VOLUME 2: CHAPTER 11 – GEOLOGICAL ENVIRONMENT

Figures (Volume 3 of this EIA Report)

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11. GEOLOGICAL ENVIRONMENT

11.1 Executive Summary

11.1.1 This chapter describes the assessment of the construction and operation of the Proposed Development on geology, peat and soils (the 'geological environment').

11.1.2 Information for the Proposed Development was compiled through a baseline desk study, which was verified by an extensive programme of fieldwork. The assessment undertaken has considered the sensitivity of key receptors identified during the baseline study and mitigation measures that have been incorporated into the Proposed Development design. In addition, potential future changes to baseline conditions have been considered.

11.1.3 The design of the Proposed Development has been informed by a detailed programme of peat depth probing, consistent with National Planning Framework 4 (NPF4), Policy 5. The route and alignment of the Proposed Development has been designed to avoid areas of significant deep peat, where possible. The assessment of peat and carbon rich soils has considered all proposed infrastructure and the potential associated effects.

11.1.4 **Chapter 4: The Routing Process and Alternatives** details how peatlands were considered and where possible avoided through the routing and alignment stages of the Proposed Development. During the later stages of design, alternative options were evaluated with a focus on tower positions and the placement of ancillary infrastructure, such as access tracks. These considerations were informed by the Phase 1 peat probing survey, which allowed for changes in the design to be made where possible whilst meeting the technical requirements for the construction and operation of the Proposed Development in often remote areas and in challenging terrain. Changes included siting infrastructure away from Class 1 and 2 peatland and deeper areas of peat identified in baseline studies and the Phase 1 Survey. Data collected during peat depth surveys was used to inform micro-siting of infrastructure and to avoid deep peat (>1m) where practicable. Details of peat avoidance methods through design, such as floating tracks, are included in **Volume 5, Appendix 11.2: Outline Peat Management Plan (PMP).**

11.1.5 The scope of the assessment was informed by pre-application advice as well as scoping and consultation responses received during the route, alignment and EIA stages of the Proposed Development.

11.1.6 The assessment is supported by appendices that identify any potential impacts the Proposed Development may have on peat (see **Volume 5, Appendix 11.2: Outline PMP** and peat stability (see **Volume 5, Appendix 11.1: Peat Landslide Hazard and Risk Assessment**).

11.1.7 Subject to the adoption of best practice construction techniques and a site-specific Construction Environmental Management Plan (CEMP), no significant adverse effects on the geological environment have been identified across the Proposed Development.

11.2 Introduction

11.2.1 This chapter evaluates the potential effects of the Proposed Development on the geological environment, based upon a geological assessment of the existing conditions. In addition, this chapter considers the extent of peat across the Proposed Development and assesses peat depth, condition, instability and management.

11.2.2 This assessment identifies areas of geological interest and features of note. The information and data collated from the peat and geological assessments have informed the Proposed Development route and alignment to minimise the potential impacts on peat and geology that may result from the Proposed Development.

11.2.3 Where potential significant effects are predicted, appropriate mitigation measures are proposed and the significance of predicted residual effects are assessed.

11.2.4 This chapter includes the following elements:

- Scope of Assessment and Methodology;
- Baseline Conditions
- Assessment of Effects;
- Cumulative Effects;
- Mitigation;
- Residual Effects; and
- Summary and Conclusions.

11.2.5 This chapter is supported by the following figures:

- **Volume 3, Figure 11.1: Superficial Geology;**
- **Volume 3, Figure 11.2: Bedrock Geology;**
- **Volume 3, Figure 11.3: National Soils Map of Scotland; and**
- **Volume 3, Figure 11.4: Carbon and Peatland Map (2016).**

11.2.6 This chapter also presents a summary of information from the following appendices:

- **Volume 5, Appendix 11.1: Peat Landslide Hazard and Risk Assessment (PLHRA);**
- **Volume 5, Appendix 11.2: Outline Peat Management Plan (Outline PMP);**
- **Volume 5, Appendix 11.3: Peat Carbon Assessment.**

11.2.7 This assessment uses information and findings presented in **Chapter 8: Ecology and Nature Conservation** and **Chapter 10: Water Environment**.

11.2.8 In addition, this chapter refers to the CEMP which will detail all the good construction practice measures and works to be established and effective measures to which the Applicant will be committed through the planning consent. The CEMP will be prepared by the Principal Contractors appointed for the construction on the Proposed Development. An Outline CEMP is included as part of this EIA submission in **Volume 5, Appendix 3.6: Outline CEMP.**

11.3 Scope of Assessment and Methodology

11.3.1 The potential effects of the Proposed Development on the geology and soils environment have been assessed through completion of an initial desk study, followed by a detailed programme of site investigation and an impact assessment across the Proposed Development.

11.3.2 The Study Area[1] includes all aspects of the Proposed Development, as described within **Chapter 3: Description of the Proposed Development**. The Study Area encompasses the area over which all desk-based and field data was gathered to inform the assessment presented in this chapter and geological features

[1] A defined area for the consideration of environmental effects (including direct, indirect and cumulative) on each relevant factor listed under Regulation 4(3) of the EIA Regulations.

which could potentially be affected by the construction and/or operation of the Proposed Development. The Study Area is shown on **Volume 3, Figures 11.1** to **11.4**.

Legislation, Policy and Guidance

11.3.3 Relevant policy and guidance documents have been reviewed and considered as part of this assessment.

Planning Policy

11.3.4 The National Planning Framework 4 (NPF4)[2], adopted by the Scottish Government on 13 February 2023, provides planning guidance and policies regarding sustainable development. The NPF4 outlines how nationally important land use planning matters should be addressed.

11.3.5 Policy 5 within this document details the approach to soils and includes some of the key points relating to development on peatlands:

"*Development proposals on peatland, carbon rich soils and priority peatland habitat will only be supported for*:

- *Essential infrastructure and there is a specific locational need and no other suitable site;*
- *The generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;*
- *Small-scale development directly linked to a rural business, farm or croft;*
- *Supporting a fragile community in a rural or island area; or*
- *Restoration of peatland habitats."*

11.3.6 Where development on peatland, carbon-rich soils or priority peatland habitat is proposed, Policy 5(d) provides that '*...a detailed site specific assessment will be required to identify:*

- *The baseline depth, habitat condition, quality and stability of carbon rich soils;*
- *The likely effects of the development on peatland, including on soil disturbance; and*
- *The likely net effects of the development on climate emissions and loss of carbon."*

"This assessment should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing the site into a functioning peatland system capable of achieving carbon sequestration."

11.3.7 In addition to NPF4, the Highland Council (THC) Highland-wide Local Development Plan (HwLDP)[3] provides planning guidance on the type and location of development that can take place in the region. The LDP presents development polices of which the following are relevant to this study:

- Policy 53: Minerals;
- Policy 55: Peat and Soils;
- Policy 60: Other Important Habitats and Article 10 Features;
- Policy 62: Geo-diversity; and

[2] The Scottish Government (2024) National Planning Framework 4 [Online] Available at: National Planning Framework 4 (National Planning Framework 4 - gov.scot) [Accessed November 2024]

[3] The Highland Council (2012) Highland-wide Local Development Plan [Online] Available at: (https://www.highland.gov.uk/download/downloads/id/1505/highland-wide_local_development_plan.pdf) [Accessed November 2024]

- Policy 69: Electricity Transmission Infrastructure.

Guidance and Standards

11.3.8 The following guidance is relevant to this chapter:

- The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments[4];
- The Scottish Government (2009) The Scottish Soil Framework[5];
- The Scottish Government, NatureScot (formally Scottish Natural Heritage (SNH)), Scottish Environment Protection Agency (SEPA) (2017) Peatland Guidance on Development on Peatland[6];
- The Scottish Office (1996) Planning Advice Note (PAN) 50 – Controlling the Environmental Effects of Surface Mineral Working[7];
- NatureScot (2023) Advising on peatland, carbon-rich soils and priority peatland habitats in development management[8];
- SEPA (2017) Developments on Peat and Off-Site Uses of Waste Peat[9];
- Scottish Renewables & SEPA (2012) Developments on Peatland - Guidance on the assessment of peat volumes, re-use of excavated peat and the minimisation of waste[10];
- Forestry Commission Scotland (FCS) & SNH (2010) Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads[11];
- Forestry Commission (2006) Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads on Peat[12];
- Scottish Renewables, SNH, SEPA, FCS, Historic Environment Scotland, Marine Scotland Science and AEECoW (2019) Good Practice during Windfarm Construction, 4th Edition[13]; and

4 The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments [Online]. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2017/04/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/documents/00517176-pdf/00517176-pdf/govscot%3Adocument/00517176.pdf [Accessed December 2024]

5 The Scottish Government (2009) The Scottish Soil Framework [Online]. Available at: http://www.gov.scot/Publications/2009/05/20145602/0 [Accessed December 2024].

6 Scottish Government, Scottish Natural Heritage, SEPA (2017) Guidance on Developments on Peatland, online version only. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot:document/Guidance+on+developments+on+peatland+-+peatland+survey+-+2017.pdf (www.gov.scot) [Accessed December 2024].

7 The Scottish Office (1996) Planning Advice Note (PAN) 50 – Controlling the Environmental Effects of Surface Mineral Working [Online]. Available at: https://www.gov.scot/publications/planning-advice-note-pan-50-annex-controlling-environmental-effects-surface/documents/ [Accessed December 2024].

8 NatureScot (2023) Advising on peatland, carbon-rich soils and priority peatland habitats in development management. Available at: Advising on peatland, carbon-rich soils and priority peatland habitats in development management | NatureScot [Accessed December 2024].

9 SEPA (2017) Developments on Peat and Off-Site Uses of Waste Peat Available at: wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf [Accessed December 2024].

10 Scottish Renewables & SEPA (2012) Developments on Peatland - Guidance on the assessment of peat volumes, re-use of excavated peat and the minimisation of waste. Available at: Guidance+on+the+assessment+of+peat+volumes%2C+reuse+of+excavated+peat%2C+and+the+minimisation+of+waste.pdf (www.gov.scot) [Accessed December 2024]

11 Forestry Commission Scotland & SNH (2010) Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads. Available at: FCE-SNH-Floating-Roads-on-Peat-report.pdf [Accessed December 2024].

12 Forestry Commission (2006) Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads on Peat Available at: https://www.roadex.org/wp-content/uploads/2014/01/Guidelines-for-the-Risk-Management-of-Peat-Slips.pdf [Accessed December 2024].

13 Scottish Renewables, NatureScot (formally Scottish Natural Heritage (SNH)), SEPA, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science and AEECoW (2019) Good Practice during Windfarm Construction, 4th Edition. Available at: guidance_-_good_practice_during_wind_farm_construction_original.pdf [Accessed December 2024].

- Construction Industry Research and Information Association (CIRIA) (2023) C741 Environmental Good Practice on Site.[14]

Consultation and Scoping

11.3.9 To inform the scope of the assessment for the Proposed Development, consultation was undertaken with statutory and non-statutory bodies through early consultation and a formal EIA scoping process.

11.3.10 Full details of the consultation process and responses are included in **Chapter 6: Scope and Consultation** and associated **Volume 5, Appendix 6.3: Scoping Matrix**. Specific scoping responses, relevant to the geological environment, are provided in **Table 11.1.**

14 CIRIA (2023) Environmental Good Practice on Site Guide (Fifth Edition) [online]. Available at: https://www.ciria.org/ItemDetail?iProductCode=C811D&Category=DOWNLOAD&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91 [Accessed January 2025]

Table 11.1: Scoping Responses and Consultations

Consultee	Type and Date	Summary of Consultation Response	EIA/Design Response to Consultee	EIA Section Addressing Consultation
NatureScot	Scoping Response 05/12/2024	There are sections of the route within The Flow Country World Heritage Site (WHS). THC has produced a toolkit for developers to use in assessments to consider impacts to the WHS. Assessments of impacts to the WHS only need to consider criterion (ix) for peatland ecosystem quality.	The WHS Toolkit has been populated for any areas of the Proposed Development that overlap with The Flow Country WHS. The WHS Toolkit is included in **Volume 5, Appendix 8.10: The Flow Country World Heritage Site (WHS) Impact Assessment Report** and a summary provided in **Chapter 8: Ecology and Nature Conservation**.	Volume 5, Appendix 8.10: The Flow Country World Heritage Site (WHS) Impact Assessment Report
		It is requested that a template, based on an assessment framework on guidelines for the selection of SSSI for bogs, is completed by the applicant. It is also requested that if the development infrastructure (including a 250m buffer) meets the criteria in the template, an additional map is provided showing these locations (e.g. Sphagnum species) in relation to the development. If available, shapefiles showing the location of infrastructure, NVC communities and peat depths should also be supplied to us to aid our assessment at the application stage or before.	The template has been completed as an annex to **Volume 5, Appendix 8.10: The Flow Country World Heritage Site (WHS) Impact Assessment Report.** Shapefiles of the location of infrastructure and peat depths are available and can be supplied.	Volume 5, Appendix 8.10: The Flow Country World Heritage Site (WHS) Impact Assessment Report
RSPB	Scoping Response 04/12/2024	It is recommended that peat depth surveys should be undertaken along all proposed routes to inform the final alignment deviation choices. The results from the peat depth survey should be used to minimise impacts on peat by helping to avoid areas deeper than 0.5m. Horizontal directional drilling through bedrock should be considered for sensitive peatland habitats that cannot be avoided.	Peat depth surveys have been undertaken along all proposed alignments where peat is present. In addition to detailed peat probing at the proposed alignment infrastructure, peat probing was undertaken at 100 m intervals, with typical offsets at 100m either side of the proposed alignment (where practical), to satisfy Phase 1 probing requirements and to allow for micro-siting within the Limit of Deviation (LoD). This is detailed within **Section 11.3** of this chapter as well as the PLHRA and the Outline PMP.	Section 11.3: Scope of Assessment and Methodology, Volume 5, Appendix 11.1: PLHRA and Volume 5, Appendix 11.2: Outline PMP.

Consultee	Type and Date	Summary of Consultation Response	EIA/Design Response to Consultee	EIA Section Addressing Consultation
		Cumulative and In-Combination Impact: At points, the proposed development runs in parallel with existing OHL and the cumulative impact of this and peatland impacts should be considered in the EIA.	There is no anticipated cumulative impact on peat when considering the existing OHL. Cumulative Effects are discussed in **Section 11.6** of this chapter.	Section 11.6: Cumulative Effects
THC	Scoping Response 18/12/2024	The EIAR should include a full assessment on the impact of the development on peat, in line with NPF4, Policy 5. The assessment must include peat probing for all areas where development is proposed but also covering areas of ground subject to micrositing limits / limits of horizontal deviation.	Peat depth surveys have been undertaken along all proposed alignments where peat is present. In addition to detailed peat probing at the proposed alignment infrastructure, peat probing was undertaken at 100 m intervals, with typical offsets at 100m either side of the proposed alignment (where practical), to satisfy Phase 1 probing requirements and to allow for micro-siting within the LoD. This is detailed within **Section 11.3** of this chapter, **Volume 5, Appendix 11.1: PLHRA** and **Volume 5, Appendix 11.2: Outline PMP**. In addition, a Carbon Calculator assessment has been undertaken and included in **Volume 5, Appendix 11.3: Peat Carbon Assessment**	Section 11.3: Scope of Assessment and Methodology, Volume 5, Appendix 11.1: PLHRA, Volume 5, Appendix 11.2: Outline PMP, and Volume 5, Appendix 11.3: Peat Carbon Assessment
		The EIAR should fully describe the likely significant effects of the development on the local geology. Proposals should demonstrate construction practices that help to minimise the use of raw materials and maximise the use of secondary aggregates and recycled or renewable materials. Where borrow pits are proposed the EIAR should include information regarding the location, size and nature of these borrow pits.	The pote significant effects of the Proposed Development on the geology are discussed in **Section 11.5** of this Chapter. Construction practices will be discussed in the CEMP**.** An outline CEMP is included as part of this EIA submission in **Volume 5, Appendix 3.6: Outline CEMP.** Borrow pits are not included as part of this EIA.	Section 11.5: Assessment of Effects and Volume 5, Appendix 3.6: Outline CEMP.
		THC's Contaminated Land officer has highlighted some of the potential concerns along the route. A detailed response will be	Assessment of contaminated land throughout the Proposed Development is included in **Sections 11.4 and 11.5** of this chapter.	Section 11.4: Baseline Conditions and Section

Consultee	Type and Date	Summary of Consultation Response	EIA/Design Response to Consultee	EIA Section Addressing Consultation
		provided once a site layout plan with the red line boundary of the final route is determined. Section A: • Former pits and quarries • Former military use at Crackaig • Sheep wash at Crackaig Section B: • Existing Electricity Substation to the south of Loch Buidhe Section C – No concerns. Section D: • Disused quarries • Former Timber Yard/Sawmill at Achterneed, north of Strathpeffer • Existing Power Stations in the Strath Conon/ Loch Achonachie area. Option E • Torr Achilty Power Station at the head of Loch Achonachie.		11.5: Assessment of Effects
SEPA	Consultation Response 22/12/2023	SEPA Ref:11591 In response to the Peat Probing Consultation Note V2 (dated 22/12/23), SEPA confirmed it was happy with the survey methodology proposed.	A Peat Probing Consultation Note was issued to SEPA to detail the proposed methodology to be undertaken throughout all of the peat surveys. A detailed methodology is included in the Consultation Note, **Volume 5, Appendix 11.1: PLHRA** and **Volume 5, Appendix 11.2: Outline PMP**.	Volume 5, Appendix 11.1: PLHRA, Volume 5, Appendix 11.2: Outline PMP,
	Scoping Response 31/10/2024	The submission should include a series of layout drawings overlain on the following:	The peat depth maps are included in **Volume 5, Appendix 11.1: PLHRA** and **Volume 5, Appendix 11.2: Outline PMP**. The Peatland Condition Mapping is	Volume 5, Appendix 11.1: PLHRA, Volume 5, Appendix 11.2: Outline

Consultee	Type and Date	Summary of Consultation Response	EIA/Design Response to Consultee	EIA Section Addressing Consultation
		a) Peat depth map showing peat probe locations and colours for each depth category; b) Peat depth map showing interpolated peat depths; c) Peatland condition mapping.	included in the **Volume 3, Figure 8.9: Peatland Condition Mapping** and a summary provided in **Chapter 8: Ecology and Nature Conservation.**	PMP, and Volume 3, Figure 8.9: Peatland Condition Mapping.
		Where complete avoidance of peat and carbon rich soils is not possible, it should be clearly demonstrated that the deepest areas of peat have been avoided and the volumes of peat excavated have been reduced, first through layout and then by design making use of techniques such as floating tracks.	Additional data was collected during peat depth surveys to allow for micro-siting of infrastructure and to ensure deep peat (>1 m) is avoided where practicable. Details of peat avoidance methods through design, such as floating tracks, are included in **Volume 5, Appendix 11.2:** Outline **PMP.**	Volume 5, Appendix 11.2: Outline PMP
		The Outline Peat Management Plan (PMP) must include: a) a table that details the volumes of acrotelmic, catotelmic and amorphous peat to be excavated (including contingency factor to consider variables such as bulking and uncertainties in the estimation of peat volumes); b) a table which details the volumes of acrotelmic, catotelmic and amorphous excavated peat used in making good site-specific areas disturbed by development, used in and off site peatland restoration, and disposal (including means of disposal). c) details of temporary peat storage and handling; d) evidence that the re-use of peat is genuine, including evidence of suitability of the peat and that the quantity does not exceed the requirement of the proposed use; e) outline details on off site peat re-use and restoration (refer to NatureScot for planning advice).	The Outline PMP includes details of all peat excavation volumes, restoration and disposal. In addition, the Outline PMP includes details of temporary storage and potential re-use.	Volume 5, Appendix 11.2: Outline PMP
		The submission must include a schedule of mitigation, which includes reference to best practice pollution prevention and	The schedule of mitigation is included within this chapter and **Chapter 19: Schedule of Mitigation.** These will be	Chapter 19: Schedule of Mitigation

Consultee	Type and Date	Summary of Consultation Response	EIA/Design Response to Consultee	EIA Section Addressing Consultation
		construction techniques (e.g. limiting the maximum area to be stripped of soils and peat at any one time)	detailed in the CEMP and undertaken by the appointed Principal Contractors.	

Potential Impacts Assessed in Full

11.3.11 The following effects on soils, peat and geology related to the Proposed Development are considered within this chapter due to the potential for significant effects as agreed during the consultation and scoping process:

- Potential effects relating to the disturbance of peat and the subsequent effects from excavated peat and management of peat and peaty soils;
- Potential effects relating to peat instability and peat slide risk;
- Potential effects relating to the loss and compaction of peat and soils;
- Potential effects relating to geological statutory designations;
- Potential effects relating to the interaction with potential contaminated land associated with former land uses; and
- Potential effects relating to the cumulative impact during construction and operation.

11.3.12 The key sensitive receptors identified within this assessment are:

- Highly sensitive soil types and associated land use (e.g. peat and blanket bog);
- Highly sensitive peat soils where peat depth is greater than 1 m;
- Class 1 or 2 priority peatland, carbon-rich and peaty soils (as there are sections of Class 1 and 2 peatlands within the Proposed Development); and
- Areas containing geological or geomorphological features considered to be of national importance (e.g., geological Sites of Special Scientific Interest (SSSIs)).

11.3.13 In addition, potential impacts of the Proposed Development on peatland have been assessed in terms of peat stability and management within the PLHRA and the Outline PMP. The PLHRA and Outline PMP are included in **Volume 5, Appendix 11.1: PLHRA** and **Volume 5, Appendix 11.2: Outline PMP** respectively.

11.3.14 **Volume 5, Appendix 11.3: Peat Carbon Assessment** presents information on the estimated change in the peat carbon storage (the total quantity of carbon stored within the peatland) of the peatland impacted by the Proposed Development. This information is determined using the bespoke methodology and Peat Carbon Calculator developed by WSP for use within the EIAs of SSEN Transmission's ASTi Projects. This calculator utilises, with appropriate adjustments to reflect the Proposed Development type, formulas and co-efficients used in the Scottish Government's Carbon Calculator Tool for Wind Farm Developments on Peatlands[15] and the Peatland Carbon Code Emission Calculator[16]. It takes into account the area, average depth, carbon content, and bulk density of the peat within the LoD of the Proposed Development to establish a baseline peat carbon storage value, and then considers the area and depth of the peat likely to be directly impacted, indirectly impacted and restored during the Proposed Development to assess the potential impact of the Proposed Development on peat carbon storage.

