Bingally 400/132 kV Substation and Access Track

Geotechnical and Geo-environmental Desk Study

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		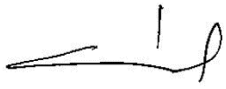	
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Revision History

Revision	Revision date	Details	Name	Position
1	September 2024	Original	Ryan Blair	Senior Consultant
2	November 2024	Revision following clients' comments	Ryan Blair	Senior Consultant
3	December 2024	Closure of Client Comments and preparation of Draft 3	Ryan Blair	Senior Consultant
4	February 2025	Revision following additional small section of access track and temporary compound 5	Ryan Blair	Senior Consultant
5	February 2025	Final	Ryan Blair	Senior Consultant

Prepared for:

Scottish Hydro Electric Transmission known as Scottish & Southern Electricity Networks (‘SSEN Transmission’)

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The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken between 06 May 2024 and 06 February 2025 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of change in any matter affecting the Report, which may come or be brought to AECOM’s attention after the date of the Report.

The Site walkover conducted of areas accessible to public on 10 May 2024 consisted of a general inspection of the Study Area aimed at identifying any obvious signs and potential sources of ground contamination affecting the proposed development areas. An environmental compliance audit and/ or detailed structural inspection of existing buildings were out with the scope of this report. Similarly, the Site visit excluded detailed consideration of the ecological or archaeological aspects of the Site, and if such are believed to be of potential significance then it is recommended that specialist advice is sought.

Any risks identified in this Report are perceived risks, based on the information reviewed during the desk study and therefore partially based on conjecture from available information. The study is limited by the non-intrusive nature of the work and actual risks can only be assessed following a physical investigation of the Site. The opinions expressed in this report and the comments and recommendations given are based on a desk-based assessment of readily available information and an initial site reconnaissance by an AECOM Engineer.

Unless otherwise stated in this Report, as a formalised development plan or finalised development option was not available at the time of writing, the assessments made cover the wider development boundary.

Reference to historical Ordnance Survey (OS) maps and/or data provides invaluable information regarding the land use history of a site. However, it should be noted that historical evidence will be incomplete for the period pre-dating the first edition and between the release of successive maps and/or data.

Table of Contents

Figures

Tables

1 Introduction

1.1 Commission

Scottish Hydro Electric Transmission known as Scottish & Southern Electricity Networks (SSEN Transmission) (the Client) commissioned AECOM Limited (AECOM) to undertake a Geotechnical and Geo-environmental Desk Study for the construction of the proposed Bingally 400/132 kV Substation, in proximity to the existing Fasnakyle Substation and an overhead line (OHL) tie in to the existing Beauly-Denny OHL. This report is specifically for the proposed Bingally 400/132 kV Substation and access track (referred to hereafter as "Proposed Development"), as summarised below in Section 1.2. The desk study findings for the proposed OHL tie ins are discussed in a separate AECOM report titled, Bingally 400 kV Overhead Line Tie-In Geotechnical and Geo-environmental Desk Study (AECOM 60701792-R-002 September 2024).

The proposed Bingally 400/132 kV Substation forms part of the Ofgem Accelerated Strategic Transmission Investment (ASTI) project for the upgrade of the 2nd Beauly – Denny 275 kV circuit to 400 kV. This project, alongside several other major network upgrades in the north of Scotland, is planned to meet the UK and Scottish Government energy targets.

The Geotechnical and Geo-environmental Desk Study (referred to hereafter as 'Desk Study') is required to characterise potential land quality constraints / opportunities to provide baseline data to satisfy planning conditions, provide input into the Environmental Appraisal and support an Application under The Town and Country Planning (Scotland) Act 1997. The Site location and boundary plans are included in **Appendix A**. This report presents the findings in relation to the Site.

1.2 Proposed Development and Planning Status

The Proposed Development comprises the upgrading of the existing Beauly-Denny 275 kV circuit to accommodate a 400 kV circuit. The Site location plan and Proposed Development boundary (i.e. site boundary plan) are shown in **Appendix A**, with an extract of the Site boundary plan provided as

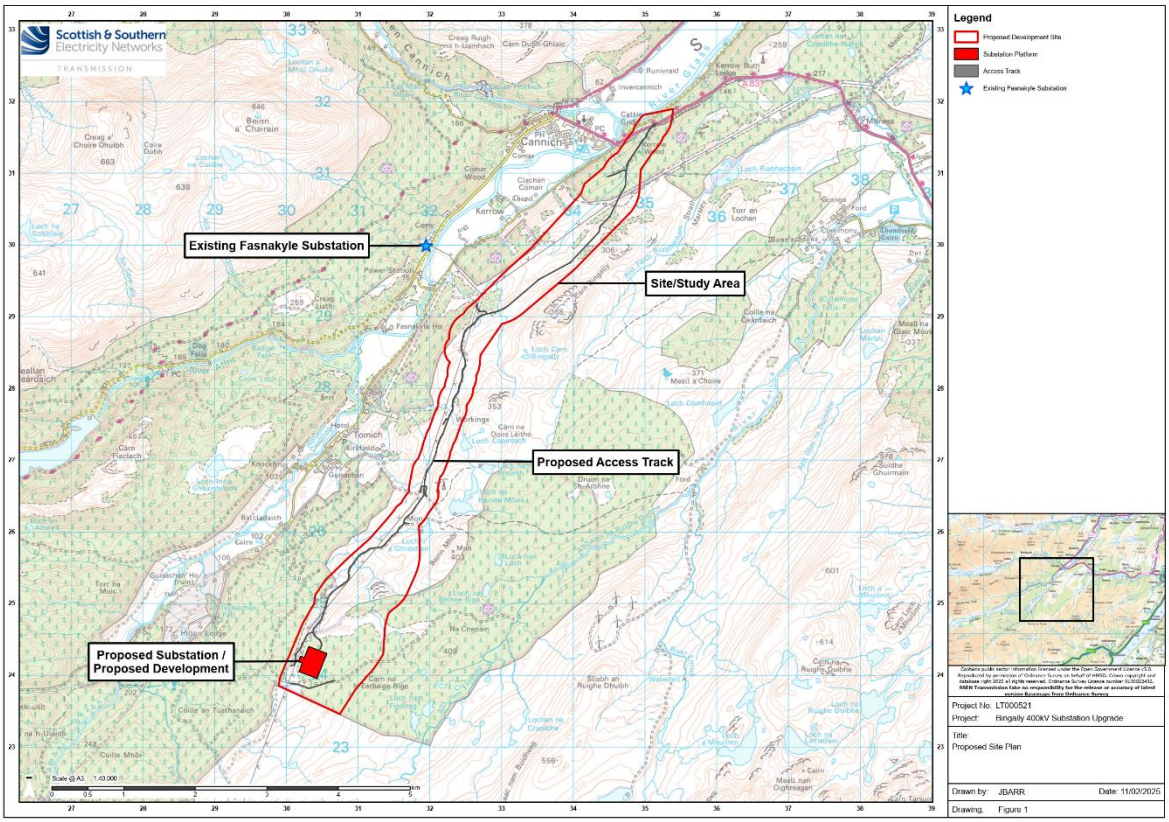
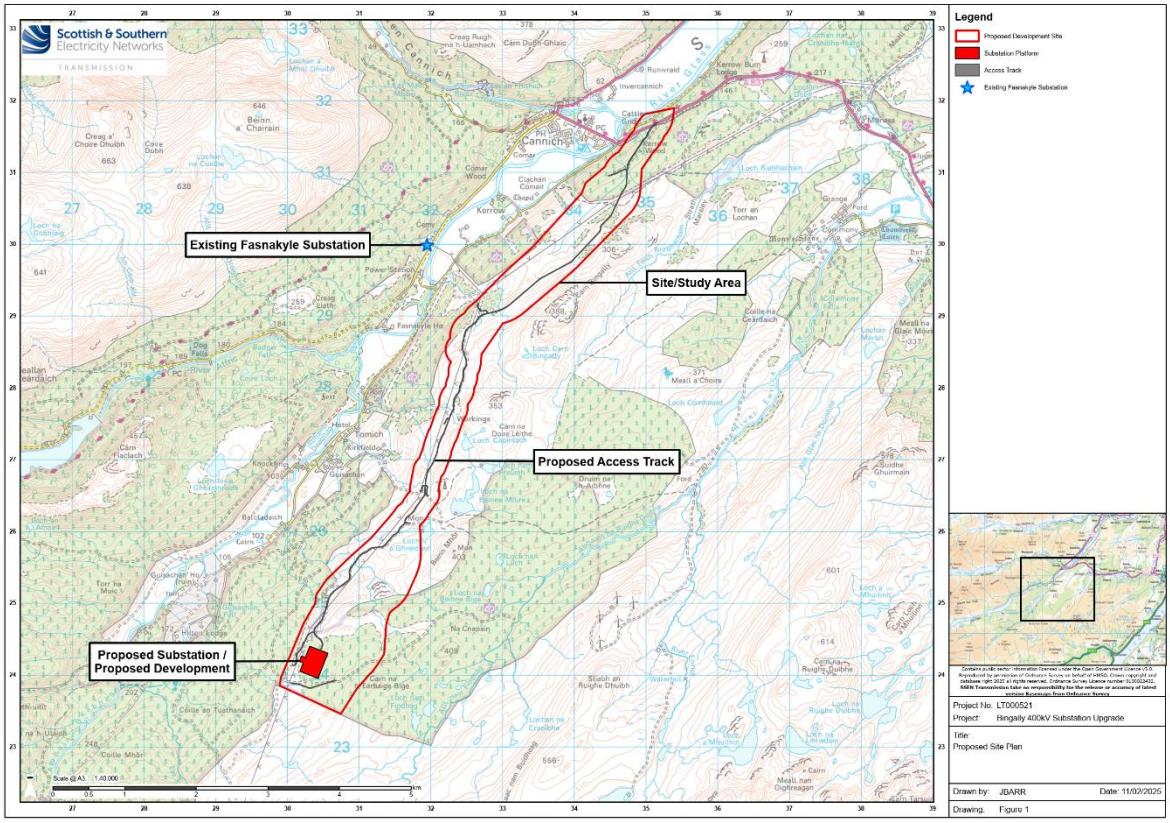


