.25 The possibility of a pollution event, resulting in impairment of surface water or groundwater impairment, occurring during operation is very unlikely as there would be a limited number of vehicles required on-site for routine maintenance.
- 7.9.26 Any maintenance activities would be undertaken using the same controls agreed with statutory consultees and deployed during the construction phase, including adherence to a CEMP, and supervision of all works. Further the scope of works which might be undertaken are no different to the work which would be undertaken during the construction phase.
- 7.9.27 Immediately post-construction, newly excavated drains and track dressings may be prone to erosion as any vegetation would not have matured. Appropriate design of the drainage system, incorporating sediment traps, would reduce the potential for the increased delivery of sediment to natural watercourses. Potential effects from sedimentation or erosion during the operational phase are considered to come from linear features on steeper slopes, where velocities in drainage channels are higher. Immediately post-construction, flow attenuation measures would remain and be maintained to slow runoff velocities and prevent erosion until vegetation becomes established.
- 7.9.28 An outline site restoration plan is presented in **Volume 4: Appendix V1-3.6: Outline Site Restoration Plan** and would be undertaken in accordance with the best practice and safeguards detailed in in Section 7.8 above, and in **Section 9.8 of Volume 1: Chapter 9: Soils, Geology and Water**.
- 7.9.29 Based upon this, the potential risk associated with frequency, duration and likelihood of a pollution event is low. It is, therefore, anticipated that the magnitude of a potential impact on surface water or groundwater during the operational phase of the Alternative Alignment would be negligible, as no detectable change would likely occur.

Therefore, the significance of effect during the operational phase of the Alternative Alignment is predicted to be **Negligible** and not significant on surface water and groundwater. No further or additional mitigation, therefore, is required.

Surface and Groundwater Flow

- 7.9.30 During the operation of the Alternative Alignment, it is not anticipated that there would be any excavation or need to stockpile large volumes of soils, reducing the potential for effects on surface and groundwater flows. Should any excavation be required, this is likely to be limited and required for maintenance of tracks etc. Any excavation, handling and placement of material would be subject to the same safeguards that would be used during the construction phase of the Alternative Alignment.
- 7.9.31 Should any non-routine maintenance be required at the sections of track crossing wet areas (defined visually on-site by a contractor or operational personnel) then the good practice measures as detailed for the construction phase would be required on a case-by-case basis. Extensive work adjacent to the water environment may require approval from SEPA under the CAR (depending upon the nature of the activity).
- 7.9.32 The likelihood, magnitude and duration of works which have the potential to alter surface and groundwater flow paths would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on surface and groundwater is **Negligible** and not significant. No mitigation is, therefore, required.

Flood Risk

- 7.9.33 Culverts beneath permanent access tracks could become blocked without routine inspection or maintenance. Any reduction in conveyance could locally increase flood risk.
- 7.9.34 In accordance with the Applicant's GEMPs (see **Volume 4: Appendix V1-3.4**), proposed infrastructure would be subject to routine inspection, and, if required, maintenance. Where identified, any remedial works would be undertaken using the same controls and authorisations detailed above and would be deployed during the construction phase of the Alternative Alignment.
- 7.9.35 The likelihood, magnitude of impact and duration of works which have the potential to alter surface and groundwater flow paths would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on surface and groundwater is **Negligible** and not significant. No mitigation is therefore required.

Designated Sites within Hydraulic Connection to the Alternative Alignment

- 7.9.36 The controls which would be adopted at site during the operational phase, and which are in accordance with best practice, would safeguard surface water and groundwater quality, surface water and groundwater flows, and mitigate flood risk. They would ensure that the potential impact of the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS is negligible and thus the significance of effect is **Negligible** and not significant. No additional mitigation is required.

7.10 Cumulative Effects

- 7.10.1 Details are provided in **Section 9.10** of **Volume 1: Chapter 9: Soils, Geology and Water**. The cumulative effects assessment for the Proposed Alignment is equally applicable to the Alternative Alignment, and no significant cumulative effects were identified with any of the projects listed in **Section 9.10** of **Volume 1: Chapter 9**.

7.11 Mitigation

7.11.1 As there are no predicted likely significant effects as defined by the EIA Regulations, other than the good practice measures that the Applicant implement as standard, no specific mitigation is required.

7.12 Residual Effects

7.12.1 No significant residual effects on soils (including peat), geology, surface water or groundwater receptors including designated water dependent sites are predicted during the construction and operation of the Alternative Alignment.

7.13 Summary and Conclusions

7.13.1 Existing soils, geological, hydrogeological and hydrological conditions have been identified and used to assess the potential effects the Alternative Alignment may have on geology, soils and the water environment.

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

7.13.3 Specifically, the assessment has shown, with regard to soils, (including peat), geology and the water environment, that the potential effect of the Alternative Alignment on the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS is negligible and not significant.

A summary of assessed effects and identified mitigation measures required to reduce the potential effects to acceptable levels are identified in **Table V5-9.5**.

Table V5-9.5: Summary of Effects and Proposed Mitigation Measures

Potential Effect	Proposed Mitigation / Enhancements	Resultant Significance of Effect
Construction Phase		
- Adverse effect on carbon rich soils and peat. - Alteration of surface water or groundwater flow. - Impairment of surface water or groundwater quality. - Increase in flood risk. - Adverse effect on water dependent designated sites.	- Mitigation by design - Protection of water supply pipework - Site investigation and use of a geotechnical risk register - Good practice construction techniques - Confirmatory water quality monitoring - Peat Management Plan; and - Landscape scale Outline Habitat Management Plan	Negligible and not significant.
Operational Phase		

Potential Effect	Proposed Mitigation / Enhancements	Resultant Significance of Effect
No additional effects or mitigation / enhancements identified		
Cumulative Effects		
No additional effects or mitigation / enhancements identified		

7.14 References

Refer to **Section 9.14** of **Volume 1: Chapter 9: Soils, Geology and Water**.