Technical Note

Project name	Subject	Date
Glen Earrach	Glen Earrach Grid Connection - Geology and Ground Conditions Assessment	April 2026

Prepared by	Checked by	Verified by	Approved by
AC Senior Civil Engineer	MC Project Manager	DL Technical Director	MC Project Manager

1. Background

Glen Earrach Energy (GEE) has instructed AECOM to undertake a desk-based geology and ground conditions assessment of the potential effects of a proposed grid connection (hereafter the Grid Connection Project) for the Glen Earrach Pumped Storage Hydro project (the Proposed Development). An indicative connection route has been identified between the substation forming part of the Proposed Development and the indicative connection point for the Proposed Development at the Bingally substation to the west (hereafter the Connection Route).

The Connection Route comprises an initial section (approximately 2km) of underground 400kV cable (UGC) from the Glen Earrach Pumped Storage Hydro substation to the start of a 400kV overhead line (OHL) section. The 400kV overhead line has an approximate length of 16km and connects the underground cable section to the Bingally Substation. The Connection Route is as shown in Figure A. To inform the assessment it is assumed that the 2km of 400kV cable will be installed through micro-tunnelling. It is also assumed that access tracks and temporary working areas will be required in the vicinity of the Connection Route during construction with construction lasting approximately 3 years.

The aim of this assessment is to identify whether the Grid Connection Project has the potential to result in any likely significant effects on geology and ground conditions having regard to the cumulative assessment approach used in the Environmental Impact Assessment Report (EIAR) for the Proposed Development, considering both the Construction Phase and the Operation Phase. This Technical Note should be read in conjunction with Chapter 15: Geology and Ground Conditions of the EIAR for the Proposed Development and Additional Information.

The assessment has been undertaken in accordance with the Institute of Environmental Management and Assessment (IEMA), now known as ISEP, guidelines. It provides baseline information, discusses appropriate mitigation and assesses the significance of impacts and considers impacts to surface and near-surface geology and ground conditions, particularly peatlands and carbon rich soils, as these are the key sensitive receptors directly affected by the Grid Connection Project.

2. Study Area

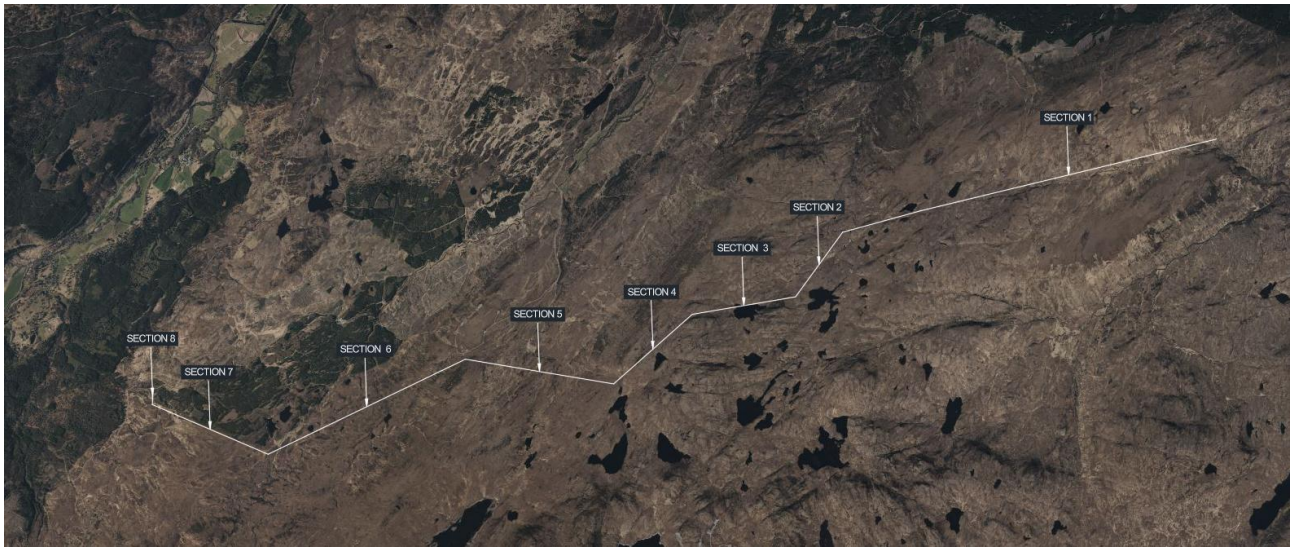
The Study Area for this Technical Note is focused principally on the OHL alignment, as the key geology and ground conditions sensitivities relevant to the assessment are peatlands and carbon-rich soils along the OHL section of the Grid Connection Project. The initial UGC section is also part of the Grid Connection Project and is noted accordingly, but the principal area of interest for this assessment is the OHL alignment and its immediate environs.