Figure 1 , below. For the purpose of this report, the following terms are used:

- **Study Area / the Site** - the redline boundary which includes the new proposed Bingally 400/132 kV Substation and proposed access track. This redline boundary is also the extent of the Study Area for this Desk Study.
- **The proposed Bingally Substation or proposed substation** - the footprint area of the new substation only.
- **Proposed access track** – the proposed access track, as shown on



- Figure 1 below.
- **Proposed Development** – the combination of the proposed Bingally Substation and proposed access track but excluding the wider redline boundary.

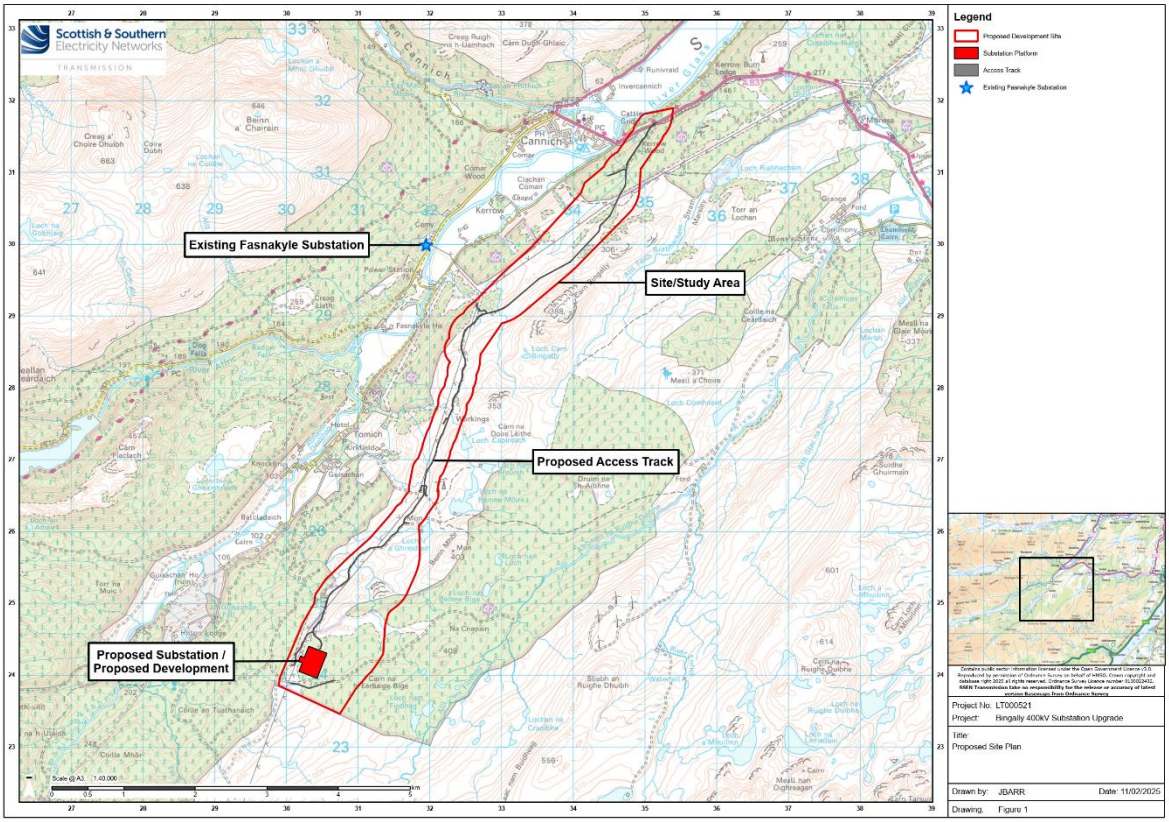


Figure 1 Development Boundary Plan

A planning application for the permission for the Proposed Development has not been submitted at time of writing.

It is understood from the Client that the Proposed Development would comprise the following:

Substation development

- A new 400 kV outdoor Air Insulated Switchgear (AIS) substation at Bingally to support upgrade of Beauly-Denny OHL to a 400 kV double circuit. The Beauly-Denny 400 kV OHL circuit would connect to a newly constructed 400 kV AIS double busbar at Bingally;
- The proposed Bingally Substation would house two no. 400 / 132 kV Super Grid Transformers (SGTs) and be future proofed with four 400 kV future bays tied into the 400 kV double busbar;
- Two no. 275 / 33 kV SGTs would be replaced with two no. 132 / 33 kV Grid Transformers (GTs) at the existing Fasnakyle 275 kV Substation.
- The existing 275 kV switchgear would also be removed and replaced at the existing Fasnakyle 275 kV Substation.

Operational Infrastructure

Additionally, due to the scale of the developments, a need for permanent operational facilities has been identified to support operational requirements:

- Lighting – proposed buildings would not be illuminated at night during normal operation. Floodlights would be installed but would only be used in the event of a fault during the hours of darkness; or during the over-run of planned works; or when sensor activated as security lighting for night-time access. The proposed access track would not be lit under normal operation;
- Permanent access – a new permanent access track from the A831 would be constructed to the new site to provide access to the proposed infrastructure.
- Security fencing – a 4 m high palisade fence would be installed around platforms, in addition a standard post and wire perimeter fence would be installed around the Site ;
- Earthworks – a cut-fill exercise would be undertaken to achieve a level area to construct infrastructure and to minimise import or export of materials;

- Site drainage and water management – new Sustainable Drainage System (SuDS basins designed to manage surface water runoff from the Site. The pond will be sized to consider the area for the 400 kV substation and capacity for runoff for any potential future development;
- Utilities and services to the control station building such as power, telecoms, water etc.; and
- Landscaping mitigation and biodiversity enhancement – this will be developed to consider the existing screening requirements to ensure areas of screening are adequate.