11.3.15 Overall, the Proposed Development is predicted to have a negligible adverse impact on peat carbon storage, predominantly due to potential indirect impacts on hydrological connectivity, and direct impacts from temporary infrastructure. It is noted in the assessment that the results reflect a realistic worst-case scenario where a total carbon loss is assumed for the temporary infrastructure and 25% carbon loss is assumed for the indirect

[15] Scottish Government: Carbon Calculator Tool available at Carbon calculator for wind farms on Scottish peatlands: factsheet - Avaliable at: Carbon calculator for wind farms on Scottish peatlands: factsheet - gov.scot [Accessed March 2025]

[16] IUCN UK Peatland Programme (2023) Peatland Code Emissions Calculator Guidance (Version 2, March 2023). Available at: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.iucn-uk-peatlandprogramme.org%2Fsites%2Fdefault%2Ffiles%2Fheader-images%2FPC_Bog%2520Emissions%2520Calculator_v2%2520-%2520locked.xlsx&wdOrigin=BROWSELINK [Accessed March 2025]

impacts, whereas in reality, complete peat excavation may not be needed for temporary infrastructure, and indirect impacts should be mitigated through best practice measures and will lessen in magnitude the further away the peat is from the infrastructure locations. The calculations demonstrate that direct impacts from permanent infrastructure are likely to have a negligible adverse impact on peat carbon storage, and these impacts are almost entirely mitigated by peat restoration and reuse to redress the infrastructure locations. Further details on these results, the methodology used, and the specific impact of the Proposed Development on peat carbon storage within The Flow Country WHS are provided in **Volume 5, Appendix 11.3: Peat Carbon Assessment**.

Issues Scoped Out of Assessment

11.3.16 Risks relating to historic coal mining activities have been scoped out of the assessment due to the absence of recorded coal mining in the area. No other issues have been excluded from the geological environment assessment.

Desk Study

11.3.17 A review of baseline data has been undertaken using publicly available information and open-source data from a range of sources to evaluate potential short- and long-term impacts that the Proposed Development may have on the geological environment.

11.3.18 The data review included:

- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping;
- NatureScot (formerly Scottish National Heritage (SNH)) SiteLink[17];
- British Geological Survey (BGS) Onshore GeoIndex[18] 1:50,000 scale mapping for bedrock and superficial geology, 1:625,000 for hydrogeology;
- Natural England MAGIC map online viewer[19];
- Scotland's Environment web-based maps[20];
- NatureScot (formerly SNH) Carbon and Peatland 2016 Map[21];
- James Hutton Institute, The National Soils Map of Scotland (1:250,000)[22];
- The Coal Authority Interactive Map[23];
- Zetica Unexploded Ordnance (UXO) Desk Study & Constraints Assessment[24];
- The Highland Council (THC) Minerals Audit Map[25];
- UK Health Security Agency UK Radon Map[26]; and

17 Nature Scot SiteLink. Available at: SiteLink - Home [Accessed November 2024]
18 British Geological Survey GeoIndex (onshore) Available at https://www.bgs.ac.uk/map-viewers/geoindex-onshore/Accessed November 2024]
19 Natural England MAGIC Map Available at: https://magic.defra.gov.uk/ [Accessed November 2024]
20 Scotland's Environment (various) Scotland's Environment Web Map. Available at: https://www.environment.gov.scot/ [Accessed November 2024]
21 Scottish Natural Heritage, Carbon Peatland Map 2016. Available at: Carbon and peatland 2016 map | Scotland's soils [Accessed November 2024]
22 James Hutton Institute, National soil map of Scotland. Available at: https://soils.environment.gov.scot/maps/ [Accessed November 2024]
23 Coal Authority Interactive Map (2024). Available at: Mining Remediation Authority Map Viewer [Accessed November 2024]. This document was considered as part of the scoping exercise and as noted previously, risks relating to coal mining activities have since been scoped out.
24 Zetica UXO (2024). Available at: Risk Maps | Zetica UXO [Accessed November 2024]
25 The Highland Council (THC) Highland Minerals Audit Map. Available at: https://www.arcgis.com/apps/mapviewer/index.html?webmap=e8a634563bec4428ae6c5a7360bcdd44 [Accessed November 2024]
26 UK Health Security Agency (2024) UK Radon Map, available at: https://www.ukradon.org/information/ukmaps [Accessed November 2024]

- National Library of Scotland Historical Maps[27].

Fieldwork

11.3.19 The information collected during the desk-based review was supported and validated by a series of detailed site walkovers and peat depth assessments. The information and observations have been reviewed in the context of the Proposed Development to evaluate both short- and long-term impacts on the geological environment.

11.3.20 The fieldwork has been undertaken to:

- Verify the information collected during the desk and baseline study;
- Undertake a visual assessment of the site and main geological features;
- Inspect rock exposures;
- Determine the depths of peat across the site and the associated stability;
- Assess the geomorphology and ground conditions across the Proposed Development;
- Confirm the underlying substrate based on the type of refusal encountered during peat probing and from Substrate exposures across the Proposed Development; and
- Assess the relative location of all the components of the Proposed Development and access routes.

Peat Probing Surveys

11.3.21 Prior to the peat probing surveys, a Peat Probing Technical Note[28] was issued to SEPA which included an initial desk study and ground truthing exercise which was undertaken to determine any high sensitivity areas and the presence of peat. The ground truthing aimed to determine whether certain areas required probing based on the presence or absence of peat. Areas that are used for grazing or have no peat forming vegetation were excluded from the peat probing survey, whilst any areas with noticeable peat or peat forming vegetation were targeted for surveying (in addition to the areas identified as requiring probing in the initial desk study[28]).The proposed peat probing methodology detailed within the Peat Probing Technical Note[28] was approved by SEPA and undertaken as follows:

- Areas of peat identified during the desk study and ground truthing exercise were probed at 100 m intervals, with typical offsets at 100 m on either side of the Proposed Alignment (where practical in relation to local ground conditions and surface water)) to satisfy Phase 1 probing requirements and to cover the LoD.
- At proposed transmission tower locations, peat data was collected over a crosshair of 100 m x 100 m from the centre point of the proposed tower with probes at 10 m centres to provide peat depth information at proposed tower bases with allowance for potential micro-siting.
- Proposed tracks were probed at 50 m intervals with offsets at 10 - 25 m on either side of the proposed track. A further probe at a 50 m offset from the proposed track centreline was undertaken to inform access track site selection and to identify any areas of shallower peat. This includes proposed tracks in cut or fill, tracks to be floated and upgrades to existing tracks, although centreline probes were not undertaken along existing tracks.
- All other Site infrastructure, including construction compounds, was probed using a 10 m x 10 m grid.

11.3.22 Based on an initial alignment design and the ground truthing exercise, targeted peat probing was undertaken using this methodology between March 2024 and February 2025.

[27] National Library of Scotland (2025) Historic Maps Side by Side Viewer. Available at: https://maps.nls.uk/geo/explore/side-by-side/#zoom=5.0&lat=56.00000&lon=-4.00000&layers=1&right=ESRIWorld [Accessed January 2025].
[28] ERM (December 2023) Spittal – Loch Buidhe – Beauly OHL Peat Probing Consultation Note.

11.3.23 Data collected during peat probing surveys was used in the consideration of alternative alignment options in the later stages of the design. Changes were made where possible whilst meeting the technical requirements for the construction and operation of the Proposed Development including siting infrastructure away from Class 1 and 2 peatland and deeper areas of peat. In addition, data from peat probing surveys informs the micro-siting of infrastructure and to ensure deep peat (>1 m) is avoided where practicable. Details of peat avoidance methods through design, such as floating tracks, are included in **Volume 5, Appendix 11.2: Outline PMP.**

11.3.24 The peat probing surveys consisted of 17,371 points across all sections of the Proposed Development. Peat is present across all sections of the Proposed Development with depths ranging from 0.01 m to 7.5 m. Notable areas of deep (>1.0 m in depth) and continuous peat (> 1.0 km along the Proposed Alignment) are present in Sections A (between Towers N13 to N35 and N129 to N139), Section B (between Towers N246 to N251), Section C (between Towers S15 to S17) and in Section D (between Towers S63 to S71). In addition to these areas of continuous deep peat, isolated pockets of deep peat occur throughout all Sections, defined by topography.

11.3.25 **Table 11.2** gives a summary of the peat probing survey data from across all sections of the Proposed Development. A more detailed description and analysis of the peat probing data can be found in **Volume 5, Appendix 11.1: PLHRA.**

Table 11.2: Summary of Peat Probing Survey across All Sections.

Section	Total Peat Probes	Peat Depth Range (m)	Average Peat Depth (m)	Percentage (%) of peat probe points with deep peat (>1.0 m)
A	8253	0.01 – 7.5 m	0.8	23.79%
B	4279	0.01 – 7.5 m	0.59	18.6%
C	1749	0.01 -6 m	0.66	21.79%
D	1774	0.01 -5 m	0.87	31.47%
E	1316	0.01 – 6.4 m	0.48	13.53%

11.3.26 It should be noted that the PLHRA and Outline PMP were based on the findings of all phases of probing. Details of these assessments are included in **Volume 5, Appendix 11.1: PLHRA** and **Volume 5, Appendix 11.2: Outline PMP** respectively.

11.3.27 Where practicable and using the LoD, micro-siting at tower locations will be reviewed during the construction process to avoid areas of deep peat (>1m) and further minimise peat disturbance.

11.3.28 The desk study and field surveys have been used to identify potential development constraints and to inform the design of the Proposed Development.

Methodology for the Assessment of Effects

11.3.29 The assessment of effects is based on the Proposed Development design detailed in **Chapter 3: Description of the Proposed Development**. The assessment considers the sensitivity of the receptor and the potential magnitude of impact in order to conclude whether the effect is significant.

Sensitivity of Receptors

11.3.30 The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Proposed Development or the sensitivity of potentially affected receptors, was assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

11.3.31 **Table 11.3** details the framework for determining the sensitivity of receptors.

Table 11.3: Framework for Determining the Sensitivity of Receptors

Sensitivity of Receptor	Definition
High	Soil type and associated land use are highly sensitive (e.g., unmodified peatland/blanket bog); Class 1 or 2 priority peatland, carbon-rich and peaty soils cover >20% of the development area; Areas containing geological or geomorphological features considered to be of national or international importance (e.g., geological SSSIs, Special Areas of Conservation (SAC); and Receptor contains areas of regionally important economic mineral deposits.
Medium	Soil type and associated land use are moderately sensitive (e.g., commercial forestry); Class 1 or 2 priority peatland, carbon-rich and peaty soils cover <20% of the development Area; Class 3 and 5 peatland areas, carbon rich and peaty soils; Receptor contains areas of locally important economic mineral deposits; and Areas containing geological features of designated regional importance including Regionally Important Geological/Geomorphological Sites (RIGS), considered worthy of protection for their historic or aesthetic importance.
Low	Geological features or geology not protected and not considered worthy of specific protection; Soil type and associated land use not sensitive to change in hydrological regime (e.g., intensive grazing); and Receptor contains Class -2, -1, 0, and 4 non-peatland areas, with no carbon-rich and/or peaty soils.
Negligible	The receptor is resistant to change and is of little environmental value.

Magnitude of Impact

11.3.32 The potential magnitude of impact would depend upon whether the potential impact would cause a fundamental, material or detectable change. In addition, the timing, scale, size and duration of the potential impact resulting from the Proposed Development are also determining factors.

11.3.33 The magnitude of impact was identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

11.3.34 The criteria for assessing the magnitude of impact are presented in **Table 11.4.**

Table 11.4: Framework for determining the magnitude of impact

Impact Magnitude	Definition
High	Major or total loss of or alteration to peatland resource such that post development characteristics or quality will be fundamentally or irreversibly changed; Long term/permanent change to human or environmental health; Catastrophic failure of site infrastructure due to ground instability; Long term/permanent change to baseline resource; and Major or total loss of a geological site or mineral deposit, where the value of the site would be severely affected.

Impact Magnitude	Definition
Medium	Loss of, or alteration to the baseline resource such that post development characteristics or quality will be partially changed; Mid-term/permanent change to human or environmental health; Ground failure that requires remediation but does not cause catastrophic failure of site infrastructure; Mid-term/permanent change to baseline resource; and Partial loss of a geological site or mineral deposit, with major effects to the settings, or where the value of the site would be affected.
Low	Small loss of soils or peatland, or where soils will be disturbed but the value not impacted; Short-term change to human or environmental health; Ground settlement/subsidence that does not adversely affect site infrastructure or require remedial action; Short-term change to baseline resource; and Small effect on a geological site or mineral deposit, such that the value of the site would not be affected.
Negligible	Minimal or no change to soils or peatland deposits; Minimal or no change to human or environmental health; Minimal or no change to ground stability; A very slight change from the baseline conditions. The change is barely distinguishable, and approximates to the 'no-change' situation; and Minimal or no change to a geological site or mineral deposit.

Significance of Effect

11.3.35 The significance of the effects of the Proposed Development have been assessed by considering the sensitivity of the receiving environment and the potential magnitude of impact, should that effect occur.

11.3.36 This approach allows for identification of the areas where mitigation measures are required and for the identification of mitigation measures appropriate to the significance of potential effects presented by the Proposed Development.

11.3.37 The sensitivity of the receptors and the predicted magnitude of impact was used as a guide, in addition to professional judgement, to predict the significance of the potential effects.

11.3.38 **Table** 11.5 summarises guideline criteria for assessing the Significance of Effects.

Table 11.5: Framework for Assessment of the Significance of Effects

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

11.3.39 Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations.

Limitations of the Assessment

11.3.40 A variety of sources and information have been consulted to provide an understanding of the Study Area, including survey data, publicly available data sources, commercial data supply companies and additional information supplied from stakeholders during the scoping and consultation stages.

11.3.41 Targeted peat probing was completed based on the results of the ground truthing exercise undertaken across the Proposed Development. From review of desk study sources, confirmed by initial site walkovers, areas with no evidence of peat or peat forming vegetation were discounted from targeted probing. To justify this assessment approach, peat probing was undertaken in a section of the alignment that was determined as not requiring probing to confirm the absence or presence of peat and to verify the accuracy of the ground truthing exercise. Full details of this assessment are explained above, by reference to the Peat Probing Technical Note[28].

11.3.42 In addition, the desk-based assessments used large scale mapping which does not necessarily include the localised environment and minor variations in ground conditions. Therefore, the field surveys were completed to fully inform the occurrence and condition of soils and geology across the Study Area.

11.3.43 It is considered that the data and information used to complete this assessment is robust and that there are no significant data gaps or limitations.

Mitigation

Embedded Mitigation

11.3.44 Embedded mitigation or primary mitigation, based on the IEMA Guidance[29], is inherent to the Proposed Development and has involved the incorporation of environmental considerations directly into the initial planning, design and routing.

11.3.45 The impact assessment and embedded mitigation process has been iterative and mitigation has developed to allow the design to be as specific as possible and as an assumed part of the Proposed Development and associated infrastructure. This process has included, for example, using existing access tracks where possible, and the siting of infrastructure to avoid sensitive geological and soil areas, other than where these are unavoidable such as extensive areas of peat.

11.3.46 **Chapter 4: The Routing Process and Alternatives** details how peatlands were avoided through the route and alignment stages of the Proposed Development. During the later stages of design, alternative options were evaluated with a focus on tower positions and the placement of ancillary infrastructure, such as access tracks.

11.3.47 **Chapter 3: Description of the Proposed Development** and **Chapter 19: Schedule of Mitigation** provides further details of the mitigation embedded into the design of the Proposed Development, avoiding key environmental constraints and limiting the impacts on the geological environment. This is as well as taking cognisance of hydrological and ecological features and associated buffers.

11.3.48 In addition to the careful design and routing process, the Proposed Development will be constructed in accordance with good practice guidelines. This includes UK and Scottish guidance on good practice for construction of infrastructure projects, to minimise disturbance and pollution during the construction phase.

[29] Implementing the Mitigation Hierarchy from Concept to Construction – Institute of Environmental Management and Assessment (IEMA) Impact Assessment Guidelines (2024) [Online] Available at: iema-mitigation-in-eia-guidance-final.pdf [Accessed January 2025]

These are established and effective measures to which the applicant will be committed to throughout the duration of the Proposed Development. These measures, based on established technical guidance, are outlined below.

General Environmental Management Plans

11.3.49 A series of General Environmental Management Plans (GEMPs) has been developed by the Applicant (see **Volume 5, Appendix 3.3**) to address general compliance requirements that will be adhered to throughout the Proposed Development. The most relevant GEMPs that will be consulted in relation to the geological environment include:

- Soil Management;
- Working in Sensitive Habitats;
- Contaminated Land; and
- Restoration.

Construction Environmental Management Plan

11.3.50 The CEMP will be prepared for the Proposed Development and used by the appointed Principal Contractors throughout the construction phase. This document will detail established best practices and effective measures that the Applicant is committed to implementing as part of the planning consent.

11.3.51 The main purpose of the CEMP is to provide details on the proposed infrastructure while ensuring that environmental impacts during construction are avoided, minimised, and controlled. Additionally, it will define good construction practices and outline specific actions required to implement mitigation measures identified in this EIA Report, the planning process, and other relevant licensing or consenting procedures.

11.3.52 The CEMP will be updated during the pre-construction phase and will be incorporated into the contractual documents between the Applicant and the appointed Principal Contractors. The CEMP will also detail measures to ensure that the works minimise the impact on peat, soils and the geological environment. It is expected that the measures outlined below will be included in the CEMP and would ensure the works are undertaken in accordance with good practice guidance. An outline CEMP is included as part of this EIA submission in **Volume 5, Appendix 3.6: Outline CEMP**.

11.3.53 The CEMP will include a construction phase PMP, which will serve as a working document throughout all key phases of the Proposed Alignment, including design, construction, operation, and reinstatement. As an integral part of the CEMP, the PMP will guide best practices for peatland management to ensure environmental protection and sustainability at every stage of the Proposed Development. The Outline PMP is included as part of this EIA Report in **Volume 5, Appendix 11.2: Outline PMP.**

Geology, Peat and Soils

11.3.54 It is expected that the following good construction practice and methodologies will be included within the CEMP, as appropriate, to minimise geological impact and prevent peat instability within areas that contain peat deposits:

- Measures to ensure well-maintained drainage systems, including the identification of any areas of sensitive drainage or hydrology in construction areas;
- Developing robust drainage systems that would require minimal maintenance and that would avoid creating areas of concentrated flow that may lead to over or undersaturation of peatland;
- Minimisation of ‘undercutting’ peat slopes and if this is necessary, a more detailed assessment (including geotechnical assessment) of the targeted area would be required;

- Ensuring construction site staff are aware of potential peat stability issues by incorporating the issue in the site induction to be undertaken (e.g. peat instability indicators and good construction practice);
- Developing methodologies to prevent degradation and erosion of exposed peat deposits to minimise effects on peat morphology and associated hydrology. This includes limiting vehicle movements on untracked ground to reduce the impact on areas of peat, reducing surface cover loss, soil compaction and impacts on areas of peat or areas with softer drift deposits / soils and steeper slopes;
- The removal and off-site disposal of soils would be avoided where possible and particularly where soils hold environmental or ecological value (e.g. peat) and agricultural productivity. Soils are to be used for reinstatement and/or restoration following construction; and
- The implementation of best practice methods for soil handling and storage. This will be required in order to preserve soil structure and texture, and to avoid compaction within sensitive locations.

Geological Designated Sites

11.3.55 In areas where geological statutory designated sites are present, it is anticipated that additional construction measures will be implemented and detailed within the CEMP. Micro-siting within the LoD will be undertaken to ensure the designated features are not significantly impacted by the Proposed Development, both prior to and during the construction phase based on the localised ground conditions encountered. In regards to solid geology, supervision may be required by a a suitably qualified and experienced Clerk of Works during the construction phase to identify any qualifying features related to the designated site.

Geotechnical Stability

11.3.56 Earth cutting along steep slopes will be avoided where possible to reduce any impact on slope stability and the potential for peat slides. Suitable engineering works will be undertaken, where required, to ensure the stability of the slope is maintained in areas prone to slides.

Contaminated Land

- Prior to commencing construction works, an onsite assessment will be made by the Principal Contractors on the potential for contamination to be present based on site-specific information regarding potentially contaminated sites;
- Where such investigations identify potentially contaminated land, strategies for mitigation or remediation of the land would be developed and agreed with the regulatory authorities (SEPA and the local authorities) and implemented prior to construction in these locations; and
- Where evidence of previously unidentified contamination is encountered during construction, appropriate investigation and remedial measures will be developed and implemented by the Principal Contractors in accordance with relevant legislation and regulatory requirements to prevent pollution of environmental receptors and / or risk to human health.

Access Tracks

- In general, proposed construction site access will be taken via the existing public road network and would make use of existing forest and estate tracks as far as practicable, upgraded as required, to avoid unnecessary disturbance to peat soils that may arise from the construction of new tracks. More details on how the Proposed Development will utilise existing infrastructure is detailed in **Chapter 3: Description of the Proposed Development.**
- The majority of access will be achieved through upgrade of existing and installation of new tracks. Floating stone roads may be installed in sensitive areas such as over deeper areas of peat (>1 m), where possible. Any floating tracks would be installed with reference to NatureScot (formerly SNH), FCS guide on the Good Practice Guide for the Use of Floating Roads on Peat[11]. All new tracks would be constructed in accordance

with best practice construction methods, and with reference to NatureScot's good practice guide: Constructed tracks in Scottish Uplands[30].

- It is assumed that the access across the Proposed Development will be via the permanent proposed track infrastructure, suitably constructed to account for the low volume of maintenance traffic. Minimal traffic is anticipated during the operational phase of the Proposed Development, and it is assumed that all vehicles will only drive on the permanent access tracks. It is not anticipated that vehicles will require off-road access which could potentially impact soils and peatland.

Pollution Prevention

- Water will be prevented, as far as practicable, from entering excavations such as cable trenches and foundations. It is anticipated that additional pollution prevention and will be implemented and detailed within the CEMP.
- Procedures will be adhered to for storage of fuels and other potentially contaminative materials in line with the Controlled Activity Regulations, to minimise the potential for accidental spillage; and
- A detailed Emergency Plan will be implemented for dealing with spillage incidents, and this will be adhered to should any incident occur, reducing the effect as far as practicable. This will be included in the CEMP for the Proposed Development.

Management Felling

- The indirect impact of management felling on peat is likely to be limited to access tracks. Given that the proposed location of the access tracks is unknown at this stage, no targeted peat probing can be undertaken and the impact on peat and soils cannot be assessed fully. Best practice guidance detailed within the CEMP should be implemented to limit any potential effects.
- Management felling would require agreement from the landowner and would be delivered under a felling permission to be applied for by the landowner. More details on management felling are presented in **Chapter 5: EIA Process and Methodology** and **Chapter 13: Forestry**.