Due to the length of the OHL, approximately 16km in length, for the purpose of this assessment, the route has been split into eight sections, as follows:

- Section 1: commencing north of the Glen Earrach PSH site boundary and runs 5.15km west south west.
- Section 2: runs south west for approximately 1.07km from the end of Section 1;
- Section 3: runs west south west for approximately 1.4km from the end of Section 2;

- Section 4: runs south west for approximately 1.4km from the end of Section 3;
- Section 5: runs west north west for approximately 2km from the end of Section 4;
- Section 6: runs south west for approximately 2.9km from the end of Section 5;
- Section 7: runs north west for approximately 1.69km from the end of Section 6; and,
- Section 8: runs north for approximately 0.3km and terminates near the proposed Bingally Substation.

Insert 1 shows the Study Area and the relevant sections of the OHL, Figure A shows the complete indicative Connection Route.



Insert 1 OHL Route and Sections

3. Methodology

3.1 Desk Based Assessment

A desk-based assessment (DBA) was carried out to review the geology and ground conditions of the Study Area. The study was informed by publicly available data, as detailed in Table 1:

Table 1. DBA Sources of Information

Area	Subject	Source
Geology	Bedrock Geology	British Geological Survey (BGS) Onshore GeoIndex Bedrock Geology Layer (1:50,000 scale)
	Superficial Geology	BGS Onshore GeoIndex Superficial Deposits Layer (1:50,000 scale)
	Carbon and Peatland	NatureScot Carbon and Peatland Map 2016
	Faults	BGS Onshore GeoIndex Linear features Layer (1:50,000 scale) BGS Onshore GeoIndex Faults Layer (1:625,000 scale)
	Boreholes	BGS Onshore GeoIndex Borehole Record Layer
	Mines and Quarries	BGS Onshore GeoIndex Mines and Quarries Layer
Hydrogeology	Hydrogeology	BGS Onshore GeoIndex Hydrogeology Layer (1:625,000 scale)
Topography	Site Topography	Ordnance Survey (OS) Mapping 1:25,000 Scale

3.2 Assessment Scope

The assessment considers the effects during the two phases of the Grid Connection Project's lifespan: Construction and Operation.

A qualitative assessment of the potential effects of the Grid Connection Project on geology and ground conditions has been undertaken using a combination of legislative standards, other statutory policy and guidance, a DBA, and professional judgement.

The assessment is in line with the approach set out above. For the purpose of this chapter, the sensitive receptors are peatlands and carbon-rich soils. Table 2 sets out the sensitive receptors for this assessment and the relative sensitivity.

Table 2 Sensitive Receptors

Receptor	Distance from Development	Sensitivity	Reason
Peatlands	On-site	High	The receptor has low capacity to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance (as set out in Policy 5 of NPF4)

As set out in Table 2, the sensitivity is considered to be **High** as the receptor is deemed to be of national importance, in line with Policy 5 of NPF4. The potential effects have been assessed prior to additional mitigation, considering the embedded mitigation set out in this assessment. The residual effects are therefore considered after the implementation of mitigation measures.

The significance of the effects arising from the Grid Connection Project will be reported using a seven-point scale, as follows: Major Adverse, Moderate Adverse, Minor Adverse, Negligible / Neutral, Minor Beneficial, Moderate Beneficial, and Major Beneficial.

Table 6 details the assessment of effects with regard to peatlands and carbon rich soils, considering the embedded mitigation set out in Section 6.