Construction Compounds

- Temporary construction compounds would be required during construction. to provide laydown areas, office, welfare and car parking areas and holding and servicing space for construction plant. The temporary construction compound areas (**Figure 1-1** in **Appendix A**) are as follows:
  - Temporary Office and Welfare Compound: located around 50 m north of the proposed substation site covering an area of 7,763 m^2.
  - Temporary Compound 1: a temporary laydown/ stockpile area located within 200 m northeast of the proposed substation site, covering a combined area of 22,483 m^2.
  - Temporary Compound 2: a temporary laydown/ stockpile area located within 100 m east of the proposed substation site, covering a combined area of 7,997 m^2.
  - Temporary Compound 3: located from 150 m east of the proposed substation site. This temporary area will be used as a material stockpile area, borrow pit, peat stockpile area and permanent peat restoration area, covering an area of 122,933 m^2.
  - Temporary Compound 4: a temporary material processing area located within 100 m south of the proposed substation site, covering an area of 22,041 m^2.
  - Temporary Compound 5: located approximately 1km south from the Site entrance, covering an area of approximately 39,825 m2. This area would be utilised for car parking and will include additional office and welfare facilities for site staff and temporary storage for excavated materials. The full extent of this area may be refined during detailed design and prior to commencement of works, such that the footprint area may be reduced.

1.3 Scope and Objective of Report

The objective of this Desk Study is to characterise the environmental setting and sensitivity across the Proposed Development, along with the potential for contamination to exist and the pathways through which contamination may come into contact with sensitive receptors given the Proposed Development as a new substation. The Desk Study includes the following key activities:

- Review of aerial imagery for the Site layout and terrain evaluation to provide a current description of the Site's layout and setting within the local area;
- Review of historical land uses for the Site and surrounds with a particular emphasis on identifying potential on-site and off-site contamination sources, and potential for Made Ground;
- A review of the Site's geological (including available British Geological Survey (BGS) borehole records), hydrological and hydrogeological setting, publicly available non-coal and coal mining records and geo-environmental information to build up an understanding of the Site setting and surrounding environmental sensitivity;
- Request and review relevant records held by the Local Authority Contaminated Land Officer and The Scottish Environment Protection Agency along with public regulatory records provided within Groundsure Reports purchased for the Site;
- Review of available records provided by the Client;
- Review publicly available records from consultees including (but not limited to) Historic Environment Scotland website, the Zetica bomb risk maps, UK Radon website, flooding information, the National Library of Scotland etc. to further inform the study;
- Develop a preliminary Conceptual Site Model (CSM) for the Site to identify the potential contamination sources, pathways, and receptors for consideration in the context of the potential development followed by a preliminary qualitative risk assessment for the Site;

- Summarise identified geo-environmental and land quality risks; and
- Recommendations for further geo-environmental assessments, if required.

1.4 Sources of Information

The following bodies were consulted during the assessment:

- Groundsure Enviro+Geo Insight (ref. GSIP-2024-14714-18280_A to G) dated 01 May 2024;
- Groundsure Enviro+Geo Insight (ref. GSIP-2024-14714-18241_A to E) dated 10 April 2024;
- Groundsure small/large scale maps (ref. GSIP-2024-14714-18279) dated 02 May 2024;
- The Coal Authority (CA) (Interactive Map Viewer | Coal Authority (bgs.ac.uk)) (accessed June 2024);
- British Geological Survey (BGS) (GeoIndex – British Geological Survey (bgs.ac.uk)) (accessed June 2024);
- Scottish Environment Agency (SEPA) (Water Environment Hub (sepa.org.uk)) (accessed June 2024);
- SEPA Flood Risk (https://map.sepa.org.uk/floodmaps/FloodRisk/Search) (accessed June 2024);
- NatureScot (Map | Scotland's environment web) (accessed June 2024);
- Historic Environment Scotland (HES) (Designations Map Search (arcgis.com)) (accessed June 2024);
- Zetica UXO Map (Risk Maps | Zetica UXO) (accessed June 2024);
- UK Radon Map (UKradon - UK maps of radon) (accessed June 2024);
- Topography map (United Kingdom topographic map, elevation, terrain (topographic-map.com)) (accessed June 2024);
- Scottish Government Energy Infrastructure (Energy Consents - Scottish Government) (accessed June 2024); and
- Google Earth satellite imagery (Google Earth) (accessed June 2024).

Specific information sources are referenced throughout the document.

2 Site Description

2.1 Site Location

The Site is located within the central Highlands area of Scotland, to the southwest of Inverness and northwest of Loch Ness. Specifically, the proposed Bingally Substation is located approximately 2.5 km south of Tomich. The national grid reference of the centre of the Site is NH 32219 28423 and nearest postcode is IV4 7LZ. The Site location is shown in **Figure 2** below with the larger figure included in **Appendix A**.

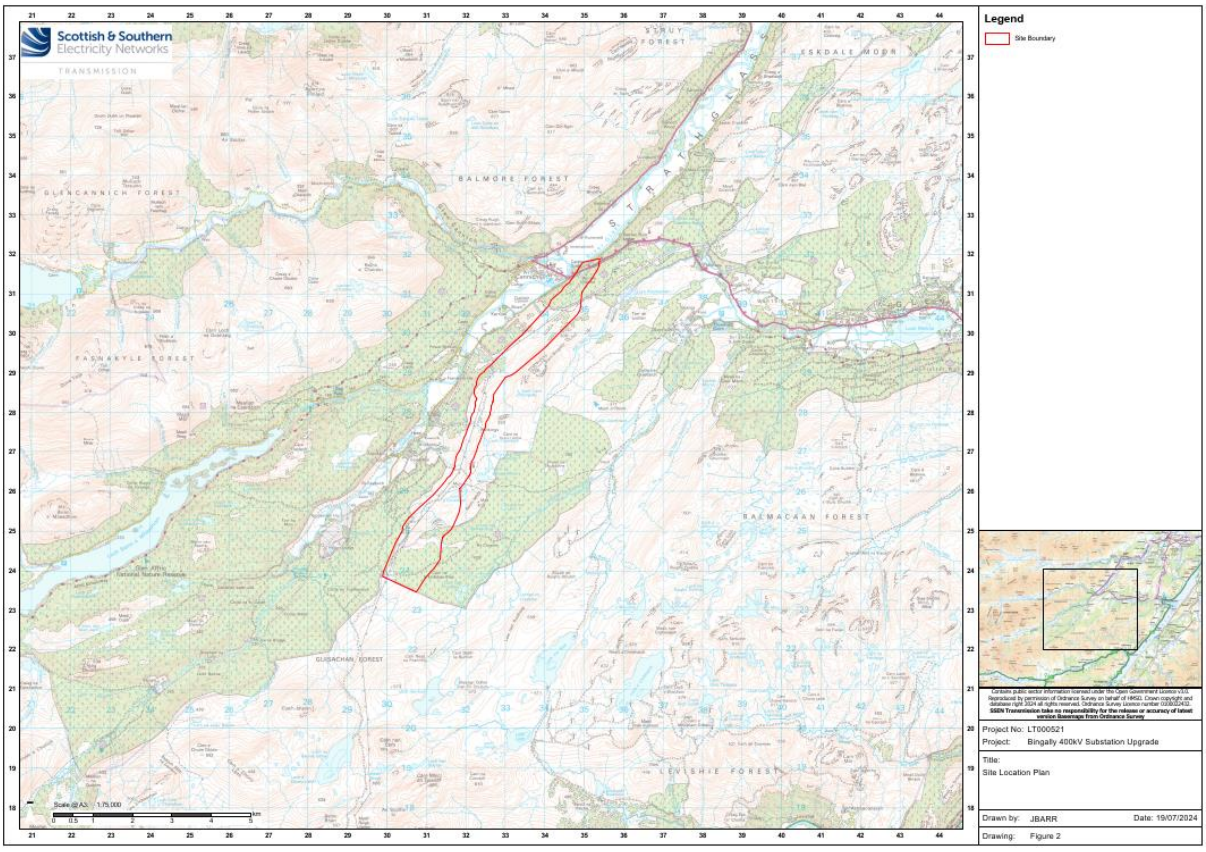


Figure 2 Site Location Plan

2.2 Site Walkover and Description

A site reconnaissance survey was undertaken by AECOM staff on 10 May 2024. During the reconnaissance, observations were made on the topography, land use, drainage and potential sources of contamination identified on site.

The Site is predominantly located in an area of forestry use and unoccupied land. the Site begins at a junction with the A831 located approximately 1.3 km east of the settlement of Cannich. This part of the Proposed Development comprises the access track that meanders in a south westerly direction for approximately 3.8 km, through areas of managed forestry plantation (for timber production) and open heathland. The track turns south southwest at the point it meets the existing Beauly Denny OHL and continues for a further 2.5 km (approximately following the route of the OHL) through further open heathland areas. The track subsequently turns southwest, following the OHL for a further 2.5 km to the Site of the proposed Bingally Substation platform through areas of managed forestry.