Adverse Weather Protocol

11.3.57 Where adverse weather occurs or is forecast best practise contained within the Bad Weather GEMP will be followed. Toolbox talks would be given to engineering, construction and supervising staff, and inspection and maintenance regimes relating to sediments and runoff control would be adopted during these scenarios. In extreme conditions, work on-site may have to be temporarily suspended until weather/ground conditions are acceptable.

Outline Peat Management Plan

11.3.58 Embedded mitigation and best practice measures will be implemented in accordance with the peat excavation, reuse, restoration potential, storage, handling, transportation and waste management and are detailed in paragraph 6.1.6 to 6.1.16 of **Volume 5, Appendix 11.2: Outline PMP.**

Additional Mitigation

11.3.59 Additional mitigation is foreseeable mitigation that requires further action to achieve the desired outcome. Where further avoidance or prevention of impacts on the geological environment is not achievable, additional mitigation measures will be implemented to address any residual effects. Additional mitigation measures will be

[30] Scottish Natural Heritage (SNH) Constructed tracks in the Scottish Uplands (2015) [Online] Available at: Constructed tracks in the Scottish Uplands https://cairngorms.co.uk/wp-content/uploads/2019/09/CD039-Scottish-Natural-Heritage-Constructed-tracks-in-the-Scottish-Uplands-2015.pdf [Accessed December 2024]

implemented in response to unexpected findings during pre-construction surveys or ground investigation. These measures should be informed by the Principal Contractors or a geotechnical specialist and tailored to the specific characteristics of the Site. Additional mitigation measures may include but are not limited to;

- Micro-siting of towers and tracks away from identified pockets of deep peat;
- Use of floating tracks where track construction in areas of peat deeper than 1.0 m cannot be avoided; and
- Reuse of peat and topsoil that is removed from in situ conditions in other areas of the Proposed Development.

11.4 Baseline Conditions

11.4.1 This section of the chapter outlines the present conditions which form the existing and future baseline environment for geology and soils within the Study Area. For the full description of the Proposed Development and the proposed works relevant to each of the five sections, refer to **Chapter 3: Description of the Proposed Development. Volume 3, Figures 11.1 to 11.4** display the tower locations in relation to available baseline mapping resources to support this chapter.

11.4.2 A summary of tower numbers appliable to each section is provided below:

- Section A – Spittal to Brora: Tower N1 to N201
- Section B – Brora to Loch Buidhe: Tower N202 to N297
- Section C – Loch Buidhe to Dounie: Tower S1 to S37
- Section D – Dounie to Near Strathpeffer: Tower N38 to N148
- Section E – Near Strathpeffer to Beauly: Tower N149 to N232

Section A – Spittal to Brora

11.4.3 Review of the NatureScot SiteLink[17] indicates there are several statutory designations within Section A of the Study Area, including SSSI, SAC, Special Protection Areas (SPA), Geological Conservation Review (GCR) Sites and Ramsar Sites. The designations related to geology, soils and peat within Section A are detailed in **Table 11.6** below:

Table 11.6: Designated Sites in Section A

Designated Site	Designation	Approximate Area (ha)	Description
Banniskirk Quarry	SSSI, GCR	5	Silurian – Devonian Chordata
Caithness and Sutherland Peatlands	SAC, Ramsar, SPA	145961	Blanket Bog
Shielton Peatlands	SSSI SPA, Ramsar, SAC (Caithness and Sutherland Peatlands)	5632	Blanket Bog
Dunbeath Water	SSSI	562	Quaternary of Scotland

11.4.4 The SSSI Shielton Peatlands is also a designated SAC named the Caithness and Sutherland Peatlands which forms part of The Flow Country WHS.

11.4.5 The Flow Country was inscribed on the World Heritage List to the United Nations Educational, Scientific and Cultural Organisation (UNESCO) as of July 2024. The WHS is recognised as being one of the largest and most intact blanket bog systems in the world.

11.4.6 An additional impact assessment of the Proposed Development on the WHS has been undertaken and findings presented in **Chapter 8: Ecology and Nature Conservation** and **Volume 5, Appendix 8.10: Flow Country World Heritage Site (WHS) Impact Assessment Report**. In addition, the THC has produced a toolkit for developers to use in assessments to consider impacts to the WHS. The WHS Toolkit has been populated as an annex to **Volume 5, Appendix 8.10: The Flow Country World Heritage Site (WHS) Impact Assessment Report**.

Land Use, Topography and Slope

11.4.7 The predominant land uses within Section A of the Proposed Development are open undeveloped moorland and commercial forestry. Section A also crosses agricultural land and several public and private roads/tracks. Section A overlaps with the eastern extents of Halsary Wind Farm from proposed Towers N21 to N23 and there is a railway at Marrel situated between proposed Towers N148 and N149. In addition, there are several residential properties adjacent to Section A of the Proposed Development, predominantly in the northern areas.

11.4.8 Furthermore, Section A of the Proposed Development crosses a series of watercourses including the Dunbeath Water, Berriedale Water, Langwell Water, River Helmsdale and Loth Burn. The majority of the larger watercourses throughout Section A flow eastwards and are ultimately drained into the North Sea to the east of the Proposed Development. In addition, there are various minor watercourses and tributaries throughout Section A of the Proposed Development.

11.4.9 OS mapping indicates that ground elevations within Section A of the Proposed Development vary between 20 m and 380 m AOD. The lowest elevations are associated with the banks of watercourses and the highest elevation is associated with the hills near Glen Sletdale.

11.4.10 In areas with significant slopes, there is an increased risk to the superficial geology and the composition and extent of the overlying soils may affect the stability of the slopes. The majority of Section A of the Proposed Development is situated across flat expanses and gentle slopes. Steep slopes are present locally throughout Section A, predominantly associated with undulating hills, steep valleys and watercourses. In the northern area of the Proposed Development, steep slopes are present associated with the western flanks of Ben-a-chielt, the eastern flanks of Beinn nan Coireag and the hill sides adjacent to the Berriedale Water. In the central and southern areas of Section A of the Proposed Development, steep slopes are present adjacent to the Langwell Water, on the flanks of the undulating hills situated to the north and west of Helmsdale, and at Glen Loth.

Soils

11.4.11 The 1:250,000 National Soil Map of Scotland[22] indicates that there are a range of soil types recorded across Section A of the Study Area:

- Mineral Gleys;
- Dystrophic Blanket Peat;
- Peaty Gleys;
- Peaty Gleyed Podzols;
- Brown Soils; and
- Mineral Podzols.

11.4.12 The majority of Section A of the Study Area is underlain by peaty gleys, peaty podzols and blanket peat. Peat deposits are predominantly mapped across the northern and central areas of Section A. Brown soils and mineral podzols are situated across steeper slopes and hillsides.

11.4.13 The following is a summary of the information on soil units within Scotland's Soils, Scotland's Environment Website. **Volume 3, Figure 11.3** includes an extract from the 'National Soils Map of Scotland'.

11.4.14 When evaluating a soil profile, the soil is divided into different horizons. There are six major horizons that define the different layers of the soil, the O, A, E, B, C, and R horizons which are defined as follows:

- O Horizon: This layer is made up of organic matter.
- A Horizon: This layer is the topsoil, made up of a combination of organic matter and mineral material.
- E Horizon: This layer consists mostly of mineral particles that cannot be leached away. This horizon is often found in older, undisturbed soils.
- B Horizon: This layer is the subsoil layer, formed of leached materials, minerals and salts.
- C Horizon: This layer is the parent material layer, this layer would have been formed from the earth's surface deposits.
- R Horizon: This layer is the bedrock.

11.4.15 In addition to the layers above, letters can be added to these horizons to indicate any special features that the horizon may show. These suffixes are detailed in **Table 11.7**.

Table 11.7: Suffixes of Soil Horizons

Suffix	Definition	Suffix	Definition
a	Highly decomposed organic matter	o	Accumulation of oxides of iron and aluminium
b	Buried horizon	p	Plowing or other anthropogenic disturbance
c	Concretions or hard nodules (iron, aluminium, manganese, or titanium)	q	Accumulation of silica
e	Organic matter of intermediate decomposition	r	Weathered or soft bedrock
f	Frozen soil	s	Accumulation of metal oxides and organic matter
g	Grey colour with strong mottling and poor drainage	t	Accumulation of clay
h	Accumulation of organic matter	v	Plinthite (hard, iron-enriched subsoil material)
j	Slightly decomposed organic matter	w	Development of colour or structure
k	Accumulation of carbonate	x	Fragipan character (high-density, brittle)
m	Cementation or induration	y	Accumulation of gypsum
n	Accumulation of sodium	z	Accumulation of salts

11.4.16 A brief description of the characteristics and formation of component soil groupings is detailed below. These are described by Scotland's Soils Map but do not include information on depths or engineering properties:

- Peaty Gleys: "*which have no free calcium carbonate in the upper horizons of the profile. There is often a gleyed pale grey Eg horizon below an organic O horizon (which is less than 50cm thick). Below the Eg there are gleyed subsoil horizons (Bg and Cg). Where the gleying is more intense in the Bg horizon than the Cg, then the soils are generally more affected by poor drainage of surface water but in those soils where the Cg is more intensely gleyed (grey and bluish grey colours can be present), then the soils are more likely to be affected by fluctuating groundwater*";
- Peaty Podzols: "*which have an organic surface layer (O or H horizon) up to 50cm thick overlying a grey, leached E Horizon. There may be a dark brown to black Bh horizon where translocated organic matter has*

accumulated and a strong brown sesquioxide-rich Bs or a combination of both (Bhs). Some peaty podzols may have some degree of waterlogging, generally in the lower horizons resulting in weak gleying with ochreous mottling and grey patches."

Carbon-rich Soils, Deep Peat and Priority Peatland Habitats

11.4.17 Peat is defined as the partially decomposed carbon-rich remains of plant and soil organisms which have accumulated at the surface of the soil profile. Peat is typically dark brown or black in colour and typically forms in anaerobic, waterlogged conditions which prevent plant material from fully decomposing. Peat ultimately forms when the accumulation of organic material exceeds the rate of decomposition. Peat is classed as greater than 0.5 m and any peat deposits less than 0.5m deep are too thin to be classified as true peat deposits and instead would be referred to as peaty or organic soils.

11.4.18 There are two distinct layers within a peat profile:

- Acrotelm is the upper fibrous surface layer which contains plant roots and is relatively dry. Acrotelmic peat is typically less than 0.5 m thick, generally situated above the groundwater table and has some tensile strength; and
- Catotelm is the lower layer of peat which typically has a very high water content. Catotelm generally lies below the ground water table and has a very low tensile strength.

11.4.19 Deep peat is defined as a surface layer of peat soil greater than 1.0 m deep by the Scottish Government (Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments[4]).

11.4.20 Peat depth surveys were carried out to determine the extent and depth of the peat present across the Study Area. The results from these surveys are summarised in **Section 11.3** of this chapter and detailed in full in **Volume 5, Appendix 11.1: PLHRA** and **Volume 5, Appendix 11.2: Outline PMP.** These appendices provide Site-specific peat depth information which informed the design of the layout of the Proposed Development and the subsequent assessment of effects.

11.4.21 The 2016 Carbon and Peatland Map[21] exhibits the distribution of peatland classes across Scotland, with the details of the specific classifications used shown in **Table 11.8**.

Table 11.8: Classification of Peat

Class of Peat	Peat Description	Indicative Soil	Indicative Vegetation
1	Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value.	Peat Soil	Peatland
2	Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential.	Peat soil with occasional peaty soil	Peatland or areas with high potential to be restored to peatland
3	Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat.	Predominately peaty soil with some peat soil	Peatland with some heath

Class of Peat	Peat Description	Indicative Soil	Indicative Vegetation
4	Area unlikely to be associated with peatland habitat or wet and acidic soils. Area unlikely to include carbon-rich soils.	Predominantly mineral soil with some peat soil	Heath with some peatland
5	Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat.	Peat Soil	No peatland vegetation
0	Mineral Soil – Peatland habitats are not typically found on such soils.	Mineral Soils	No peatland vegetation

11.4.22 The Carbon and Peatland Map indicates areas of Class 1, 2, 3, 4 and 5 peatlands within Section A of the Study Area. This section of the Study Area consists of large sections of high priority Class 1 and 2 peatland with isolated areas of Class 3, 4, and 5 peatlands. In addition, there are mapped areas of Class 0 (mineral soils) towards the southern areas of the Proposed Development, generally situated across steep slopes, hillsides or situated adjacent to watercourses.

11.4.23 **Volume 3, Figure 11.4** includes an extract from the Carbon and Peatland Map across the Proposed Development.

Superficial Geology

11.4.24 The BGS GeoIndex[18] Superficial Geology Mapping indicates that the most common superficial deposits mapped throughout Section A of the Proposed Development are peat and glacial till. **Table 11.9** details the superficial deposits that are present across Section A of the Proposed Development.

Table 11.9: Superficial Geology in Section A

Superficial Deposit	Description
Peat	Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.
Diamicton Till (Devensian)	Comprised of unsorted and unstratified drift deposits clay, sand, gravel and boulders that vary significantly in size and shape.
Alluvium	Comprised of clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.
Glaciofluvial Deposits	Comprised of sand and gravel with occasional lenses of silt, clay or organic material, that have been deposited by meltwater streams.
Raised Marine Deposits	Predominantly comprised of gravel, sand, silt and clay. Raised Marine Deposits are commonly charged with organic debris (plant and shell) and depositionally, have resulted from gradual tectonic movements and falling sea levels.
River Terrace Deposits (Undifferentiated)	Comprised of sand and gravel with localised lenses of silt, clay or peat.
Glaciofluvial Ice Contact Deposits	Comprised of stratified sand and gravel and interbedded diamicton deposited by meltwater and ice under (subglacial), within (englacial), and at the margins of, glaciers.

11.4.25 Mapped superficial deposits are absent from localised areas of the Proposed Development, indicating potential bedrock at or near surface.

11.4.26 **Volume 3, Figure 11.1** details the BGS superficial geology across the Proposed Development.

Bedrock Geology

11.4.27 The BGS GeoIndex[18] indicates that there are several bedrock formations underlying Section A of the Proposed Development, detailed in **Table 11.10** below.

Table 11.10: Bedrock Geology in Section A

Bedrock Formation	Lithology Type	Description
Spital Flagstone Formation	Sedimentary	Siltstone, mudstone and sandstone
Berriedale Sandstone Formation	Sedimentary	Sandstone, limestone, mudstone, siltstone and trace breccia
Lybster Flagstone Formation	Sedimentary	Siltstone, mudstone and sandstone
Ben Dorrery Conglomerate Member	Sedimentary	Conglomerate and arenite
Kildonan Psammite Formation	Metamorphic	Psammite and semipelite
Helmsdale Granite Phase 1	Igneous	Granite (porphyritic)
Badbea Breccio – Conglomerate Member	Sedimentary	Conglomerate with subsidiary breccia
Braemore Mudstone Formation	Sedimentary	Mudstone, siltstone and sandstone
Ousdale Arkose Formation	Sedimentary	Breccia, conglomerate and sandstone with subsidiary mudstone
Helmsdale Granite Phase 2	Igneous	Granite (porphyritic) and microgranite (aplitic)
Langwell Conglomerate Member	Sedimentary	Conglomerate

11.4.28 **Volume 3, Figure 11.2** details the BGS bedrock geology underlying the Proposed Development.

Linear Features

11.4.29 BGS GeoIndex Map[18] indicates that there are several mapped faults[31] throughout Section A of the Proposed Development.

11.4.30 The most significant, continuous faults are predominantly mapped in the northern areas of Section A near Spittal, where a fault borders the southern edge of the Loch of Toftingall, trending northeast to southwest, and another fault is located at Rangag, trending east to west. In addition, the Proposed Development crosses a series of minor faults situated in the central areas of Section A, near Newport and Langwell, trending east to west and northwest to southeast.

[31] Faults are fractures in rocks where compressional or tensional forces have caused relative displacement of the rocks on each side of the fracture.

Hydrogeological Conditions

11.4.31 The hydrogeology of Section A of the Proposed Development is detailed in **Chapter 10: Water Environment**. A summary of the hydrogeological conditions throughout Section A is detailed below.

11.4.32 The BGS GeoIndex[18] indicates that the following bedrock aquifers are present across Section A of the Proposed Development:

- The majority of the northern and southern areas of Section A of the Proposed Development are underlain by the Middle Old Red Sandstone, classified as a moderately productive bedrock aquifer comprised of sandstones, mudstones, conglomerates and interbedded lavas which yield small amounts of groundwater locally.
- The Moine Supergroup is present locally throughout Section A. This aquifer is classed as low productivity, yielding small amounts of groundwater in near surface weathered zones and secondary fractures.
- An Unnamed Igneous Intrusion (Late Silurian to Early Devonian) is mapped underlying central areas of Section A. This intrusive complex is classed as a low productivity aquifer that yields small amounts of groundwater in near surface weathered zones and secondary fractures with rare springs.
- The Lower Old Red Sandstone is present locally throughout the central areas of Section A, classified as a multi-layered, moderately productive aquifer where flow is virtually all through fractures and other discontinuities.

11.4.33 In addition, Scotland's Environment Web Map[20] indicates that Section A of the Proposed Development (from Spittal to Brora) is mainly located upon the Caithness groundwater body (ID: 150692). The southern portion of Section A is located upon the Northern Highlands groundwater body (ID: 150701) and locally upon the Brora groundwater body (ID: 150703).

11.4.34 The Caithness groundwater body covers an area of 1,339.1 km^2 and is reported to have an overall current and future status of 'Good' under the Water Framework Directive (WFD). The aquifer is recorded as Old Red Sandstone North with a dominant fracture (minor intergranular) flow typology, resulting in low to high aquifer productivity.

11.4.35 The Northern Highlands groundwater body covers an area of 9,382.3 km^2 and is reported to have an overall current and future status of 'Good' under the WFD. The aquifer is recorded as Precambrian North with a dominant fracture flow, resulting in very low to low aquifer productivity.

11.4.36 The Brora groundwater body covers an area of 154.4 km^2 and is reported to have an overall current and future status of 'Good' under the WFD. The aquifer is recorded as Pre Old Red Sandstone North with a dominant fracture (minor intergranular) flow, resulting in low to high aquifer productivity.

Mineral Resources

11.4.37 THC Minerals Audit Interactive Map[25] and BGS GeoIndex[18] indicate that there are no records of active quarrying within Section A of the Proposed Development.

Radon Gas

11.4.38 The UK Health Security Agency (UKHSA) has published reports and maps that outline radon affected areas across the UK.

11.4.39 The UK Radon Map[26] indicates that the majority of Section A of the Proposed Development is located in an area of elevated radon potential, with a maximum radon potential of 5-10%. In addition, there are localised areas of Section A that exhibit lower radon potential of 1-3%. However, the central and southern areas of

Section A are generally situated within areas of elevation radon potential of 10-30%, with some areas exceeding 30%.

11.4.40 The risk associated with ground gas is generally considered low across Section A of the Proposed Development, in accordance with BS8576 guidance[32]. There are no proposed deep enclosed excavations across the Proposed Development and there is negligible risk when considering radon gas in open, well ventilated areas of excavation. Therefore, there is minimal associated risk to workers during the construction phase and radon gas is not considered further in the assessment of Section A of the Proposed Development.

Unexploded Ordnance (UXO)

11.4.41 The Zetica UXO Desk Study & Constraints Assessment[24] identifies areas of moderate risk within Section A of the Proposed Development.

11.4.42 In December 1939, large areas of north and northwest Scotland were designated as a Protected Area under Defence Regulation No.13. This included all of Inverness-shire, Ross and Cromarty, and Sutherland, encompassing the northern part of Section A of the Proposed Development. This required those living in or entering the area to hold permits. It also allowed military training and secret military operations to take place.

11.4.43 The regulations changed in March 1942, and the Burgh of Caithness between Banniskirk and Helmsdale was incorporated into the North of Scotland Regulated Area. This enabled military authorities to requisition land within the regulated area for the purpose of military training or operations. By 1943, a battle school had been established at Helmsdale, encompassing part of Section A of the Proposed Development.

11.4.44 Therefore, a qualified Explosive Ordnance Clearance (EOC) Engineer was required during the intrusive peat and soil surveys across moderate risk UXO areas throughout Section A of the Proposed Development to ensure each survey location was safe to assess. During the site walkovers and surveys, there was no evidence of any historic training activities and no UXO detected.

Historical Maps and Contaminated Land

11.4.45 The National Library of Scotland 1:10,000 scale historical maps[27] for the Study Area have been reviewed and any features of note identified. The viewer includes historical maps from the mid 1800s, through the 1900s to present day. However, it should be noted that each map covers a limited time range and there are gaps between periods of time, especially in the 1800s to mid 1900s.

11.4.46 Contaminative sources are generally associated with historical industrial activities where localised or widespread contamination has occurred. These former activities predominantly occur in and around urban or industrial areas, or in rural areas focused on specific industries or activities (e.g. mining). However, given the predominantly rural nature and expansive undeveloped moorland across the Study Area, it is unlikely that a large number of contaminated sites would be encountered during construction activities.

11.4.47 Historical maps show that Section A of the Proposed Development has predominantly been undeveloped moorland, with areas of forestry and agricultural land including several crofts and fields. Commercial forestry has expanded across the Proposed Development in recent years.

[32] BSI Standards Publication (2013) BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs). Avaliable at: BS 8576:2013 Guidance on investigations for ground gas - Permanent gases and volatile organic compounds (VOCs), British Standards Institution - Publication Index | NBS [Accessed November 2024]

11.4.48 The Coal Authority Interactive Map Viewer[23] shows that Section A of the Proposed Development is not within a coal mining reporting area and therefore is not considered to be at risk of residual contamination arising from coal mining activities.

11.4.49 From review of historic mapping, there are various historic quarries mapped throughout the Proposed Development. Tofingall Quarry and Langergill Quarry are situated adjacent to proposed Tower N12 and Achorn Quarries are located to the east of proposed Tower N87 within the LoD. In addition, Ousdale Quarries are located between proposed Towers N122 and N123. Banniskirk Quarry and Spittal Quarry are situated near the northern extents of the Proposed Development; however, they are located outwith the Limit of Deviation.

11.4.50 There are also several records of ceased gravel pits and peat workings across Section A, particularly in the Ousdale and West Helmsdale area. Former pits could have been infilled with potentially contaminated materials which may result in ground gas generation and harm to health. However, these appear to have been localised, small scale pits and workings adjacent to existing roads or other infrastructure. Also, BGS GeoIndex indicates that there is no artificial ground mapped across Section A.

11.4.51 The SEPA waste site information[33] was consulted for the presence of landfills and waste sites (authorised and historic) and no licensed sites are situated within Section A of the Proposed Development.