4. Baseline Environment

4.1 Topography

The OHL commences north of the Glen Earrach PSH Site Boundary at around 450m Above Ordnance Datum (AOD), peaking at around 600mAOD, before terminating at the Bingally Substation area at around 320mAOD. Details of each section of the OHL and the relevant routing and topography is detailed as follows:

- Section 1 running southwest along Allt Fèith an t-Seilisdeir, a tributary of the River Coiltie to a maximum elevation of around 550m AOD;
- Section 2 of the OHL starts to the west of an unnamed tributary of the River Enrick at around 550mAOD and runs to the north of Loch nam Meur to an elevation of approximately 500mAOD;
- Section 3 commences to the west of Loch nam Meur at around 500mAOD and follows the valley north of Carn Loch a' Mhuilinn (567mAOD) and Loch a'Mhuilinn, to north of Carn na Ruighe Duibhe (614mAOD) at around 600mAOD;
- Section 4 runs along a plateau north of Carn na Ruighe Duibhe and an unnamed Lochan, to north of Loch a'Mhuilinn at 550mAOD;
- Section 5 crosses the River Enrick and an existing track to the east of Carn na Ruighe Duibhe, to the north of Carn na Ruighe Duibhe at around 480mAOD;

- Section 6 crosses Allt an Ruighe Bhuibh, north of Lochan na Craoibhe and Allt nam Fiodhag, to the south of Loch nam Fiodhag at 384mAOD; and
- Section 7 runs alongside existing forestry, to the southwest of Carn na h-Earbaige Bige at 320mAOD.

4.2 Section 8 runs alongside existing forestry, crossing an existing access track before terminating. Bedrock Geology

A review of the 1:50k Bedrock Geology Layer on the BGS Onshore GeoIndex indicates that the Study Area is generally underlain by Tarvie Psammite Formation and the Achnaconeran Striped Formation. Additionally, an Unnamed Igneous Intrusion, Pre-Caledonian-Amphibolite and hornblende schist are present within the Study Area. Details of the bedrock geology encountered is detailed as follows:

- Achnaconeran Striped Formation: Psammite and semipelite, interbanded. Semipelite is muscovite-rich and locally migmatitic – metamorphic rock.
- Tarvie Psammite Formation: Predominantly psammite, thin-bedded, siliceous to micaceous. Local, thin semipelite beds are muscovite-rich and locally migmatitic. Large quartzite lenses occur, in particular near the base. Tends to become more micaceous to the NE. Psammite is generally fine-grained. Locally well-developed cross-bedding, in places showing herring-bone cross-bedding, and symmetric ripple marks – metamorphic rock.

The BGS Onshore GeoIndex Borehole Record showed five (5) boreholes related to the Beauly – Denny 400kV overhead transmission line at the termination point of the OHL at Guisachan Forest. The borehole logs showed the presence of peat, sand and gravel, and bedrock (psammite), down to a maximum depth of 14.40m.

BGS Linear Features (1:50k scale) map shows the presence of inferred faults along the Study Area. All faults are inferred, with displacement unknown. Additionally, evidence of pegmatitic rock veins is present within the Study Area, which are described as *"coarse-grained, intrusive igneous rocks commonly found as irregular dikes, sills, or veins, primarily occurring at the margins of batholiths or within metamorphic host rocks".*

4.3 Superficial Geology and Peat

A review of the 1:50k Superficial Geology Layer on the BGS Onshore GeoIndex indicates that the Study Area is generally overlain by peat, with areas of glacial till, hummocky glacial deposits and areas with no superficial deposits mapped, which are assumed to show rock at or near surface level.

Peat is generally shown on the flatter topography across the Study Area and is not present on steep slopes.

A review of the Carbon and Peatland Map 2016 viewer also indicates that the Study Area is generally underlain by Carbon and Peatland Class 1, which is defined as *Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value*. Isolated areas of Carbon and Peatland Class 2 soils are also encountered across the Study Area, which are defined as *Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential*.

Additionally, there are widespread areas of Carbon and Peatland Class 5 across the Study Area, which is viewed as peat soils with no peatland habitat present. However, Class 5 is defined as *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.* Therefore, it is considered that deep peat (generally >1m) is likely to be present along the Study Area.

It should be noted that the ecological importance of peatlands is considered in the Terrestrial Ecology assessment for the OHL, meanwhile this assessment focuses on the material impact on peatlands. Nonetheless, the Carbon and Peatland Map classifications show consistency with the BGS 1:50k Superficial Geology Layer and confirms the assumption that deep peat (>1m) would likely be encountered across the Study Area.