The area proposed for the construction of the proposed Bingally Substation itself is an approximately level area of open heathland with juvenile trees present sporadically across the Site elevation. The ground level of the Site slopes gently downwards approximately east to west whereas the proposed Bingally Substation is generally flat. An existing access track with gravel surfacing is present at approximately 500 m west of the proposed Bingally Substation, with a drainage channel running alongside the track. An old foot bridge is located at approximately 1 km northwest of the proposed Bingally Substation.

Evidence of recent ground investigation works including ground disturbance and monitoring well apparatus were noted during the walkover within the proposed Bingally Substation platform area.

The Proposed Development would connect to the existing Fasnakyle Substation located at approximately 1.3 km northwest of the Site (at closest point). No residential dwellings are present within 500 m of the Site.

No sources of potential contamination were observed during the walkover.

Details of the Site reconnaissance are incorporated within **Section 2.3** and photos from the survey are included as **Appendix B**.

2.3 Current Site Use, Topography and Geography

2.1.1 On-Site

The Site comprises coniferous forestry land with both mature and young growth trees present, tree plantations, with forestry access tracks and roads, and open moorland also found across the Site. A Quarry (disused) and a Workings Area are shown within the southeast and centre of the Site, respectively. River Glass and other watercourses including Kerrow Burn, Allt Bailen a h-Aibhne, Allt an Fhasaich Mhoir, Allt a Chlachain and Allt Currachan are present across the Site. The west of the Site comprises the existing Beauly to Denny OHL. According to the UK topographic map[1], the Site is situated at approximate elevations varying between 78-383 m above ordnance datum (AOD). The proposed Bingally Substation area is at approximately between 320-339 m AOD, with the access track sloping north to south from 95 m AOD to 317 m AOD, to meet the substation.

2.1.2 Off- Site

The off-site area described below extends to a boundary of 1 km to the north, east, south, and west of the Site:

- **North -** An area of plantation forestry comprising predominantly coniferous woodland is to the north of site. Fasnakyle Substation is present at approximately 950 m northwest of the Site , and 5.5 km northwest of the proposed Bingally Substation.
- **East –** Plantation forestry comprising predominantly coniferous woodland is present to the east of the Site .
- **South –** Plantation forestry comprising predominantly coniferous woodland is present to the south of site. Loch na Beinne Moire, Loch a' Ghreidlein (and associated sluice), Loch Caoireach, Loch na Gobhlaig and Loch Carn Bingally are present within 250 m southeast of the Site. A holiday cottage is present at approximately 830 m southwest of the Site .
- **West –** Plantation forestry comprising predominantly coniferous woodland is present to the west of site. Tomich village is present at approximately 1 km west of the Site .

[1] World Topographic Map, 2024. *United Kingdom topographic Map* [online] Available from: https://en-gb.topographic-map.com/map-cgt/United-Kingdom/

3 Site History

3.1 Introduction

The following account of the historical development of the Site and its immediate surroundings are based on a review of historical Ordnance Survey (OS) maps and aerial photography both obtained as part of a Groundsure Report (attached as **Appendix C**), and a review of publicly available web-based mapping services.

AECOM also notes that only indicative map scales are provided. Where dates are stated, these refer to the dates of maps on which the features are present, have changed use or are no longer annotated, and do not necessarily refer to the exact dates of existence of a particular feature. Development that may have occurred between map editions is recorded as occurring on the latter published map, hence there are some limitations to the accuracy to the date of development unless supplementary evidence is available.

3.2 Historical Ordnance Survey Mapping & Aerial Photographs

A review of historical land uses within the Site and surrounding areas has been undertaken using the Groundsure maps and aerial photography and is summarised in **Table 3-1** below. It should be noted that the search has been limited to within 250 m of the Site, with only notable land uses beyond this distance included.

Where map dates are not included in the table below, there was no significant information present on those maps, or there were no apparent land use changes shown for these dates.

Table 3-1 Summary of Historical Mapping & Aerial Photography

Dates	Features within Study Area	Features within 250 m of Study Area
1872 (1:10,560, 1:2500)	• The Site was undeveloped with mainly agricultural land and forestry across the Site. • Tracks within the centre and south of the Site. • Issues and ponds within the southwest of the Site.	• Access tracks within 250 m from the Site. • Drains and ponds to the south of the Site. • A sheepfold, Ford and access tracks found to the immediate south-west of the Site. • Loch a' Ghreidlein and associated sluice present to the southeast. • The immediate surrounding comprises agricultural land and forestry.
1901 (1:10560)	• No significant changes.	• Sheepfold no longer present; and • No other significant changes.
1968 - 1969 (1:10000, 1:2500) 1971 (1:10000, 1:2500)	• A disused gravel pit within the south of the Site • OHL towers to the southwest of the Site. • Access tracks across the Site. • No other significant changes	• Sluice is now shown as a Weir and Dam to the immediate southeast of the Site, near Loch a' Ghreidlein. A new boathouse, next to Loch na Beinne Moire, approximately 250 m east of the Site • Sewage beds (disused) at 157 m northwest. • Agricultural land and forestry and access tracks • No other significant changes
1991 (1:10000) 1995 (1:2500)	• A disused quarry within the southeast of the Site • Disused gravel pit within the south no longer shown.	• No significant changes
2001 (1:10000)	• New quarry within the southwest of the Site. • No other significant changes	• The boathouse next to Loch na Beinne Moire, no longer shown. • No other significant changes
2003 (1:1250)	• Masts within the southeast of the Site. – New access tracks within the north of the Site. • No other significant changes	• Access tracks to the east and west of the Site • No other significant changes
2010 (1:10,000)	• No significant changes	• No significant changes

Dates	Features within Study Area	Features within 250 m of Study Area
2024 (1:10000)	• Quarries within the southeast and southwest of the Site are no longer shown (possibly infilled). • No other significant changes	• No significant changes
OS Bing Map (2024)	• The Site remains agricultural land and forestry across the Site. • Workings area within the centre east of the Site	• No significant changes

3.3 Summary of Potential Historical Contamination Sources

This section summarises potential contamination on site and in the vicinity associated with historical features identified in **Section 3.2**. These include:

- Made Ground associated with the construction of the OHL towers (on-site), paths and access tracks (on-site and off-site), the boathouse (off-site), construction of the Comar bridge (off-site), construction of the sluice, weir, dam (off-site), construction and decommissioning of nearby sewage works/beds (off-site), surrounding plant and equipment use in the forestry industry (on-site and off-site).
- Additionally Made Ground may be associated with the workings area and the potential infilling of the quarries (both on-site). These could have the potential for contaminants such as metals and inorganic compounds, pH, Polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) including benzene, toluene, ethylbenzene, xylene (BTEX) and methyl-tert-butyl-ether (MTBE), semi volatile organic compounds (SVOCs), volatile organic compounds (VOCs), sulphates, sulphides, cyanides and phenols;
- Potential ground gas generation from infilled quarries (on-site / off-site) and the presence of peat deposits;
- Sheepfold (off-site) could have to the potential to release contaminants such as arsenic and pesticides; and,
- No other significant contaminant features were identified within 250 m of the Site.

4 Existing Information Review

4.1 Introduction

Information provided to AECOM related to the subject site from previous ground investigation reports, planning developments, and planning applications (i.e. Highland Council Contaminated Land Officer) have been reviewed as part of this study. Relevant information relating to the Proposed Development, geological or land quality status has been subject to a review and summary as part of this report.

4.2 Third Party Information Review

4.2.1 Jacobs, ASTI Substation Site-LT521 Fasnakyle Ground Investigation Report (April 2024)

SSEN Transmission designed a ground investigation to assess the ground / groundwater conditions and geotechnical risks associated with the proposed development and provide information for detailed design. The ground investigation was also undertaken to assist in identifying a preferred location for the proposed Bingally Substation and to investigate and quantify the geotechnical and geo-environmental conditions at the proposed Bingally Substation site. A further aim of the investigation was to enable soil classification and derivation of geotechnical and geochemical parameters of the encountered materials for the design of the earthworks and structures associated with the proposed new substation.