11.4.52 In addition, there is a sheep wash at Crackaig which may have historically affected local soils and groundwater within the area. There is also the potential for contaminated land associated with the construction of the existing OHL, major road upgrades such as the A9 and the windfarm situated in the northern areas of Section A between Towers N21 to N23. Furthermore, during the scoping stage for the Proposed Development, it was identified that there may be potential for contaminated land across Section A associated with former land uses including military training.

11.4.53 However, during site walkovers and surveys of Section A, there was no evidence encountered of any contaminated land associated with any of the factors listed or previous construction activities.

Section B – Brora to Loch Buidhe

Statutory Designations

11.4.54 Review of the NatureScot SiteLink[17] indicates that there are two statutory designations related to the geology situated within Section B of the Study Area, detailed below in **Table 11.11.**

Table 11.11: Designated Sites in Section B

Designated Site	Designation	Area (ha)	Description
Strathfleet	SSSI	132.66	Moine Supergroup
Aberscross Burn to Kinnauld	GCR	81.10	Rogart Quartz-monzodiorite-granite Pluton

11.4.55 The Abercross Burn to Kinnauld GCR is mapped within the wider Strathfleet SSSI extents.

[33] Scottish Environment Protection Agency (SEPA), Waste site information. Available from: Waste site information | Scottish Environment Protection Agency (SEPA) / [Accessed December 2024]

Land Use, Topography and Slope

11.4.56 The predominant land uses within Section B of the Proposed Development are open undeveloped moorland and commercial forestry. Section B also crosses agricultural land and several public and private roads/tracks. Section B crosses a railway between proposed Towers N263 and N264, adjacent to the River Fleet, and the existing Loch Buidhe substation is present in the western extents of Section B, located to the north of proposed Towers N296 and N297. In addition, there are several residential properties adjacent to Section B of the Proposed Development.

11.4.57 Section B of the Proposed Development crosses a series of watercourses including the River Brora, River Fleet, Strath Carnaig and several minor watercourses and tributaries.

11.4.58 OS mapping indicates that ground elevations within Section B of the Proposed Development vary between 10 m AOD, on the banks of the River Fleet, and 410m AOD south of Ben Horn.

11.4.59 In areas with significant slopes, there is an increased risk to the superficial geology and the composition and extent of the overlying soils may affect the stability of the slopes. The majority of Section B of the Proposed Development is situated across gentle to moderate slopes with localised flatter expanses and topographic lows. Steep slopes are present locally throughout Section B, predominantly associated with undulating hills, steep valleys and watercourses. In the northern area of Section B of the Proposed Development, there are steep slopes associated with the hills northwest of Brora and adjacent to Loch Brora. Steep slopes are present to the east and south of Loch Horn and across Dunrobin Glen. In the southern areas of Section B, there are steep slopes on the descent to the banks of the River Fleet and there are moderate to sleep slopes present at Strath Carnaig and to the south of Loch Buidhe.

Soils

11.4.60 The 1:250,000 National Soil Map of Scotland[22] indicates that there are a range of soil types recorded across Section B of the Study Area which are (listed from north to south):

- Peaty Gleys;
- Blanket Peat;
- Peaty Podzols;
- Mineral Podzols;
- Alluvial Soils; and
- Brown Soils.

11.4.61 The majority of Section B of the Study Area is underlain by peaty gleys, peaty podzols and blanket peat. Alluvial soils are generally associated with surface watercourses, whilst brown soils and mineral podzols are generally situated across steeper slopes and hillsides.

11.4.62 **Volume 3, Figure 11.3** includes an extract from the National Soil Map across the Proposed Development.

Carbon-rich Soils, Deep Peat and Priority Peatland Habitats

11.4.63 The 2016 Carbon and Peatland Map[21] shows that Section B of the Study Area is predominantly underlain by Class 1, 2, and 5 peatland. In addition, there are mapped areas of Class 0 (mineral soils) towards the central and southern areas of the Proposed Development, predominantly adjacent to the River Fleet and across areas with steep slopes.

11.4.64 **Volume 3, Figure 11.4** includes an extract from the Carbon and Peatland Map across the Proposed Development.

Superficial Geology

11.4.65 The BGS GeoIndex[18] Superficial Geology Mapping indicates that the most common superficial deposits mapped throughout Section B of the Proposed Development are peat and glacial till. **Table 11.12** details the superficial deposits that are present across Section B of the Proposed Development.

Table 11.12: Superficial Geology in Section B

Superficial Deposit	Description
Peat	Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.
Diamicton Till (Devensian)	Comprised of unsorted and unstratified drift deposits clay, sand, gravel and boulders that vary significantly in size and shape.
Undifferentiated River Terrace Deposits	Comprised of sand and gravel with localised lenses of silt, clay or peat.
Lacustrine Deltaic Deposits	Comprised of gravel, sand, and silt. Deposited in a prograding delta at the fluvial-lacustrine boundary as fluvial current velocity is dissipated, causing a 'coarsening upward sequence' of sediments.
Alluvium	Comprised of clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.
Alluvial Fan Deposits	Comprised of gravel, sand, silt and clay. Deposits are low, outspread, relatively flat to gently sloping masses of loose rock material in a fan-like shape. Deposited by streams at the mouths of tributary valleys onto a plain or broad valley.

11.4.66 Mapped superficial deposits are absent from localised areas of the Proposed Development, indicating potential bedrock at or near surface.

11.4.67 **Volume 3, Figure 11.1** details the BGS superficial geology across the Proposed Development.

Bedrock Geology

11.4.68 The BGS GeoIndex[18] indicates that there are several bedrock formations underlying Section B of the Proposed Development, detailed in **Table 11.13** from north to south.

Table 11.13: Bedrock Geology in Section B

Bedrock Formation	Lithology Type	Description
Kildonan Psammite Formation	Metamorphic	Psammite and semipelite
Badbea Creccio – Conglomerate Member	Sedimentary	Conglomerate with subsidiary breccia
Berriedale Sandstone Formation	Sedimentary	Sandstone with subsidiary limestone, mudstone, siltstone and trace breccia
Ulbster Sandstone Formation – Sandstone	Sedimentary	Sandstone
Ulbster Sandstone Formation – Conglomerate	Sedimentary	Conglomerate

Bedrock Formation	Lithology Type	Description
Langwell Conglomerate Member	Sedimentary	Conglomerate
Altnaharra Psammite Formation – Psammite and Micaceous Psammite	Metamorphic	Siliceous to feldspathic psammite with micaceous psammite and semipelite
Altnaharra Psammite Formation – Psammite (Migmatitic)	Metamorphic	Siliceous to feldspathic psammite with micaceous psammite and semipelite
Lewisian Complex - Orthogneiss	Metamorphic	Orthogneiss

11.4.69 **Volume 3, Figure 11.2** details the BGS bedrock geology underlying the Proposed Development.

Linear Features

11.4.70 BGS GeoIndex Map[1818] indicates that there are several mapped inferred faults throughout Section B of the Proposed Development. There is a series of interlinked faults present to the southwest of Dunrobin Glen, trending northwest to southeast and northeast to southwest.

11.4.71 In addition, Section B overlaps with mapped linear boundaries of migmitisation; a geological process in which a rock undergoes partial melting during ultrametamorphism. In addition, the Section B Study Area overlaps with the mapped boundary of an area of diorite and/or granodiorite vein-swarms.

Hydrogeological Conditions

11.4.72 The hydrogeology of Section B of the Proposed Development is detailed in **Chapter 10: Water Environment**. A summary of the hydrogeological conditions throughout Section B is detailed below.

11.4.73 The BGS GeoIndex[18] indicates that the following bedrock aquifers are present across Section B of the Proposed Development, from north to south:

- Middle Old Red Sandstone (Undifferentiated) - classified as a moderately productive bedrock aquifer, comprised of sandstones, mudstones, conglomerates and interbedded lavas which yield small amounts of groundwater locally.
- Lower Old Red Sandstone - classified as a multi-layered, moderately productive aquifer where flow is virtually all through fractures and other discontinuities.
- Morar Group – classified as a low productivity bedrock aquifer, which yields small amounts of groundwater in near surface weathered zones and secondary fractures. Flow is predominantly through fractures and other discontinuities.
- Lewisian Complex – classified as a low productivity bedrock aquifer where groundwater is only present in near surface weathered zone and secondary fractures and flow is predominantly through fractures and other discontinuities.

11.4.74 In addition, Scotland's Environment Web Map[2020] indicates that Section B is predominantly located upon the Northern Highlands groundwater body. The northern extents of Section B are located upon the Brora groundwater body.

11.4.75 The Northern Highlands (ID: 150701) groundwater body covers an area of 9,382.3 km^2 and is reported to have an overall current and future status of 'Good' under the WFD. The aquifer is recorded as Precambrian North with a dominant fracture flow, resulting in very low to low aquifer productivity.

11.4.76 The Brora groundwater body (ID: 150703) covers an area of 154.4 km^2 and is reported to have an overall current and future status of 'Good' under the WFD. The aquifer is recorded as Pre Old Red Sandstone North with a dominant fracture (minor intergranular) flow typology, resulting in low to high aquifer productivity.

Mineral Resources

11.4.77 THC Minerals Audit Interactive Map[25] and BGS GeoIndex[18] indicate that there are no records of active quarrying within Section B of the Proposed Development.

Radon Gas

11.4.78 The UK Radon Map[26] indicates that the majority of the north of Section B of the Proposed Development is located in an area of elevated radon potential between 10-30%. In addition, there are localised areas in the north of Section B with over 30% radon potential.

11.4.79 The majority of the central and southern areas of Section B are mapped as the lowest band of radon potential, with less than 1% of homes at or above the Action Level. There is one minor area of the Proposed Development in the south of Section B with an elevated radon potential over 30%.

11.4.80 The risk associated with ground gas is generally considered low across Section B of the Proposed Development, in accordance with BS8576[32]. There are no proposed deep enclosed excavations across the Proposed Development and there is negligible risk when considering radon gas in open, well ventilated areas of excavation. Therefore, there is minimal associated risk to workers during the construction phase and radon gas is not considered further in the assessment of Section B of the Proposed Development.

Unexploded Ordnance (UXO)

11.4.81 The Zetica UXO Desk Study & Constraints Assessment[24] does not identify any risk areas within Section B of the Proposed Development as a result of UXO. Therefore, UXO precautions were not necessary when surveying this area and UXO is not considered a risk to Section B of the Proposed Development.

Historical Maps and Contaminated Land

11.4.82 Contaminative sources are generally associated with historical industrial activities where localised or widespread contamination has occurred. These former activities predominantly occur in and around urban or industrial areas, or in rural areas focused on specific industries or activities (e.g. mining). However, given the predominantly rural nature and expansive undeveloped moorland across the Study Area, it is unlikely that a large number of contaminated sites would be encountered during construction activities.

11.4.83 Historical maps show that Section B of the Proposed Development has predominantly been undeveloped moorland, with areas of forestry and agricultural land. Commercial forestry has expanded across the Proposed Development in recent years.

11.4.84 The Coal Authority Interactive Map Viewer[23] shows that Section B is not situated within a coal mining reporting area and therefore is not considered to be at risk from coal mining activities. There is an area that is noted to be a Coal Mining Reporting Area near Brora; however, this is situated outwith the Study Area and is therefore not included in further investigation.

11.4.85 In addition, BGS GeoIndex[18] indicates that there are no mapped historic quarries, pits or artificial ground situated within Section B of the Proposed Development.

11.4.86 The SEPA waste site information[3333] was consulted for the presence of landfills and waste sites (authorised and historic) and no licensed sites are situated within Section B of the Proposed Development.

11.4.87 There is the potential for contaminated land associated with the construction of the existing OHL, the existing Electricity Substation to the south of Loch Buidhe and the railway located at Kinnauld between Towers N263 and 264, adjacent to the River Fleet. In addition, the southern area of Section B borders part of the Morvich Quarry, located between Morvich and Kinnauld to the southwest of proposed Tower N263. However, this site is dormant and is situated outwith the LOD; therefore, it is not considered a contamination risk to Section B of the Proposed Development.

11.4.88 During site walkovers, no evidence of potential contaminated land relating to the factors listed was encountered throughout Section B of the Proposed Development.

Section C – Loch Buidhe to Dounie

Statutory Designations

11.4.89 Review of the NatureScot SiteLink[17] indicates that there are no statutory designations situated within Section C of the Study Area that are relevant to the geology, peat and soils environment.

Land Use, Topography and Slope

11.4.90 The predominant land uses within Section C of the Proposed Development are open moorland and commercial forestry. Section C crosses public roads, such as the A836, private forestry tracks and there is a railway present between proposed Towers S21 and S22.

11.4.91 The Proposed Development crosses various watercourses and surface water bodies, including the Kyle of Sutherland and Loch Leisgein.

11.4.92 Elevations along Section C range from approximately 10 m AOD adjacent to the Kyle of Sutherland to 200 m AOD in the eastern extents of Section C.

11.4.93 In areas with significant slopes, there is an increased risk to the superficial geology and the composition and extent of the overlying soils may affect the stability of the slopes. The majority of Section C of the Proposed Development is situated across gentle slopes with localised flatter expanses. There are steep slopes present on the forested land adjacent to the Kyle of Sutherland, predominantly on the western side of the river on the flanks of Creag a Choineachan. In addition, there are steep slopes present towards the southern extents of Section C to the north of Culeave and the River Carron.

Soils

11.4.94 The 1:250,000 National Soil Map of Scotland[22] indicates that there are a range of soil types recorded across Section C of the Study Area:

- Peaty Podzols;
- Peaty Gleys; and
- Mineral Podzols.

11.4.95 Section C of the Study Area is predominantly underlain by peaty gleys with minor occurrences of peaty podzols in the northern areas and mineral podzols adjacent to the Kyle of Sutherland watercourse.

11.4.96 **Volume 3, Figure 11.3** includes an extract from the National Soil Map across the Proposed Development.

Carbon-rich Soils, Deep Peat and Priority Peatland Habitats

11.4.97 The 2016 Carbon and Peatland Map[21] indicates that areas of Class 1, 2 and 5 peatlands are present within Section C of the Study Area. Class 1 and 2 peatlands are predominantly situated across the northern and

eastern extents of Section C and localised pockets of Class 1 are present towards the south of the section. Class 5 peat is present throughout the majority of the central and southern areas of Section C. In addition, there are mapped areas of Class 0 (mineral soils) throughout the central areas, situated on moderate to steep slopes and adjacent to the Kyle of Sutherland.

11.4.98 **Volume 3, Figure 11.4** includes an extract from the Carbon and Peatland Map across the Proposed Development.

Superficial Geology

11.4.99 The BGS GeoIndex[1818] Superficial Geology Mapping indicates that the most common superficial deposits mapped throughout Section C of the Proposed Development are peat, till and morainic deposits. **Table 11.14** details the superficial deposits that are present across Section C of the Proposed Development.

Table 11.14: Superficial Geology in Section C

Superficial Deposit	Description
Peat	Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.
Till and Morainic Deposits (Undifferentiated)	Comprised of Diamicton – clay, sand and gravel.
River Terrace Deposits (Undifferentiated)	Comprising sand and gravel with localised lenses of silt, clay or peat.
Alluvium	Comprising clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.
Raised Marine Beach Deposits (Late Devensian)	Comprising gravel, sand and silt.

11.4.100 Mapped superficial deposits are absent from localised areas of the Proposed Development, indicating potential bedrock at or near surface.

11.4.101 **Volume 3, Figure 11.1** details the BGS superficial geology across the Proposed Development.

Bedrock Geology

11.4.102 The BGS GeoIndex[18] indicates that Section C of the Proposed Development is underlain by the Altnaharra Psammite Formation, with minor intrusive formations, further detailed in **Table 11.15.**

Table 11.15: Bedrock Geology in Section C

Bedrock Formation	Lithology Type	Description
Altnaharra Psammite Formation – Psammite and Micaceous Psammite	Metamorphic	Siliceous to feldspathic psammite with micaceous psammite and semipelite
North Britain Siluro-Devonian Calc-Alkaline Dyke Suite - Minette	Igneous	Minette is a porphyritic alkaline igneous rock, usually occurring in dykes
Neoproterozoic Basic Minor Intrusion Suite - Amphibolite	Metamorphic	Amphibolite is commonly in sheet-like, intrusive sill form

11.4.103 **Volume 3, Figure 11.2** details the BGS bedrock geology underlying the Proposed Development.

Linear Features

11.4.104 The BGS Geoindex Map[18] indicates that there are no mapped faults or other linear features present within Section C of the Proposed Development.

Hydrogeological Conditions

11.4.105 The hydrogeology of Section C of the Proposed Development is detailed in **Chapter 10: Water Environment**. A summary of the hydrogeological conditions throughout Section C is detailed below.

11.4.106 The BGS GeoIndex[18] indicates that Section C of the Proposed Development is underlain by the Morar Group bedrock aquifer. This is classified as a low productivity aquifer with small amounts of groundwater in near surface weathered zone and secondary fractures.

11.4.107 In addition, Scotland's Environment Web Map[20] indicates that Section C of the Proposed Development is located upon the Northern Highlands groundwater body.

11.4.108 The Northern Highlands groundwater body (ID: 150701) covers an area of 9,382.3 km^2 and is reported to have an overall current and future status of 'Good' under the Water Framework Directive (WFD). The aquifer is recorded as Precambrian North with a dominant fracture flow, resulting in very low to low aquifer productivity.

Mineral Resources

11.4.109 THC Minerals Audit Interactive Map[2525] and BGS GeoIndex[18] indicate that there are no records of active quarrying within Section C of the Proposed Development.

Radon Gas

11.4.110 The UK Radon Map[26] indicates that the majority of Section C of the Proposed Development is situated in the lowest band of radon potential, with less than 1% of homes at or above the Action Level. However, there are localised areas of Section C where the maximum radon potential is greater than 30%, predominantly in the central areas adjacent to the Kyle of Sutherland.

11.4.111 The risk associated with ground gas is generally considered low across Section C of the Proposed Development, in accordance with BS8576[32]. There are no proposed deep enclosed excavations across the Proposed Development and there is negligible risk when considering radon gas in open, well ventilated areas of excavation. Therefore, there is minimal associated risk to workers during the construction phase and radon gas is not considered further in the assessment of Section C of the Proposed Development.

Unexploded Ordnance (UXO)

11.4.112 The Zetica UXO Desk Study & Constraints Assessment[24] does not identify any UXO risk areas within Section C of the Proposed Development. Therefore, UXO precautions were not necessary when surveying this area and UXO is not considered a risk to the Proposed Development in Section C.

Historical Maps and Contaminated Land

11.4.113 Contaminative sources are generally associated with historical industrial activities where localised or widespread contamination has occurred. These former activities predominantly occur in and around urban or industrial areas, or in rural areas focused on specific industries or activities (e.g. mining). However, given the predominantly rural nature and expansive undeveloped moorland across the Study Area, it is unlikely that a large number of contaminated sites would be encountered during construction activities.

11.4.114 Historical maps show that Section C of the Proposed Development has predominantly been undeveloped moorland, with areas of forestry and agricultural land. Commercial forestry has expanded across the Proposed Development in recent years.

11.4.115 The Coal Authority Interactive Map Viewer[23] shows that Section C of the Proposed Development is not within a coal mining reporting area and therefore is not considered to be at risk from coal mining activities. There is no record of any mining across Section C, although there are records of ceased gravel pits and peat cuttings. However, these appear to have been localised, small scale pits and cuttings adjacent to existing roads or other infrastructure.

11.4.116 The BGS GeoIndex[18] indicates that there is no mapped artificial ground across Section C of the Proposed Development.

11.4.117 The SEPA waste site information[33] was consulted for the presence of landfills and waste sites (authorised and historic) and no licensed sites are situated within Section C of the Proposed Development.

11.4.118 In addition, from review of the historical maps, there is the potential for contamination associated with the construction of the existing OHL and the presence of the railway at Invershin between Towers S21 and S22. However, during site walkovers, no evidence of potential contaminated land was encountered throughout Section C of the Proposed Development.

Section D – Dounie to Near Strathpeffer

Statutory Designations

11.4.119 Review of the NatureScot SiteLink[17] indicates that there are no statutory designations situated within Section D of the Study Area that are relevant to geology, peat and soils.

Land Use, Topography and Slope

11.4.120 The predominant land uses within Section D of the Proposed Development are open undeveloped moorland and commercial forestry. Section D also crosses agricultural land and several public and private roads/tracks. In addition, there are several residential properties adjacent to Section D of the Proposed Development.

11.4.121 Section D crosses various watercourses including the River Carron, Abhainn Glac an t-Seilich, River Averon, River Glass, Poll a Ghreusaich, Abhainn Sgitheach and several minor tributaries and streams.

11.4.122 OS mapping indicates that ground elevations vary significantly throughout Section D, ranging from approximately 30 m AOD in the northern extents adjacent to the River Carron to approximately 440 m AOD on the eastern flanks of Carn Beag.

11.4.123 In areas with significant slopes, there is an increased risk to the superficial geology and the composition and extent of the overlying soils may affect the stability of the slopes. The majority of Section D is situated across moderate to sleep slopes with very localised flatter expanses and topographic lows. Steep slopes are common throughout the northern and central areas of Section D, adjacent to Garvary forestry and Strathrusdale. Towards the south of Section D, there are steep slopes present to the southwest of Boath. Flatter expanses are present near Strath Mor to the west of Loch Chaplaich and across the undulating land west of Strathpeffer.

Soils

11.4.124 The 1:250,000 National Soil Map of Scotland[2222] indicates that there are a range of soil types recorded across Section D of the Study Area which are:

- Mineral Podzols;

- Alluvial Soils;
- Peaty Gleys;
- Blanket Peat;
- Mineral Gleys;
- Peaty Podzols; and
- Brown Soils.

11.4.125 The northern area of Section D is predominantly underlain by peaty gleys and localised pockets of blanket peat and mineral gleys. The southern area of the Section D is predominantly underlain by mineral podzols, peaty podzols and mineral gleys with localised pockets of peaty gleys and brown soils.

11.4.126 **Volume 3, Figure 11.3** includes an extract from the National Soil Map across the Proposed Development.

Carbon-rich Soils, Deep Peat and Priority Peatland Habitats

11.4.127 The 2016 Carbon and Peatland Map[21] indicates that areas of Class 1 and Class 2 peatland are present throughout Section D of the Proposed Development. These deposits are predominantly located in the northern and central areas of Section D near Strathrusdale and Boath.

11.4.128 The majority of Section D is underlain by Class 5 peat soil and Class 0 (mineral soils). Mineral soils are predominantly mapped adjacent to watercourses, such as the River Carron or River Sgitheach, and across moderate to steep slopes. In addition, there are very localised areas of Class 3 mapped towards the south of the Section D.