5. Embedded Mitigation

It is assumed embedded mitigation measures will be incorporated into the design of a development and aim to avoid or reduce adverse effects, including those on geology and ground conditions. We have assumed the following embedded design measures will be applied:

- Permanent infrastructure such as the OHL pylon foundations will be located to avoid areas of peat > 1.0m in depth;
- Alternative construction methodologies such as floating access tracks will be used where peat > 1.0m in depth cannot be avoided; and
- Where possible, temporary access tracks will be floated (subject to technical design) to limit the impact on the environment and removed post construction.

In relation to the initial underground cable section, it is assumed that micro-tunnelling would be undertaken in accordance with the same general design principles and material management practices as those adopted for the Proposed Development. Any arisings from the tunnelling works would be managed in line with the material management approach set out in Chapter 15 of the EIAR and, where suitable, would be reused on site. On the basis of the current assessment assumptions, spoil arising from the micro-tunnelled section is anticipated to offset, in whole or in part, the additional aggregate requirement associated with access track construction along the OHL route. No separate geology and ground conditions effects are therefore identified for the micro-tunnelled section beyond those addressed through the material management and embedded mitigation principles applied in this Technical Note.

As the design of the Grid Connection Project is preliminary in nature, the exact location of the permanent and temporary infrastructure is unknown at this stage. As such, the embedded mitigation, above, is considered to be the basis of design for the final design of the Grid Connection Project. The measures have been embedded in the design to reduce the impacts on peatlands.

6. Assessment of Effects

The assessment of effects for geology and ground conditions has been undertaken having regard to the assessment approach set out in Chapter 15: Geology and Ground Conditions of the EIAR for the Proposed Development, read together with Chapter 4: Approach to EIA. In line with that methodology, the assessment focuses on peatlands and carbon-rich soils as the key sensitive receptors for this Technical Note and applies professional judgement to determine the likely significance of effects, taking account of the embedded mitigation set out above.

6.1 Construction Phase

The construction phase of the Grid Connection Project will include construction of the OHL above-ground infrastructure, and the initial UGC section, and therefore the phase will require excavation, storage and re-use of peat deposits.

As set out in Table 2, Peat is considered to be a High sensitivity receptor. If the final design of the Grid Connection Project incorporates the embedded mitigation measures set out in ‘Embedded Mitigation’, the magnitude of effects on peat deposits within the Study Area would be negligible, resulting in a Minor Adverse (Not Significant) effect.

6.2 Operation Phase

In line with the principles set out in Chapter 15 of the main EIAR, peat disturbed during construction would be managed through minimisation, on-site reuse, and reinstatement or restoration of temporarily affected areas where appropriate. Accordingly, peat-related effects would be incurred during the construction phase, and no additional ongoing operational effects on peat are anticipated during the operational phase of the Grid Connection Project.

6.3 Additional Mitigation

Due to the embedded mitigation in the design of the Grid Connection Project, no additional mitigation measures are proposed or required for geology and ground conditions.

7. Residual Effects

In accordance with the methodology described above, potential effects have been assessed prior to additional mitigation, with the residual effects after implementation of the mitigation measures detailed in Table 6.

Table 6. Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Peat	Peat Excavation for OHL permanent infrastructure, resulting in loss of peatlands.	Minor Adverse	Not Required	Minor Adverse	**Not Significant**

As noted earlier, there are expected to be no operational effects on peat.

8. Summary

This assessment presents the baseline conditions of the Grid Connection Project and highlights the potential effects and their significance on geology and soils – with a focus on the impact on peatlands.

A DBA was conducted which indicated the presence of peatlands across the Study Area:

- Permanent infrastructure such as the OHL pylon foundations will be located to avoid areas of peat > 1.0m in depth;
- Alternative construction methodologies such as floating access tracks will be used where peat > 1.0m in depth cannot be avoided; and
- Where possible, temporary access tracks will be floated (subject to technical design) to limit the impact on the environment and removed post construction.

In relation to the initial underground cable section, it is assumed that the micro-tunnelled UGC would avoid direct effects on peat along the majority of its length, as it would pass below the peat horizon and be formed within underlying strata. At the tunnel entry and exit points, where near-surface works may be required, standard peat management and construction practices consistent with those assumed for the OHL section would be applied. Spoil arising from the micro-tunnelled section is anticipated to offset, in whole or in part, the additional aggregate requirement associated with access track construction along the OHL route.

On the basis of the embedded mitigation set out above, no likely significant effects on geology and ground conditions have been identified arising from the Grid Connection Project, having regard to the cumulative assessment approach used in the EIAR for the Proposed Development.