The ground investigation was undertaken by Igne, formerly known as Raeburn Drilling and Geotechnical Ltd, with the findings summarised in their factual report (ref: Proposed LT521 Fasnakyle 400 kV Substation near Tomich Scottish Highlands, 26560, 23 May 2024) for the works.

The ground investigation has been done in the area of the proposed Bingally Substation which is within the south of the current red line boundary. At the time of undertaking the ground investigation two options were being considered for the area of the proposed Bingally Substation and were referred to as ‘Site D’ and ‘Site D Alternative’ (this Geo-environmental Desk Study considers the ‘Site D Alternative’ area referenced in the Igne Report, as this corresponds to the proposed Bingally Substation and the south of the access track area). The new access track area was not investigated as part of the ground investigation. Jacobs UK Ltd (Jacobs) was appointed in October 2023 by SSEN Transmission to supervise the ground investigation, check the factual report and prepare a Ground Investigation Report (GIR). The ground investigation report[2] was provided to AECOM for review. A copy of this report is available in **Appendix D.**

The Site options for the location of the new proposed Bingally Substation considered for assessment within the report were Site D and Site D Alternative, located within the south of the Study Area.

A site walkover was undertaken by Jacobs across several days in November 2023, which presented similar findings to the AECOM walkover survey.

The report also reviewed details on historical mapping and environmental setting of Site D and Site D Alternative. The report identified the following key findings:

- No historical buildings were noted within the Site boundary and there is no indication that the area has been used for anything other than forestry in the past. Aerial imagery suggest that the commercial forest was planted prior to 1989 and was deforested in 2016.
- The Beauly to Denny overhead line on the western edge of the Site, first appears on the OS map series 1949-1973 and has remained in the same location to the present day, including when it was upgraded to the current 400 kV / 275 kV circuits in 2015.
- Access tracks are also first shown on the OS map series 1949-1973 and were likely constructed at the same time as the existing Beauly to Denny overhead line.
- Jacobs reviewed the BGS published geological mapping and nearby historical borehole logs. The borehole logs description is as follow:
  - Made Ground from surface to a maximum of 0.40 m bgl (NH32SW1);

[2] Jacobs, 2024. *ASTI Substation Site-LT521 Fasnakyle Ground Investigation Report*

- Peat from surface to a maximum of 1.10 m bgl (NH32NW54);
- Sand and Gravel underlying the Peat or Made Ground up to a maximum of 4.00 m bgl (NH22SE1);
- Weathered Psammite / Brocken rock underlying the superficial deposits between 2.50 m bgl and 6.00 m bgl (top of bedrocks) (NH32SW1, NH22SE2, NH22SE3); and
- Psammite bedrock underlying the superficial deposits or weathered psammite between 1.30 m bgl and 4.00 m bgl (top of bedrocks) (NH32NW57, NH22SE1).

The report highlighted that peat is a key risk at the Site and something that will need to be addressed as part of the detailed design, with a Peat Management Plan (PMP) possibly required.

The report identified potential sources of contamination as follows:

- Discrete areas of Made Ground to be encountered during development works associated with the existing power line access tracks / infrastructure and forestry land use.

The report identified potential pathways and receptors as follows:

- **Construction Workers** – During the excavation works, construction workers may be exposed to subsurface soils and shallow groundwater, therefore, if present, any contaminants in both surface and deeper soils and / or groundwater may pose a potential risk through dermal contact with soil, ingestion of contaminants or inhalation of ground gas and soil vapour (primarily during below ground works / excavations);
- **Site End Users** – Future site users may be impacted by soils reused on site for landscaping purposes which may pose a potential risk through dermal contact / ingestion of contaminants. The inhalation of ground gas and soil vapour (primarily within buildings) should also be considered; and
- **Buildings and infrastructure on site and off site** – Potential to be impacted by ground gas and soil vapour and potential creation of off-site migration pathways.

The report has excluded the following potential exposure pathways and subsequent receptors:

- **Water Environment** –The Water Environment (surface water and groundwater) has not been considered given the lack of potential land contamination sources and nature of the construction works proposed, as it is assumed any pathways will already be in place.

The report gives a summary of the results presented in the Ground Investigation (GI) factual report: *Proposed LT521 Fasnakyle 400 kV Substation, Report on Ground Investigation, Igne, February 2024* (refer to **Appendix D**). However, this is presented in **Section 4.1.2** below.

A review of the GI information has been undertaken by Jacobs to assess potential contamination risks and constraints associated with the proposed works. The land contamination assessment has been undertaken in accordance with BS 10175:2011(+A2:2017) and relevant technical guidance including Land Contamination Risk Management (LCRM).

- **Risks to Construction Workers** were identified as follows:
  - A comparison of available soil chemical results did not note any exceedances of the Acute Generic Assessment Criteria (AGACs);
  - Exceedances of residential (without plant uptake) GAC values were recorded in soils (both Made Ground and natural deposits) for total chromium with exceedances recorded in 24 of the 26 samples analysed. A maximum concentration of 37 mg / kg was recorded in TP014 at 0.50 m bgl which was taken with natural silty sand and gravel;
  - No other chemicals were recorded above the GAC; and
  - No asbestos containing materials were identified within the samples screened.
- **Risk to Site End Users** were identified as follows:

- A single exceedance of the commercial/industrial end use GAC value for chromium was recorded in TP014 (within the proposed Bingally Substation site) at 0.50 m bgl with a concentration of 37 mg / kg recorded.

- **Risks to Construction Workers and End Users from Groundwater** were concluded as follows:

- Groundwater analysis has not been undertaken during the GI works. However, due to the absence of potential contamination sources, it is considered unlikely that, contaminated groundwater will be encountered within the Site area.

- **Risks to Construction Workers from Ground gas** were identified as follows:

- Methane concentrations did not exceed either the Lower Explosive Limit (LEL) of 5% v/v and Upper Explosive Limit (UEL) of 15% v/v. The short term and long-term exposure limits for carbon dioxide, carbon monoxide and hydrogen sulphide were not exceeded;

- Depleted oxygen concentrations (below 19 % v/v) were recorded in all 13 locations monitored with a minimum concentration of 15.2% v/v in BH02;

- The results show that ground conditions at the Site are unlikely to present a potential asphyxiating or explosive risk to construction workers. However, due to the presence of peat deposits, ground gas risks may warrant further consideration during below ground or confined space working should this be undertaken; and

- Jacobs recommended that the management of any excess peat arisings will also require appropriate consideration. Further sampling and full Waste Acceptance Criteria (WAC) testing should be undertaken to determine a provisional classification of the material for disposal in line with BS EN 12457.

- **Risks to Site End Users – Ground Gas** were identified as follow:

- Elevated flow rates and / or ground gas concentrations have not been recorded. However, due to the presence of peat deposits across the Site area, an assessment of the potential risks should be undertaken in accordance with CIRIA C665 ‘Assessing risks posed by hazardous ground gases to buildings’ and BS 8485 ‘Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings’ and suitable gas mitigation measures incorporated into the final building design.

AECOM Comments

The elevated concentrations of Chromium recorded during the Jacobs risk assessment is likely to be representative of background concentrations within this area of Scotland. With reference to the BGS document ‘*Great Glen: Regional Geochemical Atlas’* published 1987, natural background concentrations of chromium in Scotland are typically elevated. The notes within the chromium regional background map state the following:

> “*The Morar Division has a higher background (average 85ppm* [85mg/kg] *Cr) than the Loch Eil Division (average 65ppm* [65mg/kg]*), despite the presences amphibolites in the latter. This is consistent with the higher proportion of basic Lewisian detritus in the Morar Division and the increased maturity of the Loch Eil Division metasediments”.*

As bedrock is present at shallow depths across the Site area, and overlying sediments are likely to have been derived to a degree from the underlying bedrock geology, the recorded concentrations of chromium in superficial deposits of up to 37 mg / kg are not unanticipated, and likely represent natural background concentrations from natural materials within this area.