11.4.129 **Volume 3, Figure 11.4** includes an extract from the Carbon and Peatland Map across the Proposed Development.

Superficial Geology

11.4.130 The BGS GeoIndex[18] Superficial Geology Mapping indicates that the most common superficial deposits mapped throughout Section D of the Proposed Development are till, morainic deposits and peat. **Table 11.16** details the superficial deposits that are present across Section D of the Proposed Development.

Table 11.16: Superficial Geology in Section D

Superficial Deposit	Description
River Terrace Deposits (Undifferentiated)	Comprised of sand and gravel with localised lenses of silt, clay or peat.
Till and Morainic Deposits (Undifferentiated)	Comprised of Diamicton – clay, sand and gravel.
Alluvium	Comprised of clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.
Peat	Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.
Glaciofluvial Deposits	Comprised of sand and gravel with occasional lenses of silt, clay or organic material, that have been deposited by meltwater streams.
River Terrace Deposits (Undifferentiated)	Comprised of sand and gravel with localised lenses of silt, clay or peat.

11.4.131 Mapped superficial deposits are absent from localised areas of the Proposed Development, indicating potential bedrock at or near surface.

11.4.132 **Volume 3, Figure 11.1** details the BGS superficial geology across the Proposed Development.

Bedrock Geology

11.4.133 The BGS GeoIndex[18] indicates Section D of the Proposed Development is predominantly underlain by metamorphic and sedimentary bedrock formations, as detailed in **Table 11.17**.

Table 11.17: Bedrock Geology in Section D

Bedrock Formation	Lithology Type	Description
Altnaharra Psammite Formation - Psammite and Micaceous Psammite	Metamorphic	Siliceous to feldspathic psammite with micaceous psammite and semipelite
Crom Psammite Formation	Metamorphic	Interbedded micaceous psammite, semipelite and pelite
Diebidale Pelite Formation	Metamorphic	Interbedded psammite and semipelite
Ben Wyvis Pelite Formation	Metamorphic	Interbedded semipelite and psammite
Tarvie Psammite Formation	Metamorphic	Psammite
Braemore Mudstone Formation	Sedimentary	Mudstone, siltstone and sandstone
Ousdale Arkose Formation	Sedimentary	Breccia, conglomerate and sandstone with subsidiary mudstone

11.4.134 **Volume 3, Figure 11.2** details the BGS bedrock geology underlying the Proposed Development.

Linear Features

11.4.135 BGS GeoIndex Map[1818] indicates that there are several mapped faults throughout Section D of the Proposed Development. The most significant, continuous faults are predominantly mapped in the southern area of Section D. There is a fault present trending northwest to southeast on the southern side of Strathrusdale and intercepting the Proposed Development on the eastern side of Loch Morie. In addition, a northeast to southwest trending fault is mapped from the south of Strathrusdale to the southern extents of Section D. This fault crosses the Proposed development at proposed Tower S99 to the southwest of Boath and between proposed Towers S136 and S137.

Hydrogeological Conditions

11.4.136 BGS GeoIndex[18] indicates that the following bedrock aquifers are present across Section D of the Proposed Development:

- Morar Group – classified as a low productivity bedrock aquifer, which yields small amounts of groundwater in near surface weathered zones and secondary fractures and flow is predominantly through fractures and other discontinuities.
- Lower Old Red Sandstone - classified as a multi-layered, moderately productive aquifer where flow is virtually all through fractures and other discontinuities.
- Loch Eil Group – classified as a low productive bedrock aquifer which yields small amounts of groundwater in the near surface weathered zone and secondary fractures and flow is virtually all through fractures and discontinuities.

11.4.137 In addition, Scotland's Environment Web Map[20] indicates that Section D of the Proposed Development is predominantly located upon the Northern Highlands groundwater body. The Northern Highlands groundwater body (ID: 150701) covers an area of 9,382.3 km^2 and is reported to have an overall current and future status of 'Good' under the WFD. The aquifer is recorded as Precambrian North with a dominant fracture flow, resulting in very low to low aquifer productivity.

11.4.138 In addition, the southern extents of Section D are situated upon the Invergordon groundwater body (ID: 150679).

11.4.139 The Invergordon groundwater body covers an area of 520.0 km^2 and is reported to have an overall current and future status of Good under the WFD. The aquifer type is recorded as Old Red Sandstone North with a dominant fracture (minor intergranular) flow and low to high aquifer productivity.

Mineral Resources

11.4.140 THC Minerals Audit Interactive Map[25] and BGS GeoIndex[1818] indicate that there are no records of active quarrying within Section D of the Proposed Development.

Radon Gas

11.4.141 The UK Radon Map[26] indicates that the majority of Section D of the Proposed Development is located in an area of elevated radon potential, with a maximum radon potential of 30%. The central and southern areas of Section D are generally situated within areas of elevation radon potential of 1-3%, with some areas exceeding 30%. The northern areas of Section D are generally situated in areas of the lowest band of radon potential, with less than 1% of homes at or above the Action Level.

11.4.142 The risk associated with ground gas is generally considered low across Section D of the Proposed Development, in accordance with BS8576[32]. There are no proposed deep enclosed excavations across the Proposed Development and there is negligible risk when considering radon gas in open, well ventilated areas of excavation. Therefore, there is no associated risk to workers during the construction phase and radon gas is not considered further in the assessment of Section D of the Proposed Development.

Unexploded Ordnance (UXO)

11.4.143 The Zetica UXO Desk Study & Constraints Assessment[24] identifies areas of high and low risk within Section D of the Proposed Development relating to the Loch Glass/Alness range.

11.4.144 Records indicate that gunnery practice took place in Glen Glass, approximately 500 m west of the Study Area. In addition, military training, small arms training and tank training were all undertaken around the area of Strathpeffer at the southern extent of Section D of the Proposed Development.

11.4.145 Therefore, a qualified EOC Engineer was required during the intrusive peat and soil surveys across moderate to high risk UXO areas throughout Section D of the Proposed Development to ensure each survey location was safe to assess. During site walkovers and surveys, there was no evidence of any historic military training activities and no UXO detected.

Historical Maps and Contaminated Land

11.4.146 Contaminative sources are generally associated with historical industrial activities where localised or widespread contamination has occurred. These former activities predominantly occur in and around urban or industrial areas, or in rural areas focused on specific industries or activities (e.g. mining). However, given the predominantly rural nature and expansive undeveloped moorland across the Study Area, it is unlikely that a large number of contaminated sites would be encountered during construction activities.

11.4.147 Historical maps show that Section D of the Proposed Development has predominantly been undeveloped moorland, with areas of forestry and agricultural land. Commercial forestry has expanded across the Proposed Development in recent years.

11.4.148 The Coal Authority Interactive Map Viewer[2323] shows that Section D of the Proposed Development is not within a coal mining reporting area and therefore is not considered to be at risk from coal mining activities. In addition, BGS GeoIndex indicates that there are no mapped historic mines, quarries, pits or artificial ground within Section D of the Proposed Development.

11.4.149 The SEPA waste site information[33] was consulted for the presence of landfills and waste sites (authorised and historic) and no licensed sites are situated within Section D of the Proposed Development.

11.4.150 There is potential for contaminated land to be present in Section D associated with former land uses including military training areas.

11.4.151 During site walkovers, no evidence of potential contaminated land was encountered throughout Section D of the Proposed Development related to the factors listed.

Section E – Near Strathpeffer to Beauly

Statutory Designations

11.4.152 Review of the NatureScot SiteLink[17] indicates that there are no statutory designations situated within Section E of the Study Area that are relevant to geology, peat and soils.

Land Use, Topography and Slope

11.4.153 The predominant land uses within Section E of the Proposed Development are open undeveloped moorland, commercial forestry and agricultural land. Section E also crosses several public and private roads/tracks. There is a railway near Strathpeffer situated between proposed Towers S152 and S153, adjacent to the Peffery Burn. In addition, there are residential properties adjacent to Section E of the Proposed Development and a recreation centre is present at Fairburn to the east of proposed Tower S184.

11.4.154 The Proposed Development crosses a series of watercourses including the River Conon, River Orrin, Allt Goibhre and the River Beauly.

11.4.155 OS mapping indicates that ground elevations within Section E of the Proposed Development vary between 15 m AOD near Tower S175 adjacent to the River Conon in the northern area and 368 m AOD near Tower S210 in the central areas of Section E.

11.4.156 In areas with significant slopes, there is an increased risk to the superficial geology and the composition and extent of the overlying soils may affect the stability of the slopes. The majority of Section E of the Proposed Development is situated on gentle to moderate slopes, with localised areas of steep slopes and flatter expanses. Steep slopes are largely present throughout the central and southern areas Section E, adjacent to the River Orrin at Stronachroe, Auchmuir Wood and alongside the River Beauly and Ruttle Wood. In addition, there are steep slopes present in the north of Section E adjacent to the Peffery Burn north of Strathpeffer. Flatter expanses are present across Section E to the north of the River Conon and adjacent to Loch nam Bonnach further south.

Soils

11.4.157 The 1:250,000 National Soil Map of Scotland[22] indicates that there are a range of soil types recorded across Section E of the Study Area which are:

- Peaty Gleyed Podzols with dystrophic blanket peat;
- Humus-iron Podzols;
- Brown Earths;
- Mineral alluvial soils with peaty alluvial soils; and
- Peaty gleyed podzols with dystrophic semi-confined peat and peaty gleys.

11.4.158 The majority of Section E of the Proposed Development is underlain by Humus-iron Podzols with peaty gleyed podzols. Alluvial soils are generally associated with surface watercourses, whilst brown soils and mineral podzols are generally situated across steeper slopes and hillsides.

11.4.159 **Volume 3, Figure 11.3** includes an extract from the National Soil Map across the Proposed Development.

Carbon-rich Soils, Deep Peat and Priority Peatland Habitats

11.4.160 The 2016 Carbon and Peatland Map[21] indicates that the majority of Section E is underlain by Class 0 (mineral soils), particularly due to the presence of agricultural land, areas with steep slopes, hillsides and watercourses where alluvial soils are typically present. High priority Class 1 and 2 peatland is mapped locally throughout the central areas of Section E, between proposed Towers S202 and S207. In addition, localised Class 5 peat is mapped throughout northern and southern areas of the Proposed Development.

11.4.161 **Volume 3, Figure 11.4** includes an extract from the Carbon and Peatland Map across the Proposed Development.

Superficial Geology

11.4.162 The BGS GeoIndex[18] Superficial Geology Mapping indicates that the most common superficial deposits mapped throughout Section E of the Proposed Development are glacial and fluvial derived deposits and peat. **Table 11.18** details the superficial deposits that are present, listed from north to south, across Section E of the Proposed Development.

Table 11.18: Superficial Geology in Section E

Superficial Deposit	Description
Hummocky (Moundy) Glacial Deposits	Comprised of rock debris, clayey till, sand and gravel.
River Terrace Deposits	Comprised of sand and gravel with localised lenses of silt, clay or peat.
Alluvium	Comprised of clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.
Raised Marine Beach Deposits	Comprised of gravel, sand, silt and clay. Raised Marine Deposits are commonly charged with organic debris (plant and shell) and depositionally, have resulted from gradual tectonic movements and falling sea levels.
Diamicton Till (Devensian)	Comprised of unsorted and unstratified drift deposits clay, sand, gravel and boulders that vary significantly in size and shape.

Superficial Deposit	Description
Peat	Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.

11.4.163 Mapped superficial deposits are absent from localised areas of the Proposed Development, indicating potential bedrock at or near surface.

11.4.164 **Volume 3, Figure 11.1** details the BGS superficial geology across the Proposed Development.

Bedrock Geology

11.4.165 The BGS GeoIndex[18] indicates that there are several bedrock formations underlying Section E of the Proposed Development, detailed in **Table 11.19.**

Table 11.19: Bedrock Geology in Section E

Bedrock Formation	Lithology Type	Description
Braemore Mudstone Formation	Sedimentary	Mudstone, sandstone and limestone
Ousdale Arkose Formation	Sedimentary	Breccia and conglomerate
Tarvie Psammite Formation	Metamorphic	Psammite
Achnaconeran Striped Formation	Metamorphic	Psammite and semipelite
Caledonian Supersuite	Igneous	Pegmatite, Lamprophyres and Granite

11.4.166 **Volume 3, Figure 11.2** details the BGS bedrock geology underlying the Proposed Development.

Linear Features

11.4.167 BGS GeoIndex Map[18] indicates that there are three mapped inferred faults that overlap with Section E of the Proposed Development. There is a fault present in the northern section, trending northeast to southwest, that crosses proposed Tower S165 to the west of Coulwood. There is another fault present to the east of Loch Achonachie, trending north to south. In addition, there is a major fault trending northeast to southwest that overlaps with Section E of the Proposed Development adjacent to proposed Tower S198.

Hydrogeological Conditions

11.4.168 The hydrogeology of Section E of the Proposed Development is detailed in **Chapter 10: Water Environment**. A summary of the hydrogeological conditions throughout Section E is detailed below.

11.4.169 The BGS GeoIndex[18] indicates that the following bedrock aquifers are present across Section E of the Proposed Development:

- Loch Eil Group – classified as a low productive bedrock aquifer which yields small amounts of groundwater in the near surface weathered zone and secondary fractures and flow is virtually all through fractures and discontinuities.
- Lower Old Red Sandstone – classified as a multi-layered, moderately productive aquifer where flow is virtually all through fractures and other discontinuities.

- Middle Old Red Sandstone (Undifferentiated) - classified as a moderately productive bedrock aquifer, comprised of sandstones, mudstones, conglomerates and interbedded lavas which yield small amounts of groundwater locally.
- Glenfinnan Group – classified as a low productivity bedrock aquifer which yields small amounts of groundwater in near surface weathered zone and secondary fractures. Flow is virtually all through fractures and other discontinuities.

11.4.170 In addition, Scotland's Environment Web Map[20] indicates that Section E of the Proposed Development is located upon three groundwater bodies: the Invergordon groundwater body, the Muir of Ord groundwater body and the Northern Highlands groundwater body.

11.4.171 The Invergordon groundwater body (ID: 150679) covers an area of 520 km^2 and is reported to have an overall status of Good under the WFD. The aquifer is recorded as Old Red Sandstone North and has low to high aquifer productivity. It is overlain by moderate to low permeability strata which is several metres thick.

11.4.172 The Muir of Ord groundwater body (ID: 150619) covers an area of 158.3 km^2 and is reported to have an overall current status of Poor under the WFD. The aquifer is recorded as Old Red Sandstone North with a dominant fracture (minor intergranular), resulting in low to high aquifer productivity.

11.4.173 The Northern Highlands groundwater body (ID: 150701) covers an area of 9,382.3 km^2 and is reported to have an overall current status of Good under the WFD. The aquifer is recorded as Precambrian North with a dominant fracture flow, resulting in very low to low aquifer productivity.

Mineral Resources

11.4.174 THC Minerals Audit Interactive Map[25] and BGS GeoIndex[18] indicate that there are no records of active quarrying within Section E of the Proposed Development.

Radon Gas

11.4.175 The UK Radon Map[26] indicates that the majority of Section E of the Proposed Development is situated in a band of elevated radon potential, with 1-3% of homes at or above the Action Level. Near the southern extents of the Proposed Development, there are two isolated sections in the lowest band of radon potential, with less than 1% of homes at or above the Action Level. In addition, locally across the central areas of Section E, there is mapped maximum radon potential of 5-10% and 10- 30%.

11.4.176 The risk associated with ground gas is generally considered low across Section E of the Proposed Development, in accordance with BS8576[32], given that the majority of the Section is situated in mapped areas of very low radon potential. There are no proposed deep enclosed excavations across the Proposed Development and there is negligible risk when considering radon gas in open, well ventilated areas of excavation. Therefore, there is minimal associated risk to workers during the construction phase and radon gas is not considered further in the assessment of Section E of the Proposed Development.

Unexploded Ordnance (UXO)

11.4.177 The Zetica UXO Desk Study & Constraints Assessment[24] identifies areas of high, moderate and low risk within Section E of the Proposed Development relating to the Glenorrin range.

11.4.178 During World War II, a military training range was established at Glenorrin, encompassing part of the Study Area. Air Ministry (AM) map dating from July 1944 describes the area as a British Army firing range and delineates a 'Restricted Flying' area. However, other than grenade training at Ruttle Wood, no evidence of military training within the Glenorrin range has been found. It is considered likely that the 'Restricted Flying'

area represents a safety buffer, larger than the actual area of land used for training. It is also considered likely that training would have been focused on rural heathland and mountains, where conditions were more suitable for simulating battle conditions.

11.4.179 Due to the findings of this assessment, a qualified EOC Engineer was required during the intrusive peat and soil surveys across moderate to high risk UXO areas throughout Section E of the Proposed Development to ensure each survey location was safe to assess. During site walkovers, there was no evidence of any historic military training activities and no UXO detected.

Historical Maps and Contaminated Land

11.4.180 Contaminative sources are generally associated with historical industrial activities where localised or widespread contamination has occurred. These former activities predominantly occur in and around urban or industrial areas, or in rural areas focused on specific industries or activities (e.g. mining). However, given the predominantly rural nature and expansive undeveloped moorland across the Study Area, it is unlikely that a large number of contaminated sites would be encountered during construction activities.

11.4.181 Historical maps show that Section E of the Proposed Development has predominantly been undeveloped moorland, with areas of forestry and agricultural land. Commercial forestry has expanded across the Proposed Development in recent years.

11.4.182 The Coal Authority Interactive Map Viewer[23] shows that Section E of the Proposed Development is not within a coal mining reporting area and therefore is not considered to be at risk from coal mining activities. In addition, BGS GeoIndex[18] indicates that there are no mapped historic quarries, mines, pits and artificial ground situated within Section E of the Proposed Development.

11.4.183 The SEPA waste site information[33] was consulted for the presence of landfills and waste sites (authorised and historic) and no licensed sites are situated within Section E of the Proposed Development.

11.4.184 A former timber yard is situated at Achterneed, north of Strathpeffer, where timber treatments could have taken place. However, it is located approximately 1.15km to the east of the LoD at proposed Tower S154 and is therefore not considered to pose a direct contaminated land risk to the Proposed Development.

11.4.185 There is potential for contaminated land to be present across Section E, associated with former land uses including military training areas. In addition, there may also be potential for contaminated land associated with the construction of the existing OHL, major roads such as the A835 and the railway situated between proposed Towers S152 and S153 to the west of Dingwall. Torr Achilty Dam and Power Station is situated at the eastern edge of Loch Achonachie; however, this is situated approximately 650m west of the LoD and is not anticipated to have impacted the land within Section E of the Proposed Development.

11.4.186 During site walkovers and surveys, no evidence of potential contaminated land was encountered throughout Section E of the Proposed Development in relation to the factors listed.

Future Baseline

11.4.187 There is 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 slightly higher average temperatures. This suggests that there may be greater pressures on water supply 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. These climate change factors have been taken into account when considering the potential for significant effects.

11.5 Assessment of Effects

11.5.1 An assessment of the effects of the Proposed Development on the geological environment has been undertaken for Sections A to E, identifying significant effects during the construction and operational phases.

11.5.2 In this section, there is reference to the most significant findings from the existing baseline review (as discussed at **Section 11.4** above).

Construction Phase

Section A - Spittal to Brora

Disturbance and Excavation of Deep Peat

11.5.3 Construction activities including excavation of tracks, tower foundations and other key infrastructure can lead to disturbance of peat. Beyond the main construction activities, there are other considerations including the temporary storage of soils and peat across the Proposed Development. The details of peat disturbance through excavations and subsequent re-use methods are included in **Volume 5, Appendix 11.2: Outline PMP** and will be included in the Habitat Management Plan (HMP) submitted post-consent.

11.5.4 As stated in **Section 11.4**, Section A overlaps with areas of Class 1 and 2 peatland. Areas of deep peat are generally confined to flatter expanses and topographic lows. Peat is generally absent across areas with significant slopes and topographic highs.

11.5.5 Peat probing has been conducted across Section A of the Proposed Development at 8253 locations. 169 proposed towers were identified within areas of peat or peaty soil. The percentage of deep peat recorded from probe points across Section A is displayed in **Table 11.2**. The depth of peat at each location was measured and the assessment identified deep peat (>1 m) at a total of 71 tower locations within a 55 m radius from tower centres[34]. The full results are included in **Volume 5, Appendix 11.2: Outline PMP.** Micro-siting may be required during the construction process to avoid areas of deep peat (>1 m), where possible, within the LoD.

11.5.6 Peat probing was also conducted at 12 proposed permanent access track locations across Section A. The depth of peat along each track was determined and the assessment identified deep peat along six of the proposed permanent access tracks that had been surveyed.

11.5.7 Baseline studies identified Class 1 and 2 peatland is present across more than 20% of the Proposed Development area in Section A. As defined in the framework outlined in paragraph 11.3.32, this results in disturbance and excavation of deep peat within Section A being classified as a high sensitivity receptor in this assessment of effects.

11.5.8 Taking account of the embedded mitigation, the magnitude of impact is classed as low as peat soils will be disturbed but the value not impacted. The Outline PMP details how the disturbance to peat soils will be minimised through mitigation to maintain the value of the peat soils.

11.5.9 Therefore, with a high receptor sensitivity and a low magnitude of impact the significance of effect for the disturbance and excavation of peat would be classed as **moderate**, in the context of the EIA Regulations.

[34] Peat data was collected over a crosshair of 100 m x 100 m from the centre point of the proposed tower with probes at 10 m intervals to provide peat depth information at proposed tower bases, with allowance for potential micro-siting. Therefore, the peat data for each tower was analysed on this basis, using 55 m from tower centres to ensure all relevant data was included,

Peat Stability

11.5.10 The potential presence of peat and ground instability within the Study Area is a major factor that has been considered throughout the design phase of the Proposed Development. Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

11.5.11 Construction activities have the potential to increase the likelihood of peat slides if the ground conditions where the peat is present are altered. Such activities include the removal of surface vegetation, excavation of peat and other near surface soils from the bedding surface of the underlying rock and loading of soils through storage of materials which could increase the potential for instability.

11.5.12 Peat slides can affect soils and local sensitive habitats and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect if peat slides onto areas of sensitive habitat or causes damage to local surrounding surface soils, reducing water quality and/or modifying drainage patterns. Based on the Scottish Government guidance[6], the receptor criteria for assessing peat slide risks are:

- Non-critical infrastructure (minor/private roads, tracks);
- Watercourses and critical infrastructure (pipelines, motorways, dwellings and business properties etc.);
- Sub-Community (settlement 1-10 residents); and
- Community (settlement of >10 residents).

11.5.13 A detailed account of potential peat slide risk and appropriate mitigation is presented in **Volume 5, Appendix 11.1: PLHRA.**

11.5.14 Given the presence of Class 1 and 2 peatland across more than 20% of the Proposed Development, identified during baseline studies, peat instability across Section A is classified as a high sensitivity receptor.

11.5.15 Peat depths across Section A of the Proposed Development are generally shallow with approximately 76% of probes recording peat depths less than 1.0 m. The PLHRA has identified 14 risk zones across Section A and negligible to moderate risk of peat instability.

11.5.16 As noted at paragraph 11.3.35 above, good practice measures and guidance will be embedded in the design principles, and separately within the CEMP. Proposed drainage measures will be set out in the CEMP and through adoption of these measures, the risk of peat instability will be further reduced.

11.5.17 Following the implementation of mitigation measures, the magnitude of impact of peat stability in Section A has been classed as low. The assessment of peat stability, detailed in the PLHRA**,** identifies a negligible to moderate risk of peat instability throughout Section A. Taking account of the embedded mitigation measures, peat stability is not expected to adversely affect site infrastructure or require remedial action. Therefore, with a high receptor sensitivity and a low magnitude of impact the significance of effect for peat stability is classed as **moderate**, in the context of the EIA Regulations.

Loss and Compaction of Peat and Soils

11.5.18 During the construction phase, there is the potential that the Proposed Development infrastructure may result in degradation, removal or loss of soils. In particular, plant and vehicle movements, soil stripping and stockpiling may affect the nature of the peat and soils across the Proposed Development. Plant and vehicle movements may compact areas of unstripped soils and peat. All activity requiring removal, transport and stockpiling of soils may cause erosion of soils and loss of structure, resulting in overall soil degradation.

11.5.19 The key infrastructure which would cause potential loss and compaction of peat and soils are new permanent access tracks and tower bases. Other aspects of infrastructure which should be considered for excavation requirements include the upgrade or creation of bellmouths, temporary access tracks and temporary construction compound facilities. All traffic routes will be clearly demarcated across the Proposed Development and vehicles will not be permitted outwith these areas. In addition, only tracked or low ground pressure vehicles will be permitted to access any unstripped ground.

11.5.20 The Proposed Development has sought to avoid areas of deep peat, detailed further in **Section 11.3.** However, throughout Section A of the Proposed Development, deep peat is present within a 20 m radius[35] from the following proposed tower centres: N19, N22 - N30, N34, N35 ,N47, N50, N86, N96, N105, N121, N130 – N134, N137, N138, N142, N144, N154, N160 - N162, N165, N172, N173 and N191. **Volume 5, Appendix 11.1: PLHRA** and **Appendix 11.2: Outline PMP** outline the areas of deep peat along the Proposed Development.

11.5.21 In addition, deep peat has been recorded at numerous locations along the proposed access tracks. **Volume 5, Appendix 11.1: PLHRA** displays an interpolation of peat depths over 1.0 m deep and proposed locations for floating tracks.

11.5.22 Outwith areas of deep peat, the remainder of the peat deposits across the Proposed Development are classed as thin deposits between 0.5 and 1.0 m in depth. Further information on peat excavation is included in **Volume 5, Appendix 11.2: Outline PMP**, which details the peat volumes estimated for excavation and re-use. In addition, the HMP will be submitted post-consent and will detail areas of peatland which could be identified for restoration, such as areas of eroded peat, using surplus catotelmic peat[36] from excavations across the Proposed Development.

11.5.23 Excluding areas of peat, the remainder of the soils across Section A are less than 0.5 m deep and are generally classed as peaty or mineral soils that are not considered nationally and environmentally significant. These soils would be reinstated in the vicinity of their origin where possible.

11.5.24 In regard to compaction of soils, survey results have indicated that areas of Section A are underlain by thin soils and that construction of access tracks and movement of construction traffic, in the absence of good construction practice, could potentially lead to the compaction of these soils. Compaction reduces soil permeability, resulting in increased run-off and erosion of the soils. The superficial soils underlying the Proposed Development are of varying permeability; therefore, any potential compaction of soils could result in an increase in run-off, altering the existing ground conditions.

11.5.25 Considering all relevant factors, soil is classed as a medium sensitivity receptor, in relation to compaction and loss. The overall magnitude of impact is low therefore, the significance of effect associated with the loss of soils is considered to be **minor**, in the context of the EIA Regulations.

11.5.26 Due to the presence of deep peat across Section A, peat is classified as a high sensitivity receptor, in relation to compaction and loss. **Volume 5, Appendix 11.2: Outline PMP** identifies the volume of peat to be excavated and reused during construction. Embedded mitigation measures will minimise peat loss across Section A, resulting in a low overall magnitude of impact. Excavated peat will be reinstated as close to its original location as possible and repurposed for infrastructure redressing and peatland restoration. Consequently, all excavated peat is expected to be reused, reducing overall loss.

[35] Peat data has been analysed within a 20m radius from tower centres to focus on tower location and potential for micro-siting within this radius.
[36] Catotelmic peat is defined in Section 11.4.18.

11.5.27 With a high receptor sensitivity and a low magnitude of impact, the significance of effect associated with the loss and compaction of peat is classed as **moderate**, in the context of the EIA Regulations.

Impacts on Geology and Geological Designated Sites

11.5.28 As detailed in **Section 11.4**, there are several designated sites associated with the geology and soils environment across the Proposed Development. The presence of the Proposed Development within a designated geological site has the potential to damage or have adverse effects on the features of the designated site.

11.5.29 Section A overlaps with areas of the Caithness and Sutherland Peatlands SAC, SPA and Ramsar Site, the Shielton Peatlands SSSI, SPA, SAC and Ramsar Site and the Dunbeath Water SSSI. In addition, Banniskirk Quarry (SSSI and GCR) is situated in close proximity to the northern extents of Section A.

11.5.30 The Shielton Peatlands / Caithness and Sutherland Peatlands form part of The Flow Country (an intact and expansive blanket bog system that stretches across Caithness and Sutherland). The Flow Country was inscribed on the World Heritage List to UNESCO as of July 2024. These designated sites are all highly sensitive receptors.

11.5.31 Section A crosses the Shielton Peatlands / Caithness and Sutherland Peatlands at Towers N24 to N28 and Towers N33 to N37. The Proposed Development route has been micro-sited to minimise impact on these designated peatlands. In addition, the peat depth data has informed the Proposed Development design and where possible, areas of deep peat have been avoided. The controls included in the Proposed Development design and best practice measures aim to safeguard these designated peat deposits. This is to ensure that where possible, any qualifying features associated are not significantly impacted.

11.5.32 The Dunbeath Water SSSI, recognised for the Quaternary of Scotland Geology, is situated between Towers N83 and N84. The controls which would be adopted, as part of the CEMP, will ensure that, where possible, any qualifying features related to the designated sites are not significantly impacted and that significant erosion and sedimentation does not occur. This may include supervision by a suitably qualified and experienced clerk of works during the construction phase.

11.5.33 Banniskirk Quarry SSSI and GCR, recognised for the Silurian-Devonian Chordata fossils, is situated near the northern extent of the Proposed Development, approximately 170 m beyond the LoD to the northeast of Tower N2. The controls which would be adopted, as part of the CEMP, will ensure that, where possible, any qualifying features related to the designated sites are not significantly impacted and that significant erosion and sedimentation does not occur. It is unlikely that the Proposed Development would have any adverse effects on both the Banniskirk Quarry SSSI and GCR as it is situated outwith the construction corridor and LoD. However, given the proximity of the designated site, additional construction measures should be implemented throughout this area of the Proposed Development and detailed within the CEMP. This may include supervision by a suitably qualified and experienced clerk of works during the construction phase.

11.5.34 It is important to note that these nationally recognised geological formations and features are very localised across Section A and that the majority of peat, soils and bedrock do not exhibit any local, regional or nationally important minerals or geological features. Implementation of the controls as part of the CEMP will help to minimise any impacts to designated sites.

11.5.35 For Section A of the Proposed Development, receptor sensitivity is assessed as high due to the presence of SSSIs, SACs, GCR and the WHS. Using the criteria outlined in **Table 11.4**, the magnitude of impact would be medium as it would involve "*partial loss of a geological site where the value of the site would be affected*". Therefore, the significance of effect is classed as **moderate,** in the context of the EIA Regulations.

Contaminated Land

11.5.36 **Section 11.4** identified limited potential sources of contamination throughout Section A of the Proposed Development. The main sources of potential contamination identified across Section A were former pits and quarries, former military land uses, a sheep wash and construction of existing utilities and infrastructure. However, during site walkovers and visual inspections of the ground conditions, no evidence of potential contaminated land was identified.

11.5.37 If any evidence of potential contamination is encountered during the construction phase of the Proposed Development, appropriate action would be taken in accordance with the Applicant's GEMPs and the CEMP. The risk of contaminated land across the Site is considered to be low, therefore, disturbance of the soil across Section A of the Proposed Development is considered to be low sensitivity in relation to contaminated land with a low magnitude of impact. Therefore, the significance of effect is classed as **negligible,** in the context of the EIA Regulations.

Section B - Brora to Loch Buidhe

Disturbance and Excavation of Deep Peat

11.5.38 Construction activities including excavation of tracks, tower foundations and other key infrastructure can lead to disturbance of peat. Beyond the main construction activities, there are other considerations include the temporary storage of soils and peat across the Proposed Development. The details of peat disturbance through excavations and subsequent re-use methods are included in **Volume 5, Appendix 11.2: Outline PMP** and will be included in the HMP submitted post-consent.

11.5.39 As stated in **Section 11.4**, Section B overlaps with areas of Class 1 and 2 peatland. Areas of deep peat are generally confined to flatter expanses and topographic lows. Peat is generally absent across areas with significant slopes and topographic highs.

11.5.40 Peat probing has been conducted across Section B of the Proposed Development at 4279 locations. 89 proposed towers were identified within areas of peat or peaty soil, The percentage of deep peat recorded from probe points across Section B is displayed in **Table 11.2**.The depth of peat at each location was measured and the assessment identified deep peat (>1m) at 35 proposed tower locations within a 55 m radius of tower centres[34]. The full results are included in **Volume 5, Appendix 11.2: Outline PMP.** Micro-siting may be required during the construction process to avoid areas of deep peat (>1m), where possible, within the LoD.

11.5.41 Peat probing was also conducted along one proposed permanent access track location in Section B. The assessment did not identify any areas of deep peat (>1 m) along the proposed access track.

11.5.42 Baseline studies identified that Class 1 and 2 peatland is present across more than 20% of the Proposed Development area in Section B.As defined in the framework outlined in paragraph 11.3.32, this results in the disturbance and excavation of deep peat within Section B being classified as a high sensitivity receptor in this assessment of effects.

11.5.43 Taking account of the embedded mitigation, the magnitude of impact is classed as low as peat soils will be disturbed but the value not impacted. The Outline PMP details how the disturbance to peat soils will be minimised through mitigation to maintain the value of the peat soils.

11.5.44 Therefore, with a high receptor sensitivity and a low magnitude of impact the significance of effect for the disturbance and excavation of peat would be classed as **moderate**, in the context of the EIA Regulations.

Peat Stability

11.5.45 The potential presence of peat and ground instability within the Study Area is a major factor that has been considered throughout the design phase of the Proposed Development. Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

11.5.46 Construction activities have the potential to increase the likelihood of peat slides if the ground conditions where the peat is present are altered. Such activities include the removal of surface vegetation, excavation of peat and other near surface soils from the bedding surface of the underlying rock, and loading of soils through storage of materials which would increase the potential for instability.

11.5.47 Peat slides can affect soils and local sensitive habitats, and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect if peat slides onto areas of sensitive habitat or causes damage to local surrounding surface soils, reducing water quality and/or modifying drainage patterns. Based on the Scottish Government guidance[6], The receptor criteria for assessing peat slide risks are:

- Non-critical infrastructure (minor/private roads, tracks);
- Watercourses and critical infrastructure (pipelines, motorways, dwellings and business properties etc.);
- Sub-Community (settlement 1-10 residents); and
- Community (settlement of >10 residents).

11.5.48 A detailed account of potential peat slide risk and appropriate mitigation is presented in **Volume 5, Appendix 11.1: PLHRA.**

11.5.49 Given the presence of Class 1 and 2 peatland across more than 20% of the Proposed Development, peat instability across Section B is classified as a high sensitivity receptor.

11.5.50 Peat depths across Section B of the Proposed Development are generally shallow with approximately 81% of probes recording peat depths less than 1.0 m. The PLHRA has identified 17 risk zones across Section B and that the majority of Section B is at moderate to negligible risk of peat instability, prior to mitigation. However, there is one high risk zone (HA8) identified in Section B between proposed Towers N233 to N236. Evidence of a previous land slide originating from the southwestern extents of Tower N233 was identified during an aerial review of the Site. As a result, the hazard risk points situated adjacent to the slide and associated slope have been escalated from a moderate to high risk to account for this known instability. The high-risk points are all located along the southern LoD boundary. Across the remainder of the zone, the risk rating points for Proposed Infrastructure locations, including towers and tracks, vary from Negligible to Moderate. However, due to the evidence of a previous slide, a conservative approach has been undertaken when determining the overall hazard ranking of this area.

11.5.51 As noted in paragraph 11.3.35, good practice measures and guidance will be embedded in the design principles, and separately within the CEMP. Proposed drainage measures will be set out in the CEMP and through adoption of these measures, the risk of peat instability will be further reduced.

11.5.52 The magnitude of impact of peat stability in Section B has been classed as medium. The assessment of peat stability, detailed in the PLHRA**,** identifies a negligible to high risk of peat instability throughout the Section B, with the high-risk zone located between Towers N233 and N236. Taking account of the embedded mitigation measures overall peat stability is not expected to adversely affect site infrastructure or require remedial action. However, taking into account the identified high-risk zone a cautious approach has been adopted when

assessing the magnitude of impact. Therefore, with a high receptor sensitivity and a medium magnitude of impact the significance of effect for peat stability is classed as **moderate**, in the context of the EIA Regulations.

Loss and Compaction of Peat and Soils

11.5.53 During the construction phase, there is the potential that the Proposed Development infrastructure may result in degradation, removal or loss of soils. In particular, plant and vehicle movements, soil stripping and stockpiling may affect the nature of the peat and soils across the Proposed Development. Plant and vehicle movements may compact areas of unstripped soils and peat. All activity requiring removal, transport and stockpiling of soils may cause erosion of soils and loss of structure, resulting in overall soil degradation.

11.5.54 The key infrastructure which would cause potential loss and compaction of peat and soils are new access tracks and tower bases. Other aspects of infrastructure which should be considered for excavation requirements include the upgrade or creation of bellmouths and temporary construction compound facilities. All traffic routes will be clearly demarcated across the Proposed Development and vehicles will not be permitted outwith these areas. In addition, only tracked or low ground pressure vehicles will be permitted to access any unstripped ground.

11.5.55 The Proposed Development has sought to avoid areas of deep peat. However, throughout Section B of the Proposed Development, deep peat is present within a 20 m radius[35] from the following proposed tower centres: N209, N210, N213, N214, N227, N228, N229, N230, N231, N233, N235 – N237, N243, N246, N249, N268, N274 and N295. **Volume 5, Appendix 11.1: PLHRA** and **Appendix 11.2: Outline PMP** outline the areas of deep peat along the Proposed Development.

11.5.56 In addition, deep peat has been recorded in numerous locations along the proposed access tracks. **Volume 5, Appendix 11.1: PLHRA** displays an interpolation of peat depths over 1.0 m deep and proposed locations for floating tracks.

11.5.57 Outwith areas of deep peat, the remainder of the peat deposits across the Proposed Development are classed as thin deposits between 0.5 and 1.0 m in depth. Further information on peat excavation is included in **Volume 5, Appendix 11.2: Outline PMP**, which details the peat volumes estimated for excavation and re-use. In addition, the HMP will be submitted post-consent and will detail areas of peatland which could be identified for restoration, such as areas of eroded peat, using surplus catotelm peat from excavations across the Proposed Development.

11.5.58 Excluding areas of peat, the remainder of the soils across Section B are less than 0.5 m deep and are generally classed as peaty or mineral soils that are not considered nationally and environmentally significant. These soils would be reinstated in the vicinity of their origin where possible.

11.5.59 In regard to compaction of soils, survey results have indicated that areas of Section B are underlain by thin soils and that construction of access tracks and movement of construction traffic, in the absence of good construction practice, could potentially lead to the compaction of these soils. Compaction reduces soil permeability, resulting in increased run-off and erosion of the soils. The superficial soils underlying the Proposed Development are of varying permeability; therefore, any potential compaction of soils could result in an increase in run-off, altering the existing ground conditions.

11.5.60 Considering all relevant factors, soil is classed as a medium sensitivity receptor, in relation to compaction and loss. The overall magnitude of impact is low therefore, the significance of effect associated with the loss of soils is considered to be **minor**, in accordance with the EIA Regulations.

11.5.61 Due to the presence of deep peat across Section B, peat is classified as a high sensitivity receptor, in relation to compaction and loss.

11.5.62 **Volume 5, Appendix 11.2: Outline PMP** identifies the volume of peat to be excavated and reused during construction. Embedded mitigation measures will minimise peat loss across Section B, resulting in a low overall magnitude of impact. Excavated peat will be reinstated as close to its original location as possible and repurposed for infrastructure redressing and peatland restoration. Consequently, all excavated peat is expected to be reused, reducing overall loss.

11.5.63 With a high receptor sensitivity and a low magnitude of impact, the significance of effect associated with the loss and compaction of peat is classed as **moderate**, in the context of the EIA Regulations.

Impacts on Geology and Geological Designated Sites

11.5.64 As detailed in **Section 11.4**, Section B overlaps with two statutory designations of geological importance: Strathfleet SSSI and Aberscross Burn to Kinnauld GCR. Towers N262 and N263 are situated within the extents of these statutory designations.

11.5.65 The controls which would be adopted as part of the CEMP, will ensure that, where possible, any qualifying features related to the designated sites are not significantly impacted and that significant erosion and sedimentation does not occur. This may include supervision by a suitably qualified and experienced clerk of works during the construction phase.

11.5.66 It is important to note that these nationally recognised geological formations and features are very localised across Section B and the majority of peat, soils and bedrock do not exhibit any local, regional or nationally important minerals or geological features.

11.5.67 For Section B of the Proposed Development, receptor sensitivity is assessed as high due to the presence of a SSSI and GCR. Using the criteria outlined in **Table 11.4**, the magnitude of impact would be medium where "*partial loss of a geological site or mineral deposit [occurs], with major effects to the settings, or where the value of the site would be affected*". Therefore, the significance of effect is classed as **moderate** in the context of the EIA regulations.

Contaminated Land

11.5.68 **Section 11.4** identified limited potential sources of contamination throughout Section B of the Proposed Development. The main sources of potential contamination identified across Section B were former quarries, railways and the construction of the existing utilites and infrastructure. However, during site walkovers and visual inspections of the ground conditions, no evidence of contaminated land was identified.

11.5.69 If any evidence of potential contamination is encountered during the construction phase of the Proposed Development, appropriate action would be taken in accordance with the Applicant's GEMPs and the CEMP. On this basis, the risk of contaminated land across the Site is considered to be low, therefore, disturbance of the soil across Section B of the Proposed Development is considered to be low sensitivity in relation to contaminated land with a low magnitude of impact. Therefore, the significance of effect is classed as **negligible**, in the context of the EIA regulations.

<u>Section C - Loch Buidhe to Dounie</u>

Disturbance and Excavation of Deep Peat

11.5.70 Construction activities including excavation of tracks, tower foundations and other key infrastructure can lead to disturbance of peat. Beyond the main construction activities, there are other considerations include the

temporary storage of soils and peat across the Proposed Development. The details of peat disturbance through excavations and subsequent re-use methods are included in **Volume 5, Appendix 11.2: Outline PMP** and will be included in the HMP submitted post-consent.

11.5.71 As stated in **Section 11.4**, Section C overlaps with areas of Class 1, 2 and 5 peatland. Areas of deep peat are generally confined to flatter expanses and topographic lows. Peat is generally absent across areas with significant slopes and topographic highs.

11.5.72 Peat probing has been conducted across Section C of the Proposed Development at 1749 locations. 30 proposed towers were identified within areas of peat or peaty soil. The percentage of deep peat recorded from probe points across Section C is displayed in **Table 11.2**.The depth of peat at each location was measured and the assessment identified deep peat (>1 m) at 14 tower locations within a 55 m radius from each of the tower centres[34]. The full results are included in **Volume 5, Appendix 11.2: Outline PMP.** Micro-siting may be required during the construction process to avoid areas of deep peat (>1 m), where possible, within the LoD.

11.5.73 Peat probing was also conducted along four proposed permanent access track locations across Section C. The depth of peat along each track was determined and the assessment identified deep peat (>1 m) along three of the proposed permanent access tracks that had been surveyed.

11.5.74 Baseline studies identified that Class 1 and 2 peatland is present across more than 20% of the Proposed Development area in Section C. As defined in the framework outlined in paragraph 11.3.32, this results in the disturbance and excavation of deep peat within Section C being classified as a High sensitivity receptor in this assessment of effects.

11.5.75 Taking account of the embedded mitigation measures, the magnitude of impact is classed as low as soils will be disturbed but the value not impacted. The Outline PMP details how the disturbance to peat soils will be minimised through mitigation to maintain the value of the peat soils.

11.5.76 Therefore, with a high receptor sensitivity and a low magnitude of impact the significance of effect for the disturbance and excavation of peat would be classed as **moderate**, in the context of the EIA Regulations.

Peat Stability

11.5.77 The potential presence of peat and ground instability within the Study Area is a major factor that has been considered throughout the design phase of the Proposed Development. Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

11.5.78 Construction activities have the potential to increase the likelihood of peat slides if the ground conditions where the peat is present are altered. Such activities include the removal of surface vegetation, excavation of peat, and other near surface soils from the bedding surface of the underlying rock, and loading of soils through storage of materials which would increase the potential for instability.

11.5.79 Peat slides can affect soils and local sensitive habitats, and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect if peat slides onto areas of sensitive habitat or causes damage to local surrounding surface soils, reducing water quality and/or modifying drainage patterns. Based on the Scottish Government guidance[6], the receptor criteria for assessing peat slide risks are:

- Non-critical infrastructure (minor/private roads, tracks);
- Watercourses and critical infrastructure (pipelines, motorways, dwellings and business properties etc.);

- Sub-Community (settlement 1-10 residents); and
- Community (settlement of >10 residents).

11.5.80 A detailed account of potential peat slide risk and appropriate mitigation is presented in **Volume 5, Appendix 11.1: PLHRA**.

11.5.81 Given the presence of Class 1 and 2 peatland across more than 20% of the Proposed Development, peat instability across Section C is classified as a high sensitivity receptor.