4.2.2 Igne, Proposed LT521 Fasnakyle 400 KV Substation Report on Ground Investigation Report (May 2024)

SSEN Transmission commissioned Igne (formerly Raeburn Drilling & Geotechnical Limited (RDG)) to undertake a ground investigation for the LT521 Fasnakyle project, in the area of the proposed Bingally Substation and extreme south of the access track. The Site works were carried out under the supervision of Jacobs. The objective of the works was to provide information on the ground conditions for design and construction of the proposed development and in relation to determine any geochemical contamination of the Site. The Site work was carried out between 6 November and 23 January 2023, in accordance with EN1997-2:2007, BS5930, BS10175 and in-house - procedures. Additionally, four rounds of ground gas monitoring were undertaken between December 2023 and April 2024.

The report on ground investigation comprised borehole and trial pits records, testing records, laboratory results, photographs, and a site plan. A copy of the Igne factual report is available in **Appendix D**.

The ground investigation works included 25 No. boreholes sunk by a mixture of dynamic sampling, rotary open-hole and rotary core drilling methods to a maximum depth of 13.10 m bgl (BH25). A total of 38 No. trial pits were excavated by mechanical means. Additionally, 6,270 No. peat probes were undertaken across the Site D and Site

D Alternative areas. The GI covered the proposed Bingally Substation platform, and areas to the northeast of the proposed Bingally Substation platform area.

Perforated standpipes were installed in 13 boreholes between 1.00 m bgl (BH18, BH25, BH26) and 11.50 m bgl (BH22) in superficial deposits and bedrock to monitor ground gas concentrations for methane, carbon monoxide, carbon dioxide, hydrogen sulphide, and oxygen. In addition, groundwater levels were recorded during ground gas monitoring.

The following in situ testing was undertaken during the ground investigation works:

- 26 No. Standard Penetration Tests (SPTs) were carried out within the boreholes;
- Six No. in situ thermal resistivity tests were carried out within selected trial pits (15 were scheduled however this was not completed due to shallow bedrock and unsuitable material);
- One No. soakaway test was undertaken within TP28 (six No. were scheduled however this was not completed due to shallow bedrock and unsuitable superficial deposits); and
- Recovery of disturbed samples from all exploratory holes and hand pits for geotechnical, geochemical and geo-environmental laboratory testing.
- The following geo-environmental tests were carried out:
- Metals (Toxic 9 Suite); Inorganic Suite (pH, total cyanide and sulphate); Total Petroleum Hydrocarbon Criteria Working Group / Volatile Petroleum Hydrocarbon Criteria Working Group TPHCWG / VPHCWG; TPHCWG Aliphatic / Aromatic Split; Polyaromatic Hydrocarbons (PAH) (USEPA 16); VOCs / SVOCs ; Asbestos.

The report identified the following key findings:

- The area of the GI lies approximately 3 km south of the village of Tomich and is accessed by existing forestry tracks (approximate National Grid reference NH299240);
- Peat deposits were encountered throughout the area of the GI;
- Chemical contamination testing was carried out on 26 soil and two leachate samples from peat and superficial deposits;
- No asbestos containing materials were identified within the soil samples analysed;
- Only one samples was subjected to WAC testing and was undertaken in BH12, at 0.50 m bgl. The results did not show any exceedances of inert landfill, stable non-reactive hazardous landfill and hazardous landfill acceptance criteria; and
- Groundwater strikes were recorded in 16 boreholes and 24 trial pits in the Peat and Granular Glacial Deposits between 0.10 m (TP34) and 3.20 m bgl (BH28).

A summary of the geological strata encountered during the GI is presented below:

- Topsoil was encountered in TP16 and TP27 only, recorded to a maximum depth of 0.30 m bgl (TP16). Topsoil was described as brown gravelly sandy silty TOPSOIL with low cobble content and dark brown sandy locally spongy fibrous peaty TOPSOIL within TP16 and TP27 respectively;
- Made Ground and evidence of contamination was not encountered during the GI;
- Tree roots from surface to 0.40 m bgl were encountered in BH08;
- Peat was encountered from surface to a maximum depth of 3.50 m (BH28) within 13 boreholes and in all trial pits, with the exception of TP16 and TP27. Suspected Peat was also encountered within 5,991 (of a total of 6,270) peat probes undertaken across the Site. Peat depths estimated from the probing were typically less than 2 m in thickness, although local areas of deeper peat were recorded within the area of the GI up to a maximum of 7.82 m. Where observed in exploratory holes, the Peat was generally described as dark brown slightly sandy plastic amorphous locally spongey fibrous PEAT. The Von Post scale for the humification and estimation of moisture content for the Peat, was typically recorded in the range of H4 to H5 / B1 to B2, although humification of up to H8 was locally recorded as well as moisture contents of up to B3;
- Superficial deposits of sand and gravel were encountered from surface (BH03) to 5.00 m bgl (BH18). Granular Glacial Deposits were generally encountered beneath the Peat or Topsoil within 19 No. boreholes and 32 trial pits. Gravel was described as brown very sandy silty fine to coarse angular and subangular of

psammite with cobbles (BH03), and grey very sandy slightly silty fine and medium angular and subangular (BH28). Sand was generally described as medium dense grey / brown very gravelly silty fine to coarse with cobbles. Gravel of psammite, pelite and granite (BH18, BH25);

- Weathered bedrock was recorded beneath the Peat and Granular Glacial Deposits between surface (BH04) and 7.60 m bgl (BH25) (top of bedrock) and described as highly weathered evident as a localised reduction of strength on fracture surfaces, sand infilling between fracture surfaces and locally recovered as gravel (BH25);
- Bedrock was encountered within all boreholes between surface (BH19 and BH20) and 7.60 m bgl (BH25). Within the trial pits probable bedrock was encountered between 0.30 m (TP09) and 2.90 m bgl (TP28) (top of bedrock). Bedrock was not encountered within TP11, TP17, TP26 and TP36, and these holes terminated at depths of 1.50 m, 2.50 m, 2.00 m and 1.40 m bgl respectively. The bedrock mainly comprises Psammitte, and Pelite with occasional igneous intrusions (Granite); and
- Four rounds of ground gas monitoring (including groundwater level monitoring) were undertaken within 11 boreholes, with a range in atmospheric pressure between 950 and 994 mbar. The following ground gas and groundwater results were recorded:
  - Methane (CH4) at 0% v/v;
  - Carbon dioxide (CO_2) between 0% v/v and 2.20% v/v;
  - Oxygen (O_2) between 15.00% v/v and 20.10% v/v (minimum and maximum) [AECOM comment: the fourth round in BH18 discounted from the assessment as the values are significantly lower and different from other rounds and locations. This is possibly due to the groundwater level rising at 1.59 m bgl while the response zone is of 2.60 m bgl;
  - Hydrogen sulphide (H_2S) between 0 ppm and 1 ppm;
  - Carbon monoxide (CO) at 0 ppm and 2 ppm (steady levels) with higher peak at 10 ppm in BH02; and
  -
  - Groundwater levels were recorded in 13 boreholes from surface (BH08) to 4.85 m bgl (BH11). None of the locations were recorded as dry.

4.2.3 Fairhust, LT521-Bingally 400kV Substation, Additional Access Track Peat Probing and Coring GI Summary Note (July 2024)

Additional peat probing within the Site was undertaken by BAM Ritchies in May to July 2024. The additional probing was undertaken to cover areas of the proposed access track, OHL and any infrastructure which were not included within the initial probing by Igne as part of Ground Investigation. The BAM Ritchies Ground Investigation is included in **Appendix D**. Peat depths estimated as part of the survey were typically less than 1.0 m in thickness although localised deeper peat deposits were recorded with the maximum thickness estimated as 4.5 m. In total 3,361 probes were undertaken as part of the additional probing exercise. No further intrusive results were available for the access track with a ground investigation currently being conducted.