11.5.82 Peat depths across Section C of the Proposed Development are generally shallow with approximately 79% of probes recording peat depths less than 1.0 m. The PLHRA has identified 4 risk zones across Section C and that there is low to negligible risk of peat instability across Section C prior to mitigation.

11.5.83 As noted in paragraph 11.3.35, good practice measures and guidance will be embedded in the design principles and separately within the CEMP. Proposed drainage measures will be set out in this document and through adoption of these measures, the risk of peat instability will be further reduced.

11.5.84 The magnitude of impact of peat stability in Section C has been classed as low. The assessment of peat stability, detailed in the PLHRA**,** identifies a negligible to low risk of peat instability throughout the Section C. Taking account of the embedded mitigation measures peat stability is not expected to adversely affect site infrastructure or require remedial action. Therefore, with a high receptor sensitivity and a low magnitude of impact, the significance of effect for peat stability would be classed as **moderate**, in the context of the EIA Regulations.

Loss and Compaction of Peat and Soils

11.5.85 During the construction phase, there is the potential that the Proposed Development infrastructure may result in degradation, removal or loss of soils. In particular, plant and vehicle movements, soil stripping and stockpiling may affect the nature of the peat and soils across the Proposed Development. Plant and vehicle movements may compact areas of unstripped soils and peat. All activity requiring removal, transport and stockpiling of soils may cause erosion of soils and loss of structure, resulting in overall soil degradation.

11.5.86 The key infrastructure which would cause potential loss and compaction of peat and soils are new access tracks and tower bases. Other aspects of infrastructure which should be considered for excavation requirements include the upgrade or creation of bellmouths and temporary construction compound facilities. All traffic routes will be clearly demarcated across the Proposed Development and vehicles will not be permitted outwith these areas. In addition, only tracked or low ground pressure vehicles will be permitted to access any unstripped ground.

11.5.87 The Proposed Development has sought to avoid areas of deep peat. However, throughout Section C of the Proposed Development, deep peat was recorded within a 20 m radius[35] from the following tower centres: 3, 4, 9, 13, 14, 16, 17, 31, 33 and 35. **Volume 5, Appendix 11.1: PLHRA** and **Appendix 11.2: Outline PMP** outline the areas of deep peat along the Proposed Development.

11.5.88 In addition, deep peat has been recorded in numerous locations along the proposed access tracks. **Volume 5, Appendix 11.1: PLHRA** displays an interpolation of peat depths over 1.0m deep and proposed locations for floating tracks.

11.5.89 Outwith areas of deep peat, the remainder of the peat deposits across the Proposed Development are classed as thin deposits between 0.5 and 1.0m in depth. Further information on peat excavation is included in **Volume 5, Appendix 11.2: Outline PMP**, which details the peat volumes estimated for excavation and re-use. In

addition, the HMP will be submitted post-consent and will detail areas of peatland which could be identified for restoration, such as areas of eroded peat, using the surplus catotelm peat from excavations across the Proposed Development.

11.5.90 Excluding areas of peat, the remainder of the soils across Section C are less than 0.5 m deep and are generally classed as peaty or mineral soils that are not considered nationally and environmentally significant. These soils would be reinstated in the vicinity of their origin where possible.

11.5.91 In regard to compaction of soils, survey results have indicated that areas of Section C are underlain by thin soils and that construction of access tracks and movement of construction traffic, in the absence of good construction practice, could potentially lead to the compaction of these soils. Compaction reduces soil permeability, resulting in increased run-off and erosion of the soils. The superficial soils underlying the Proposed Development are of varying permeability; therefore, any potential compaction of soils could result in an increase in run-off, altering the existing ground conditions.

11.5.92 Considering all relevant factors, soil is classed as a medium sensitivity receptor, in relation to compaction and loss. The overall magnitude of impact is low therefore, the significance of effect associated with the loss of soils is considered to be **minor**, in the context of the EIA regulations.

11.5.93 Due to the presence of deep peat across Section C, peat is classified as a high sensitivity receptor, in relation to compaction and loss.

11.5.94 **Volume 5, Appendix** 11.2: Outline PMP identifies the volume of peat to be excavated and reused during construction. Embedded mitigation measures will minimise peat loss across Section C, resulting in a low overall magnitude of impact. Excavated peat will be reinstated as close to its original location as possible and repurposed for infrastructure redressing and peatland restoration. Consequently, all excavated peat is expected to be reused, reducing overall loss.

11.5.95 With a high receptor sensitivity and a low magnitude of impact the significance of effect associated with the loss and compaction of peat is classed as **moderate**, in the context of the EIA regulations.

Impacts on Geology and Geological Designated Sites

11.5.96 Desk based research has indicated that Section C does not overlap with any geological designated sites and that the underlying bedrock geology does not exhibit any local, regional or nationally important features or minerals.

11.5.97 Using the criteria outlined in **Table 11.4**, while the receptor sensitivity is assessed as low where "*geological features or geology [are] not protected and [are] not considered worthy of specific protection*", the magnitude of impact would be low where "*small effect on a geological site or mineral deposit, such that the value of the site would not be affected*." Therefore, the significance of effect is classed as **negligible,** in the context of the EIA Regulations.

Contaminated Land

11.5.98 **Section 11.4** identified limited potential sources of contamination throughout Section C of the Proposed Development. No sources of potential contamination were identified across Section C. This was confirmed by observations during site walkovers and visual inspections of the ground conditions where there was no evidence of any contaminated land present.

11.5.99 If any evidence of potential contamination is encountered during the construction phase of the Proposed Development, appropriate action would be taken in accordance with the Applicant's GEMPs and the CEMP. On

this basis, the risk of contaminated land across the Site is considered to be low, therefore, disturbance of the soil across Section C of the Proposed Development is considered to be low sensitivity in relation to contaminated land with a low magnitude of impact. Therefore, the significance of effect is classed as **negligible,** in the context of the EIA Regulations.

Section D - Dounie to near Strathpeffer

Disturbance and Excavation of Deep Peat

11.5.100 Construction activities including excavation of tracks, tower foundations and other key infrastructure can lead to disturbance of peat. Beyond the main construction activities, there are other considerations include the temporary storage of soils and peat across the Proposed Development. The details of peat disturbance through excavations and subsequent re-use methods are included in **Volume 5, Appendix 11.2: Outline PMP** and will be included in the HMP submitted post-consent.

11.5.101 As stated in **Section 11.4**, Section D overlaps with areas of Class 1 and 2 peatland. Areas of deep peat are generally confined to flatter expanses and topographic lows. Peat is generally absent across areas with significant slopes and topographic highs.

11.5.102 Peat probing has been conducted across Section D of the Proposed Development at 1774 locations. 46 proposed towers were identified within areas of peat or peaty soil. The percentage of deep peat recorded from probe points across Section D is displayed in **Table 11.2**. The depth of peat at each location was measured and the assessment identified deep peat (>1 m) at 27 tower locations within a 55 m radius from tower centres[34]. The full results are included in **Volume 5, Appendix 11.2: Outline PMP.** Micro-siting may be required during the construction process to avoid areas of deep peat (>1m), where possible, within the LoD.

11.5.103 Peat probing was also conducted along one proposed permanent access track across Section D. The results of the survey indicated that there were areas of deep peat (>1 m) along the proposed access track.

11.5.104 Class 1 and 2 peatland is present across more than 20% of the Proposed Development area in Section D. As defined in the framework outlined in paragraph 11.3.32, this results in the disturbance and excavation of deep peat within Section D being classified as a high sensitivity receptor in this assessment of effects

11.5.105 Taking account of the embedded mitigation measures, the magnitude of impact is classed as low as soils will be disturbed but the value not impacted. The Outline PMP details how the disturbance to peat soils will be minimised through mitigation to maintain the value of the peat soils.

11.5.106 Therefore, with a high receptor sensitivity and a low magnitude of impact the significance of effect for the disturbance and excavation of peat would be classed as **moderate**, in the context of the EIA Regulations.

Peat Stability

11.5.107 The potential presence of peat and ground instability within the Study Area is a major factor that has been considered throughout the design phase of the Proposed Development. Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

11.5.108 Construction activities have the potential to increase the likelihood of peat slides if the ground conditions where the peat is present are altered. Such activities may involve the removal of surface vegetation, excavation of peat and other near surface soils from the bedding surface of the underlying rock, and loading of soils through storage of materials which would increase the potential for instability.

11.5.109 Peat slides can affect soils and local sensitive habitats, and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect if peat slides onto areas of sensitive habitat or causes damage to local surrounding surface soils, reducing water quality and/or modify drainage patterns. Based on the Scottish Government guidance[6], the receptor criteria for assessing peat slide risks are:

- Non-critical infrastructure (minor/private roads, tracks);
- Watercourses and critical infrastructure (pipelines, motorways, dwellings and business properties etc.);
- Sub-Community (settlement 1-10 residents); and
- Community (settlement of >10 residents).

11.5.110 A detailed account of potential peat slide risk and appropriate mitigation is presented in **Volume 5, Appendix 11.1: PLHRA.**

11.5.111 Given the presence of Class 1 and 2 peatland across more than 20% of the Proposed Development, peat instability across Section D is classified as a high sensitivity receptor.

11.5.112 Peat depths across Section D of the Proposed Development are generally shallow with approximately 75% of probes recording peat depths less than 1.0 m. The PLHRA has identified 8 risk zones across Section D and that there is moderate to negligible risk of peat instability across Section D prior to mitigation.

11.5.113 As noted in paragraph 11.3.35, good practice measures and guidance will be embedded in the design principles and separately within the CEMP. Proposed drainage measures will be set out in the CEMP and through adoption of these measures, the risk of peat instability will be further reduced.

11.5.114 The magnitude of impact of peat stability in Section D has been classed as low. The assessment of peat stability, detailed in the PLHRA**,** identifies a low to moderate risk of peat instability throughout the Section D. Taking account of the embedded mitigation measures peat stability is not expected to adversely affect site infrastructure or require remedial action. Therefore, with a high receptor sensitivity and a low magnitude of impact the significance of effect for peat stability is classed as **moderate**, in the context of the EIA Regulations.

Loss and Compaction of Peat and Soils

11.5.115 During the construction phase, there is the potential that the Proposed Development infrastructure may result in degradation, removal or loss of soils. In particular, plant and vehicle movements, soil stripping and stockpiling may affect the nature of the peat and soils across the Proposed Development. Plant and vehicle movements may compact areas of unstripped soils and peat. All activity requiring removal, transport and stockpiling of soils may cause erosion of soils and loss of structure, resulting in overall soil degradation.

11.5.116 The key infrastructure would cause potential loss and compaction of peat and soils are new access tracks and tower bases. Other aspects of infrastructure which should be considered for excavation requirements include the upgrade or creation of bellmouths and temporary construction compound facilities. All traffic routes will be clearly demarcated across the Proposed Development and vehicles will not be permitted outwith these areas. In addition, only tracked or low ground pressure vehicles will be permitted to access any unstripped ground.

11.5.117 The Proposed Development has sought to avoid areas of deep peat. However, throughout Section D of the Proposed Development, deep peat (>1 m) was recorded within a 20 m radius[35] from the following proposed tower centres: S46, S47, S51 -S53, S55, S56, S59, S60, S62 -S70, S73, S83, S107 and S108. **Volume 5, Appendix 11.1: PLHRA** and **Appendix 11.2: Outline PMP** outlines the areas of deep peat along the Proposed Development.

11.5.118 In addition, deep peat has been recorded in numerous locations along the proposed access tracks. **Volume 5, Appendix 11.1: PLHRA** displays an interpolation of peat depths over 1.0 m deep and proposed locations for floating tracks.

11.5.119 Outwith areas of deep peat, the remainder of the peat deposits across the Proposed Development are classed as thin deposits between 0.5 and 1.0 m in depth. Further information on peat excavation is included in **Volume 5, Appendix 11.2: Outline PMP**, which details the peat volumes estimated for excavation and re-use. In addition, the HMP will be submitted post-consent and will detail areas of peatland which could be identified for restoration, such as areas of eroded peat, to account for the surplus catotelmic peat from excavations across the Proposed Development.

11.5.120 Excluding areas of peat, the remainder of the soils across Section D are less than 0.5 m deep and are generally classed as peaty or mineral soils that are not considered nationally and environmentally significant. These soils would be reinstated in the vicinity of their origin where possible.

11.5.121 In regard to compaction of soils, survey results have indicated that areas of Section D are underlain by thin soils and that construction of access tracks and movement of construction traffic, in the absence of good construction practice, could potentially lead to the compaction of these soils. Compaction reduces soil permeability, resulting in increased run-off and erosion of the soils. The superficial soils underlying the Proposed Development are of varying permeability; therefore, any potential compaction of soils could result in an increase in run-off, altering the existing ground conditions.

11.5.122 Considering all relevant factors, soil is classed as a medium sensitivity receptor, in relation to compaction and loss. The overall magnitude of impact is low therefore, the significance of effect associated with the loss of soils is considered to be **minor**, in the context of the EIA regulations.

11.5.123 Due to the presence of deep peat across Section D, peat is classified as a high sensitivity receptor, in relation to compaction and loss.

11.5.124 **Volume 5, Appendix 11.2: Outline PMP** identifies the volume of peat to be excavated and reused during construction. Embedded mitigation measures will minimise peat loss across Section D, resulting in a low overall magnitude of impact. Excavated peat will be reinstated as close to its original location as possible and repurposed for infrastructure redressing and peatland restoration. Consequently, all excavated peat is expected to be reused, reducing overall loss.

11.5.125 With a high receptor sensitivity and a low magnitude of impact the significance of effect associated with the loss and compaction of peat is classed as **moderate**, in the context of the EIA Regulations.

Impacts on Geology and Geological Designated Sites

11.5.126 As detailed in **Section 11.4**, Section D does not overlap with any geological designated sites and that the underlying bedrock geology does not exhibit any local, regional or nationally important features or minerals.

11.5.127 Using the criteria outlined in **Table 11.4**, while the receptor sensitivity is assessed as low where "*geological features or geology [are] not protected and [are] not considered worthy of specific protection*", the magnitude of impact would be Low where "*small effect on a geological site or mineral deposit, such that the value of the site would not be affected*.". Therefore, the significance of effect is classed as **negligible,** in the context of the EIA Regulations.

Contaminated Land

11.5.128 **Section 11.4** identified limited potential sources of contamination throughout Section D of the Proposed Development. The main source of potential contamination identified across Section D was former military uses. However, during site walkovers and visual inspections of the ground conditions, no evidence of potential contaminated land was identified.

11.5.129 If any evidence of potential contamination is encountered during the construction phase of the Proposed Development, appropriate action would be taken in accordance with the Applicant's GEMPs and the CEMP. On this basis, the risk of contaminated land across the Site is considered to be low, therefore, disturbance of the soil across Section D of the Proposed Development is considered to be low sensitivity in relation to contaminated land with a low magnitude of impact. Therefore, the significance of effect is classed as **negligible,** in the context of the EIA Regulations.

Section E - Near Strathpeffer to Beauly

Disturbance and Excavation of Deep Peat

11.5.130 Construction activities including excavation of tracks, tower foundations and other key infrastructure can lead to disturbance of peat. Beyond the main construction activities, there are other considerations include the temporary storage of soils and peat across the Proposed Development. The details of peat disturbance through excavations and subsequent re-use methods are included in **Volume 5, Appendix 11.2: Outline PMP** and will be included in the HMP submitted post-consent.

11.5.131 As stated in **Section 11.4**, Section E overlaps with localised areas of Class 1 and 2 peatland. Areas of deep peat are generally confined to flatter expanses and topographic lows. Peat is generally absent across areas with significant slopes and topographic highs.

11.5.132 Peat probing has been conducted across Section E of the Proposed Development at 1316 locations. 24 proposed towers were identified within areas of peat or peaty soil. The percentage of deep peat recorded from probe points across Section E is displayed in **Table 11.2**.The depth of peat at each location was measured and the assessment identified deep peat (>1 m) at 14 tower locations within a 55 m radius from each of the tower centres[34]. The full results are included in **Volume 5, Appendix 11.2: Outline PMP.** Micro-siting may be required during the construction process to avoid areas of deep peat (>1 m), where possible, within the LoD.

11.5.133 Peat probing was also conducted along eight proposed permanent access track locations across Section E. The depth of peat along each track was determined and the assessment identified deep peat (>1 m) along 4 of the proposed permanent access tracks.

11.5.134 Class 1 and 2 peatland is present across less than 20% of the Proposed Development area within Section E. As defined in the framework outlined in paragraph 1.3.32 this results in the disturbance and excavation of deep peat across Section E being classified as a medium sensitivity receptor in this assessment of effects.

11.5.135 Taking account of the embedded mitigation measures the magnitude of impact is classed as low as peat soils will be disturbed but the value not impacted. The Outline PMP details how the disturbance to peat soils will be minimised through mitigation to maintain the value of the peat soils.

11.5.136 Therefore, with a medium receptor sensitivity and a low magnitude of impact the significance of effect for the disturbance and excavation of peat would be classed as **minor**, in the context of the EIA Regulations.

Peat Stability

11.5.137 The potential presence of peat and ground instability within the Study Area is a major factor that has been considered throughout the design phase of the Proposed Development. Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

11.5.138 Construction activities have the potential to increase the likelihood of peat slides if the ground conditions where the peat is present are altered. Such activities include the removal of surface vegetation, excavation of peat and other near surface soils from the bedding surface of the underlying rock, and loading of soils through storage of materials which would increase the potential for slide.

11.5.139 Peat slides can affect soils and local sensitive habitats, and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect if peat slides onto areas of sensitive habitat, or causes damage to local surrounding surface soils, reducing water quality and/or modifying drainage patterns. Based on the Scottish Government guidance[6], the receptor criteria for assessing peat slide risks are:

- Non-critical infrastructure (minor/private roads, tracks);
- Watercourses and critical infrastructure (pipelines, motorways, dwellings and business properties etc.);
- Sub-Community (settlement 1-10 residents); and
- Community (settlement of >10 residents).

11.5.140 A detailed account of potential peat slide risk and appropriate mitigation is presented in **Volume 5, Appendix 11.1: PLHRA**.

11.5.141 Given the presence of Class 1 and 2 peatland across less than 20% of the Proposed Development, peat instability across Section E is classified as a medium sensitivity receptor.

11.5.142 Peat depths across Section E of the Proposed Development are generally shallow with approximately 86% of probes recording peat depths less than 1.0 m. The PLHRA has identified 5 risk zones across Section E and that there is moderate to negligible risk of peat instability across Section E.

11.5.143 As noted in paragraph 11.3.25, good practice measures and guidance are embedded in the design principles and separately within the CEMP. Proposed drainage measures will be set out in the CEMP and through adoption of these measures, the risk of peat instability will be further reduced.

11.5.144 The magnitude of impact of peat stability in Section E has been classed as low. The assessment of peat stability, detailed in the **PLHRA,** identifies a negligible to moderate risk of peat instability throughout the Section E. Taking account of the embedded mitigation measures, peat stability is not expected to adversely affect site infrastructure or require remedial action. Therefore, with a moderate receptor sensitivity and a low magnitude of impact the significance of effect for peat stability is classed as **minor**, in the context of the EIA Regulations.

Loss and Compaction of Peat and Soils

11.5.145 During the construction phase, there is the potential that the Proposed Development infrastructure may result in degradation, removal or loss of soils. In particular, plant and vehicle movements, soil stripping and stockpiling may affect the nature of the peat and soils across the Proposed Development. Plant and vehicle movements may compact areas of unstripped soils and peat. All activity requiring removal, transport and stockpiling of soils may cause erosion of soils and loss of structure, resulting in overall soil degradation.

11.5.146 The key infrastructure would cause potential loss and compaction of peat and soils are new access tracks and tower bases. Other aspects of infrastructure which should be considered for excavation requirements include the upgrade or creation of bellmouths and temporary construction compound facilities. All traffic routes will be clearly demarcated across the Proposed Development and vehicles will not be permitted outwith these areas. In addition, only tracked or low ground pressure vehicles will be permitted to access any unstripped ground.

11.5.147 The Proposed Development has sought to avoid areas of deep peat. However, throughout Section E of the Proposed Development, deep peat (>1m) was recorded within a 20 m radius[35] from the following proposed tower centres: S203, S207 - S212, S215 and S219. **Volume 5, Appendix 11.1: PLHRA** and **Appendix 11.2: Outline PMP** outline the areas of deep peat along the Proposed Development.

11.5.148 In addition, deep peat has been recorded in numerous locations along the proposed access tracks. **Volume 5, Appendix 11.1: PLHRA** displays an interpolation of peat depths over 1.0 m deep and proposed locations for floating tracks.

11.5.149 Outwith areas of deep peat, the remainder of the peat deposits across the Proposed Development are classed as thin deposits between 0.5 and 1.0m in depth. Further information on peat excavation is included in **Volume 5, Appendix 11.2: Outline PMP**, which details the peat volumes estimated for excavation and re-use. In addition, the HMP will be submitted post-consent and will detail areas of peatland which could be identified for restoration, such as areas of eroded peat, using surplus catotelm peat from excavations across the Proposed Development.

11.5.150 Excluding areas of peat, the remainder of the soils across Section E are less than 0.5 m deep and are generally classed as peaty or mineral soils that are not considered nationally and environmentally significant. These soils would be reinstated in the vicinity of their origin where possible.

11.5.151 In regard to compaction of soils, survey results have indicated that areas of Section E are underlain by thin soils and that construction of access tracks and movement of construction traffic, in the absence of good construction practice, could potentially lead to the compaction of these soils. Compaction reduces soil permeability, resulting in increased run-off and erosion of the soils. The superficial soils underlying the Proposed Development are of varying permeability; therefore, any potential compaction of soils could result in a increase in run-off, altering the existing ground conditions.

11.5.152 Considering all relevant factors, soil is classed as a medium sensitivity receptor, in relation to compaction and loss. The overall magnitude of impact is low therefore, the significance of effect associated with the loss of soils is considered to be **minor**, in the context of the EIA Regulations.

11.5.153 Due to the presence of localised deep peat across Section E, peat is classified as a medium sensitivity receptor, in relation to compaction and loss.

11.5.154 **Volume 5, Appendix 11.2: Outline PMP** identifies the volume of peat to be excavated and reused during construction. Embedded mitigation measures will minimise peat loss across Section E, resulting in a low overall magnitude of impact. Excavated peat will be reinstated as close to its original location as possible and repurposed for infrastructure redressing and peatland restoration. Consequently, all excavated peat is expected to be reused, reducing overall soil loss.

11.5.155 With a medium receptor sensitivity and a low magnitude of impact, the significance of effect associated with the loss and compaction of peat is classed as **minor**, in the context of the EIA regulations.

Impacts on Geology and Geological Designated Sites

11.5.156 As detailed in **Section 11.4**, Section E does not overlap with any geological designated sites and that the underlying bedrock geology does not exhibit any local, regional or nationally important features or minerals.

11.5.157 Using the criteria outlined in Table 11.4, while the receptor sensitivity is assessed as Low where "*geological features or geology [are] not protected and [are] not considered worthy of specific protection*", the magnitude of impact would be low where "*small effect on a geological site or mineral deposit, such that the value of the site would not be affected*.". Therefore, the significance of effect is classed as **negligible** in the context of the EIA regulations.

Contaminated Land

11.5.158 **Section 11.4** identified limited potential sources of contamination throughout Section E of the Proposed Development. The main sources of potential contamination identified across Section E include former military land uses, the Torr Achilty Dam and Power Station, a railway, a former timber yard and the construction of existing roads and utility infrastructure. However, during site walkovers and visual inspections of the ground conditions, no evidence of any contaminated land was identified.

11.5.159 If any evidence of potential contamination is encountered during the construction phase of the Proposed Development, appropriate action would be taken in accordance with the Applicant's GEMPs and the CEMP. On this basis, the risk of contaminated land across the Site is considered to be low, therefore, disturbance of the soil across Section E of the Proposed Development is considered to be low sensitivity in relation to contaminated land with a low magnitude of impact. Therefore, the significance of effect is classed as **negligible,** in accordance with the EIA Regulations.

Operational Phase

11.5.160 During the operation of the Proposed Development, it is anticipated that routine maintenance of infrastructure would be required. It is not anticipated that there would be any excavation or need to stockpile large volumes of soils or peat, reducing the potential effects on soils or ground stability. Should any excavation be required, this is likely to be limited. Any excavation, handling and placement of material would be subject to the same safeguards that would be used during the construction phase of the Proposed Development.

11.5.161 There would be no anticipated impacts upon the geology, soils or peat during the operational phase therefore, effects will be **not significant**.

11.5.162 Peatland restoration is planned across the Study Area. Habitat enhancement and mitigation is considered within **Chapter 8: Ecology and Nature Conservation,** however, more detailed information on necessary compensation will be provided at a later stage due to the requirement for landowner agreement.

11.6 Cumulative Effects

11.6.1 Geology, soils and peat are considered localised receptors specific to the defined Proposed Development area; therefore, intra and inter-project developments in the wider vicinity of the Proposed Development have not been considered to have a cumulative effect on the localised geological environment. Three developments have been identified for consideration of intra-project cumulative effects. These are the three substations outlined in **Table 11.20** below:

Table 11.20: List of Projects considered for intra-project effects

Development	Distance from Proposed Development	Status
Banniskirk 400kV Substation and HVDC Converter Station	Adjacent	Under Consideration
Carnaig 400kV Substation	Adjacent	Under Consideration
Fanellan 400kV Substation and HVDC Converter Station	Adjacent	Under Consideration

11.6.2 One development has been identified for consideration of inter-project cumulative effects as it is directly adjacent to the Proposed Development, outlined in **Table 11.21** below:

Table 11.21: List of Projects considered for inter-project effects

Development	Distance from Proposed Development	Status
Beauly to Blackhillock to New Deer to Peterhead 400kV OHL	Adjacent	Scoping Application Decision Issued

11.6.3 The Banniskirk, Carnaig and Fannellan substations and the Beauly to Blackhillock to New Deer to Peterhead 400 kV OHL all have the potential for cumulative effects on the geological environment. The proposed substations and the Beauly to Blackhillock to New Deer to Peterhead 400kV OHL are all located within the Proposed Development.

11.6.4 Whilst these developments might present significant effects to the geological environment in their own right, no significant effects have been identified localised to the Proposed Development. Assuming the other developments will adopt best practice measures, relevant legalisation, planning policy and guidance regulated by statutory consultees, no significant cumulative effects are therefore anticipated. Furthermore, the construction programmes for each of the developments is expected to limit the likelihood of construction activities coinciding. On this basis, cumulative effects during the construction and operation on the geological environment are considered to be not significant.

11.7 Mitigation

11.7.1 Embedded mitigation has been developed as the Proposed Development design has progressed through the route, alignment and EIA stages. Standard mitigation measures relating to the geological environment, during construction and operational phases, are embedded through the design and adoption of best practice measures during construction to ensure that disturbance of geology, peat and soils is avoided or minimised. Further information on the embedded mitigation measures is detailed in **Section 11.3**.

11.7.2 **Chapter 4: The Routing Process and Alternatives** details how peatlands were initially avoided through the early alignment options of the Proposed Development. During the later stages of design, alternative options were evaluated with a focus on tower positions and the placement of ancillary infrastructure, such as access tracks.

11.7.3 Embedded mitigation was taken into account in the assessment of effects. Following the assessment of effects, additional mitigation measures are put in place to further mitigate the significance of effects. Additional mitigation specific to each potential effect are listed below:

Disturbance of Deep Peat

- Avoid the loading on deep peat.

- Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.

Peat Stability

- Visual inspections to be completed in areas of moderate to high risk, as identified by the PLHRA, during construction and for a period after and during heavy rainfall events to identify risk to slope stability.
- Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the peat data collected that identifies increased stability risk, e.g., due to localised topography or ground conditions.

Loss and Compaction of Peat

- Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.
- Reuse of surplus peat that is removed from in situ conditions to other areas within the Proposed Development.

Loss and Compaction of Soils

- Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys.
- Reuse of surplus soils that is removed from in situ conditions to other areas within the Proposed Development.

Impact on Solid Geology and Geological Designated Sites

- Use of the LoD to aid micro-siting of Proposed Development infrastructure to limit impacts on solid geology.

Impact on Contaminated Land

- Where potential contamination is identified, strategies for the assessment, mitigation or remediation of the contamination will be developed and agreed with the regulatory authorities.

11.8 Residual Effects

11.8.1 Following the inclusion of the additional mitigation measures detailed in **Section 11.7**, residual effects associated with each potential effect are detailed below.

Disturbance of Deep Peat

11.8.2 The residual effect, following the implementation of additional mitigation, associated with the disturbance of deep peat will be **minor** in Sections A, B, C and D, and **negligible** in Section E, and, therefore, **not significant** in the context of the EIA Regulations.

Peat Stability

11.8.3 The residual effect, following the implementation of additional mitigation, associated with peat stability will be **minor** in Sections A, C and D, and **negligible** in Section E, and, therefore, **not significant** in the context of the EIA Regulations.

11.8.4 For Section B a residual effect of moderate remains the same as the significance of effect following the implementation of additional mitigation, due to the presence of a known historical peat slide. The peat slide risk is dynamic risk assessment and the residual effect will remain until further ground investigation has been undertaken during the preconstruction phase of the Proposed Development. The risk will be reviewed further and the design for the construction phase include the implementation of any additional mitigation required in the

areas identified as having a moderate to high risk of peat slide. In addition, continuous reviews will be undertaken during construction phase to account for the site and weather conditions as appropriate for the phase of construction. The PLHRA is a dynamic document that will undergo continuous evaluation and updates throughout the Proposed Development construction phase.

11.8.5 Due to the presence of a high-risk rating zone identified in Section B identified during the Hazard Ranking in the PLHRA, and the high sensitivity of the receptor, the residual effect for Section B will be **moderate** and therefore **significant** in the context of the EIA regulations.

Loss and Compaction of Peat

11.8.6 The residual effect, following the implementation of additional mitigation, associated with the loss and compaction of peat will be **minor** in Sections A, B, C and D, and **negligible** in Section E, and, therefore, **not significant** in the context of the EIA Regulations.

Loss and Compaction of Soils

11.8.7 The residual effect, following the implementation of additional mitigation, associated with the loss and compaction of soil will be **negligible** across all sections, and, therefore, **not significant** in the context of the EIA Regulations.

Impact on Solid Geology and Geological Designated Sites

11.8.8 The residual effect, following the implementation of additional mitigation, associated with the impact on solid geology and geological designated sites will be **minor** across Section A and B, and **negligible** across Sections C, D and E, and, therefore, **not significant** in the context of the EIA Regulations.

Impact on Contaminated Land

11.8.9 The residual effect, following the implementation of additional mitigation, associated with the impact on contaminated land will be **negligible** across all sections and, therefore, **not significant** in the context of the EIA Regulations.

11.8.10 During the operational phase, no potential effects have been identified that will impact the peat and soils (in relation to compaction and loss), solid geology, geological designated sites and contaminated land across the Proposed Development. Prior to the inclusion of embedded mitigation measures, the residual effects on the potential effects during the operational phase of the Proposed Development are all considered **negligible** in the context of the EIA Regulations and therefore do not require additional mitigation.

11.8.11 Table 11.22**Table 11.22** provides a summary of the effects and mitigations detailed within this chapter.

Table 11.22: Summary of Effects

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
Construction Phase						
Peat	Disturbance of Deep Peat	A	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, an Outline PMP has been included as part of this assessment in **Volume 5, Appendix 11.2.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52**.**	Moderate	Additional mitigation specific to the disturbance of deep peat (>1m): • Avoid the loading on deep peat. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.	Minor
Peat	Peat Stability	A	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, a PLHRA has been included as part of this assessment in **Volume 5, Appendix 11.1.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the peat stability: • Visual inspections to be completed in areas of moderate risk, as identified by the PLHRA, during construction and for a period after and during heavy rainfall events to identify risk to slope stability. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the peat data collected that identifies increased stability risk, e.g., due to localised topography or ground conditions.	Minor
Peat	Loss and Compaction of Peat	A	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP.	Moderate	Additional mitigation specific to the loss and compaction of peat: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.	Minor

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
			Further information on embedded mitigation measures is detailed from paragraph 11.3.52.		• Reuse of surplus peat that is removed from in situ conditions to other areas within the Proposed Development.	
Soils	Loss and Compaction of Soils	A	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Minor	Additional mitigation specific to the loss and compaction of soil: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys. • Reuse of surplus soils that is removed from in situ conditions to other areas within the Proposed Development.	Negligible
Geology and Geological Designated Sites	Impact on Solid Geology and Geological Designated Sites	A	There are several Geological Designated Sites across Section A of the Proposed Development Mitigation has been embedded in the design and routing of the Proposed Development to avoid impact to these designated sites where possible. Good practice measures should be adopted, detailed within a series of GEMPs and the CEMP. Further information on the embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Mitigation specific to the impact on solid geology: • Use of the LoD to aid micro-siting of Proposed Development infrastructure to limit impacts on solid geology.	Minor

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
Contaminated Land	Impact on Contaminated Land	A	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Negligible	Additional mitigation specific to the impact on contaminated land: • Where potential contamination is identified, strategies for the assessment, mitigation or remediation of the contamination will be developed and agreed with the regulatory authorities.	Negligible
Peat	Disturbance of Deep Peat	B	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, an Outline PMP has been included as part of this assessment in **Volume 5, Appendix 11.2.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the disturbance of deep peat (>1m): • Avoid the loading on deep peat. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.	Minor
Peat	Peat Stability	B	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, a PLHRA has been included as part of this assessment in **Volume 5, Appendix 11.1.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the peat stability: • Visual inspections to be completed in areas of moderate to high risk of slope failure, specifically between Towers N233 and N236, as identified by the PLHRA, during construction and for a period after and during heavy rainfall events to identify risk to slope stability. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the peat data collected that identifies increased stability risk, e.g., due to localised topography or ground conditions.	Moderate

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
Peat	Loss and Compaction of Peat	B	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the loss and compaction of peat: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified. • Reuse of surplus peat that is removed from in situ conditions to other areas within the Proposed Development.	Minor
Soils	Loss and Compaction of Soils	B	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed in paragraph 11.3.42.	Minor	Additional mitigation specific to the loss and compaction of soil: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys. • Reuse of surplus soils that is removed from in situ conditions to other areas within the Proposed Development.	Negligible
Geology and Geological Designated Sites	Impact on Solid Geology and Geological Designated Sites	B	There are two Geological Designated Sites across Section B of the Proposed Development. These sites cover a very localised area of the Proposed Development and mitigation has been embedded in the design and routing of the Proposed Development to avoid impact to these designated sites where possible. Good practice measures should be adopted, detailed within a series of GEMPs and the CEMP. Further information on the embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Mitigation specific to the impact on solid geology: • Use of the LoD to aid micro-siting of Proposed Development infrastructure to limit impacts on solid geology.	Minor

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
Contaminated Land	Impact on Contaminated Land	B	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Negligible	Additional mitigation specific to the impact on contaminated land: • Where potential contamination is identified, strategies for the assessment, mitigation or remediation of the contamination will be developed and agreed with the regulatory authorities.	Negligible
Peat	Disturbance of Deep Peat	C	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, an Outline PMP has been included as part of this assessment in **Volume 5, Appendix 11.2.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the disturbance of deep peat (>1m): • Avoid the loading on deep peat. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.	Minor

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
Peat	Peat Stability	C	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, a PLHRA has been included as part of this assessment in **Volume 5, Appendix 11.1.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the peat stability: • Visual inspections to be completed in areas of moderate risk, as identified by the PLHRA, during construction and for a period after and during heavy rainfall events to identify risk to slope stability. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the peat data collected that identifies increased stability risk, e.g., due to localised topography or ground conditions.	Minor
Peat	Loss and Compaction of Peat	C	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the loss and compaction of peat: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified. • Reuse of surplus peat that is removed from in situ conditions to other areas within the Proposed Development.	Minor
Soils	Loss and Compaction of Soils	C	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP.	Minor	Additional mitigation specific to the loss and compaction of soil: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys.	Negligible

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
			Further information on embedded mitigation measures is detailed from paragraph 11.3.52.		• Reuse of surplus soils that is removed from in situ conditions to other areas within the Proposed Development.	
Geology and Geological Designated Sites	Impact on Solid Geology and Geological Designated Sites	C	There are no Geological Designated Sites across Section C. In addition, the underlying bedrock geology across Section C does not exhibit any local, regional or nationally important features or minerals. Therefore, there is no specific embedded mitigation for these receptors. Following detailed ground investigations, if any areas of geological significance are identified then this should be reported to the appropriate qualified person and dealt with accordingly.	Negligible	Mitigation specific to the impact on solid geology: • Use of the LoD to aid micro-siting of Proposed Development infrastructure to limit impacts on solid geology.	Negligible
Contaminated Land	Impact on Contaminated Land	C	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Negligible	Additional mitigation specific to the impact on contaminated land: • Where potential contamination is identified, strategies for the assessment, mitigation or remediation of the contamination will be developed and agreed with the regulatory authorities.	Negligible
Peat	Disturbance of Deep Peat	D	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP.	Moderate	Additional mitigation specific to the disturbance of deep peat (>1m): • Avoid the loading on deep peat. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.	Minor

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
			In addition, an Outline PMP has been included as part of this assessment in **Volume 5, Appendix 11.2.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.			
Peat	Peat Stability	D	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, a PLHRA has been included as part of this assessment in **Volume 5, Appendix 11.1.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the peat stability: • Visual inspections to be completed in areas of moderate risk, as identified by the PLHRA, during construction and for a period after and during heavy rainfall events to identify risk to slope stability. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the peat data collected that identifies increased stability risk, e.g., due to localised topography or ground conditions.	Minor
Peat	Loss and Compaction of Peat	D	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Moderate	Additional mitigation specific to the loss and compaction of peat: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified. • Reuse of surplus peat that is removed from in situ conditions to other areas within the Proposed Development.	Minor
Soils	Loss and Compaction of Soils	D	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP.	Minor	Additional mitigation specific to the loss and compaction of soil: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys.	Negligible

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
			Further information on embedded mitigation measures is detailed from paragraph 11.3.52.		• Reuse of surplus soils that is removed from in situ conditions to other areas within the Proposed Development.	
Geology and Geological Designated Sites	Impact on Solid Geology and Geological Designated Sites	D	There are no Geological Designated Sites across Section D. In addition, the underlying bedrock geology across Section D does not exhibit any local, regional or nationally important features or minerals. Therefore, there is no specific embedded mitigation for these receptors. Following detailed ground investigations, if any areas of geological significance are identified then this should be reported to the appropriate qualified person and dealt with accordingly.	Negligible	Mitigation specific to the impact on solid geology: • Use of the LoD to aid micro-siting of Proposed Development infrastructure to limit impacts on solid geology.	Negligible
Contaminated Land	Impact on Contaminated Land	D	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Negligible	Additional mitigation specific to the impact on contaminated land: • Where potential contamination is identified, strategies for the assessment, mitigation or remediation of the contamination will be developed and agreed with the regulatory authorities.	Negligible
Peat	Disturbance of Deep Peat	E	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP.	Minor	Additional mitigation specific to the disturbance of deep peat (>1m): • Avoid the loading on deep peat. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified.	Negligible

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
			In addition, an Outline PMP has been included as part of this assessment in **Volume 5, Appendix 11.2.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.			
Peat	Peat Stability	E	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. In addition, a PLHRA has been included as part of this assessment in **Volume 5, Appendix 11.1.** Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Minor	Additional mitigation specific to the peat stability: • Visual inspections to be completed in areas of moderate risk, as identified by the PLHRA, during construction and for a period after and during heavy rainfall events to identify risk to slope stability. • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the peat data collected that identifies increased stability risk, e.g., due to localised topography or ground conditions.	Negligible
Peat	Loss and Compaction of Peat	E	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph **11.3.52**.	Minor	Additional mitigation specific to the loss and compaction of peat: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys where deep peat was identified. • Reuse of surplus peat that is removed from in situ conditions to other areas within the Proposed Development.	Negligible
Soils	Loss and Compaction of Soils	E	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP.	Minor	Additional mitigation specific to the loss and compaction of soil: • Use of the LoD to aid micro-siting of Proposed Development infrastructure based on the findings of site surveys.	Negligible

Receptor	Potential Effect	Section	Embedded Mitigation	Significance of Effect	Additional Mitigation	Residual Significance of Effect
			Further information on embedded mitigation measures is detailed from paragraph 11.3.52.		• Reuse of surplus soils that is removed from in situ conditions to other areas within the Proposed Development.	
Geology and Geological Designated Sites	Impact on Solid Geology and Geological Designated Sites	E	There are no Geological Designated Sites across Section E. In addition, the underlying bedrock geology across Section E does not exhibit any local, regional or nationally important features or minerals. Therefore, there is no specific embedded mitigation for these receptors. Following detailed ground investigations, if any areas of geological significance are identified then this should be reported to the appropriate qualified person and dealt with accordingly.	Negligible	Mitigation specific to the impact on solid geology: • Use of the LoD to aid micro-siting of Proposed Development infrastructure to limit impacts on solid geology.	Negligible
Contaminated Land	Impact on Contaminated Land	E	Mitigation has been embedded into the design and routing of the Proposed Development and through the implementation of mitigation based on IEMA guidance, good practice measures and through a series of GEMPs and the CEMP. Further information on embedded mitigation measures is detailed from paragraph 11.3.52.	Negligible	Additional mitigation specific to the impact on contaminated land: • Where potential contamination is identified, strategies for the assessment, mitigation or remediation of the contamination will be developed and agreed with the regulatory authorities.	Negligible

11.9 Summary and Conclusions

11.9.1 This chapter has assessed the potential significance of effects of the Proposed Development on the geological environment during the construction and operational phases.

11.9.2 Best practice construction techniques that would safeguard the soils, peat and geology and would be incorporated in the detailed design of the Proposed Development have been identified. Subject to the adoption of the best practice the geological environment can be safeguarded during and following the construction of the Proposed Development.

11.9.3 Specifically, the assessment has shown, with regard to soils, (including peat) and geology, that the potential effect of the Proposed Development on the Caithness and Sutherland Peatlands (SAC, Ramsar, SPA) Shielton Peatlands (SSSI, SPA, Ramsar, SAC) that form part of The Flow Country WHS, Dunbeath Water (SSSI) and Banniskirk Quarry (SSSI) in Section A and Strathfleet (SSSI) and Aberscross Burn to Kinnauld (GCR) in Section B is minor and not significant.

11.9.4 For Section B, the residual effect remains moderate, even after additional mitigation measures, due to the known presence of a historical peat slide within the LoD, a high receptor sensitivity of the peatland and a moderate magnitude of impact rating. This decision will be reassessed through visual inspections before, during and after construction, especially following periods of heavy rainfall to identify slope stability risks. The PLHRA is a dynamic document that will be continuously evaluated and updated throughout the Proposed Development. Detailed analysis and mitigation measures are provided in **Volume 5, Appendix 11.1: PLHRA**.

11.9.5 A summary of effects and the proposed mitigation measures that are required to reduce such effects are identified in **Table 11.23**.

Table 11.23: Summary of Effects and Proposed Mitigation Measures

Potential effect	**Proposed Mitigation/ Enhancements**	**Section**	**Significance of residual effect**
Construction Phase			
Disturbance of Deep Peat	Mitigation by design Good practice construction techniques to be included in the CEMP Peat Management Plan Habitat Management Plan	A	Minor and Not Significant
		B	Minor and Not Significant
		C	Minor and Not Significant
		D	Minor and Not Significant
		E	Minor and Not Significant
Loss and Compaction of Peat	Mitigation by design Good practice construction techniques to be included in the CEMP Peat Management Plan Habitat Management Plan	A	Minor and Not Significant
		B	Minor and Not Significant
		C	Minor and Not Significant
		D	Minor and Not Significant
		E	Minor and Not Significant
Loss and Compaction of Soils	Mitigation by design Good practice construction techniques to be included in the CEMP Peat Management Plan	A	Negligible and Not Significant
		B	Negligible and Not Significant
		C	Negligible and Not Significant

Potential effect	**Proposed Mitigation/ Enhancements**	**Section**	**Significance of residual effect**
	Habitat Management Plan	D	Negligible and Not Significant
		E	Negligible and Not Significant
Peat Stability	Mitigation by design Good practice construction techniques to be included in the CEMP Peat Landslide Hazard Risk Assessment Peat Management Plan Habitat Management Plan	A	Minor and Not Significant
		B	**Moderate and Significant**
		C	Minor and Not Significant
		D	Minor and Not Significant
		E	Negligible and Not Significant
Solid Geology and Geological Designations	Mitigation by design Good practice construction techniques to be included in the CEMP	A	Minor and Not Significant
		B	Minor and Not Significant
		C	Negligible and Not Significant
		D	Negligible and Not Significant
		E	Negligible and Not Significant
Contaminated Land	Mitigation by design Good practice construction techniques to be included in the CEMP	A	Negligible and Not Significant
		B	Negligible and Not Significant
		C	Negligible and Not Significant
		D	Negligible and Not Significant
		E	Negligible and Not Significant
Operational Phase			
No additional effects or mitigation / enhancement identified.			