4.3 Local Authority Consultation

4.3.1 Contaminated Land Officer - Consultation

AECOM has requested information from The Highland Council (THC) Contaminated Land Officer relating to potentially contaminated land within the Site within a radius of no greater than 500 m from the Site. The following information has been issued to AECOM on 12 April 2024 (ref.24/07), a copy of the correspondence is available in **Appendix E**:

- "*The Highland Council Contaminated Land Team does hold records of two potential sources of contaminated land:*

Name	National Grid Reference	Description	Distance from site
Borrow Pit / Workings	232365: 827693	Sourced from our current OS Maps and also from Planning Application 10/01752/FUL - Borrow Pit for the extraction of crushed rock material for construction of	Within the centre east of the Site

Name	National Grid Reference	Description	Distance from site
		new temporary and upgraded existing access tracks - Land 1.3 KM E Of Lillieoak, Tomich, Cannich.	
Quarry	230831: 823944	Sourced from our Historical Maps E5c Scale 1: 10560 and Epochm7 Scale 1: 10000 both dated 1971 and Current OS Mastermap. The feature is labelled as 'Quarry (dis)' on the 1971 maps but then labelled as 'Quarry' in the Current OS Mastermap.	Within the southeast of the Site

- *There are no details of any potentially contaminative sources within the immediate surrounding area of the Site;*
- *Other than the two potentially contaminative sources identified onsite THC is not aware of any other recorded current or historical environmental problems at the Site and adjacent areas with regards to ground contamination or solid waste arisings;*
- *There are no details of any current/former landfills offsite within 250 m;*
- *There are no known historical landfills within 500 m of the Site boundary;*
- *There are no known areas of ecologically sensitivity in the vicinity of the Site; and*
- *THC is not aware of any further environmental information for the Site*".

4.3.2 SEPA, Freedom of Information Request

AECOM has requested information from SEPA to assess any information relating to potentially contaminated land within the Site within a radius of no greater than 1km from the Site. The following information has been issued to AECOM on 26 April 2024 (Ref-Response toF0196906), and attached as **Appendix C**:

- SEPA does not hold any contaminated land information on this particular site or surrounding area.

5 Environmental Setting

5.1 Published Geology

The following summary of the geology beneath the Site is based on a review of geological mapping available from the BGS Geoindex, published BGS 1:50,000 scale map Sheets 73W Invermoriston (dated 2012 and 1976), and the Groundsure Report (**Appendix C**).

Extracts of the geological maps indicated above are presented below as **Figure 3, Figure 4** and **Figure 5**.

5.1.1 Artificial Ground

There are no BGS designated areas of made ground or artificial ground recorded on-site or within the surrounding area. Although no Made Ground is shown on published BGS mapping on the Site and within 1 km, localised Made Ground the construction of the OHL towers (on-site), paths and access tracks (on-site and off-site), the boathouse (off-site), constructions of the Comar bridge (off-site), the sluice, weir, dam (off-site), the monument at Beinn Mhor (on-site), surrounding plant and equipment use in the forestry industry (on-site and off-site). Additionally made ground may be associated with the workings area and the potential infilling of the quarry (both on-site) may be present.

5.1.2 Natural Superficial Deposits

Superficial geology comprises Peat and Glacial Till (Till Devensian-Diamicton) across the majority of the Site where present, with a significant proportion of the Site area where superficial deposits are not indicated to be present. The superficial deposits for the Site are shown on **Figure 3** and **Figure 4** below.

Alluvial Fan Deposits (of gravel, sand, silt and clay), Alluvium (of sand, gravel and boulders), River Terrace Deposits (of sand and gravel) and Glaciofluvial Sheet Deposits (of sand, gravel and boulders) are present off-site to the west of the northern and central portions of the Site. The immediate surrounding area to the southwest and approximately 1 km southeast shows Moranic Deposits (of sand, gravel and boulder)[3].

[3] BGS, 2022. *GeoIndex Onshore* [online]. Available from: GeoIndex - British Geological Survey (bgs.ac.uk)

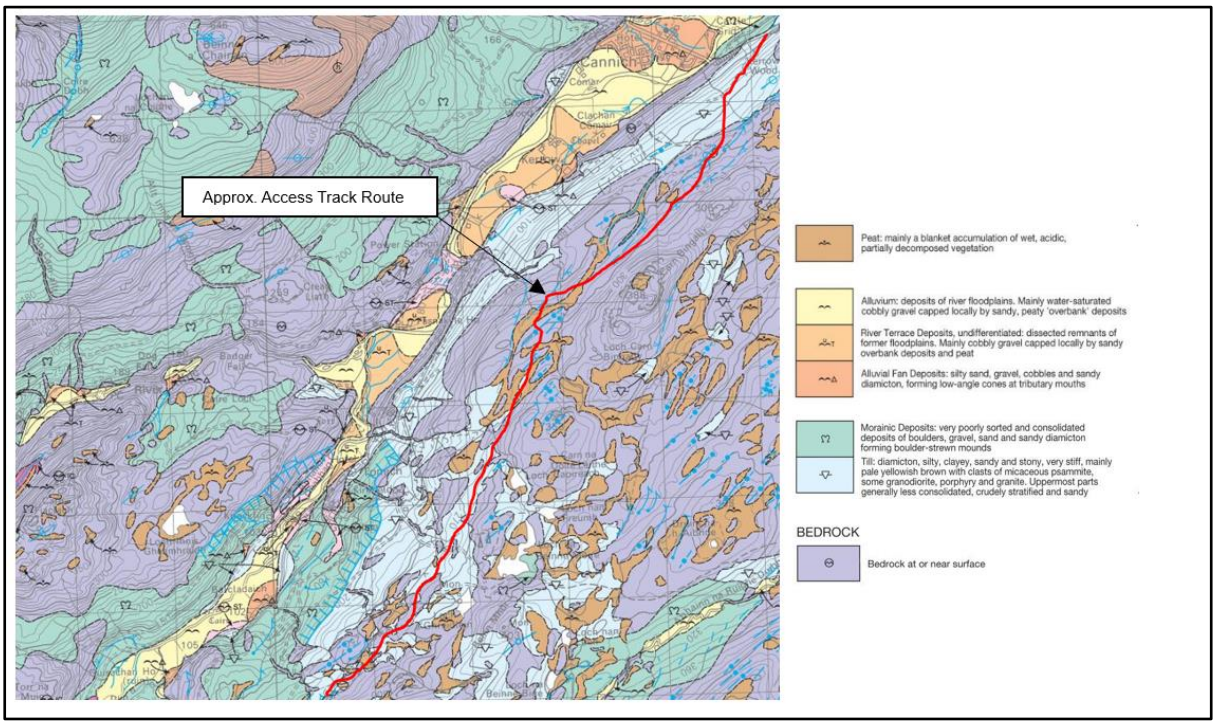


Figure 3 Superficial Geology – Proposed access track

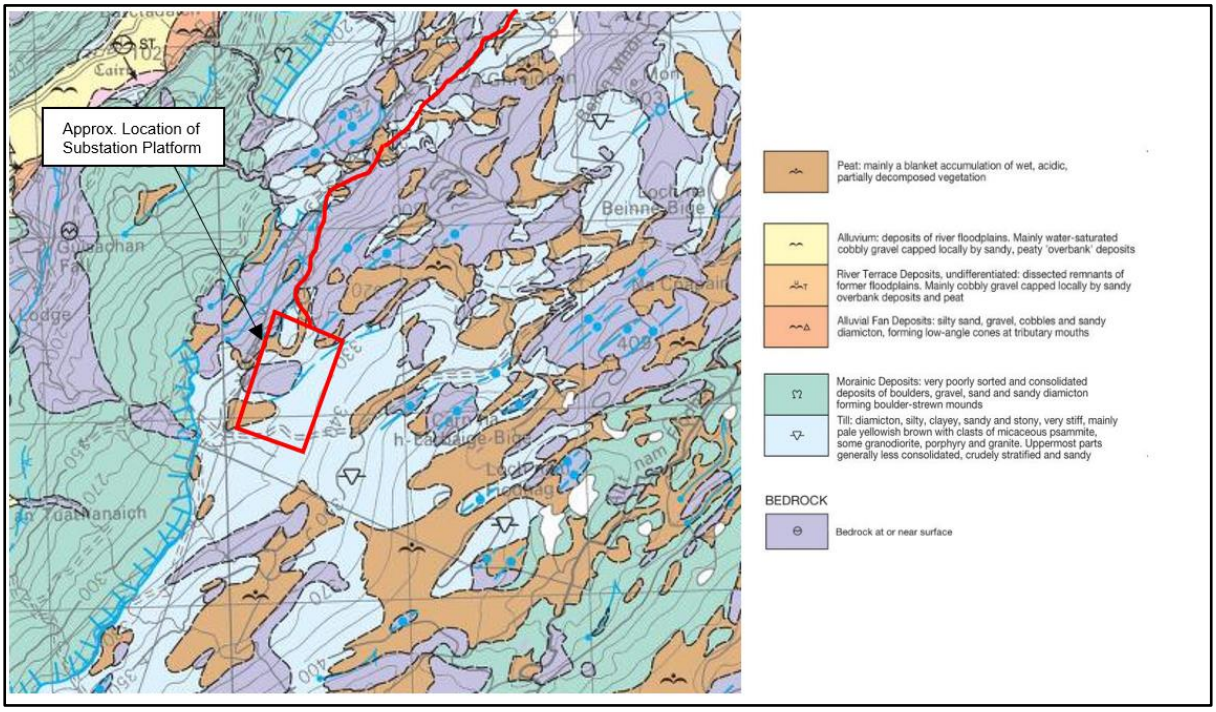


Figure 4 Superficial Geology – Proposed Substation Platform

5.1.3 Solid Geology

The bedrock geology underlying the Site comprises Tarvie Psammite Formation-Psammite (*named the Upper Garry Psammite Formation on BGS 1993 paper map)* from the Loch Eil Group. The bedrock geology is shown in **Figure 5** below.

Tarvie Psammite Formation of Psammite and Semipelite is shown off-site to the immediate east of the centre of the Site. Localised areas of unmade igneous intrusion (pre-caledonian in age) are present within 1 km west of the Site. Glen Moriston Vein Complex- Pegmatite and Leucogranite is present off-site approximately 70 m southeast, at 490 m northeast, and at 740 m southwest of the Site.

Tarvie Psammite Formation is defined by BGS as '*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*.'

The Strathglass Fault is shown to be present at approximately 700 m west of the Site.

Linear features (shown on the BGS Online Geoindex) including 'limit of pegmatitic rock veins', 'axis of large-scale glacial flute', 'ice-marginal glacial single-sided meltwater channel (right)' and 'marked concave break in slope (arrowheads denote uphill side)' are shown on site and in the surrounding area. Glacial meltwater channel centre lines (undifferentiated) are present approximately 290 m to the west of the central area, and at 1 km northeast of the Site.

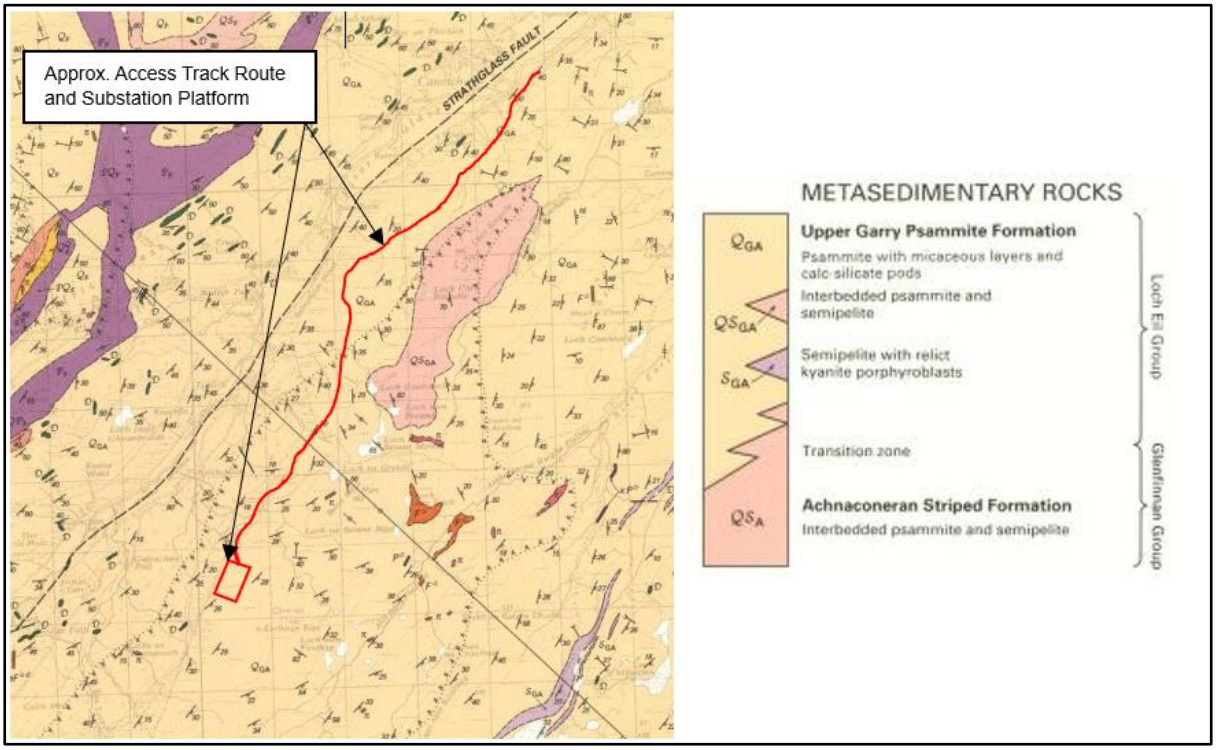


Figure 5 Solid Geology

5.2 Historical Borehole Records

Historical borehole records available on the BGS Onshore Geoindex[3] have been reviewed on 10 May 2024 to provide an indication of the ground conditions on site. Boreholes were recorded within the west of the Site, in the area of the Beauly Denny OHL. Records of these are included in **Appendix F**. Seven boreholes (NH32SW1, NH22SE1, NH22SE2, NH22SE4, NH32NW54, NH32NW55, NH32NW56, NH32NW57) were recorded in (or within close proximity to) the area of the proposed Bingally Substation and access track.

The BGS historical borehole records encountered the following general sequence:

- Made Ground from surface to a maximum of 0.40 m bgl (NH32SW1);

- Peat from surface to a maximum of 1.10 m bgl (NH32NW54);
- Sand and Gravel underlying the Peat or Made Ground up to a maximum of 4.00 m bgl (NH22SE1);
- Weathered Psammite / Broken rock underlying the superficial deposits between 1.10 m bgl and 3.90 m bgl (top of bedrock) (NH32SW1, NH22SE2); and
- Psammite bedrock underlying the superficial deposits or weathered psammite between 1.30 m bgl and 4.00 m bgl (top of bedrocks) (NH32NW57, NH22SE1).

Groundwater was not encountered in the boreholes records reviewed above, and there was no noted evidence of contamination recorded.

5.3 Mining and Quarrying

The Coal Authority website[4] reviewed on 10 May 2024, determined that the Site does not lie within a Coal Authority Reporting Area, also confirmed by the Groundsure Report (**Appendix C**).

The Groundsure report indicates seven non-coal mining areas of vein mineral commodity- to the south, at distances of 112 m southeast, 255 m south, 854 m east, 303 m east, 492 m northeast, 632 m northeast, and 783 m southwest of the Site. These are considered unlikely to represent potential impacts to the Site from a contamination perspective due to the features being localised and at distance from the Site.

The Groundsure Report indicates five quarries and pits in the vicinity of the Site. 'Guisachan Forest Pit' located within the east of the Site is for the commodity of sand and gravel, and of ceased status. There is an additional 'Guisachan Forest Pit' located 10 m southwest of the Site for commodity of Igneous and Metamorphic Rock, and of ceased status. Historical sand pits are shown within the north, at 208m northwest and at 358m northwest of the Site on OS maps 1901.

Additionally, BGS records 'Fasnakyle Bridge Pit' located and 'Guisachan Quarry' located approximately 750 m west of the centre and 820 m southwest of the Site, respectively. These quarries are potentially infilled.

5.4 Hydrology

The SEPA Water Environment Hub[5], the Groundsure Report **(Appendix C)** and other publicly available sources have been reviewed to identify relevant hydrological features on-site and in the surrounding area. The hydrology of the area is summarised in **Table 5-1** below.

Table 5-1 Summary of On-site and Surrounding Area Hydrology

Feature	Distance & Direction*	Flow Direction	Description
Kerrow Burn	On-site, north	East	Sourced from the convergence of two water courses which both sourced from approximately NH 35079 30770 and NH 35079 30770. Enters the River Glass at NH 34480 31314.
Allt a Chlachain	On-site, north	Southeast	Sourced from around NH 34054 30370 and appears to flow into a manmade drainage system at NH 33656 30840. This then possibly flows into the River Glass at NH 34206 31150.
Allt Currachan	On-site, within the centre	East	Sourced from three lochans include Loch na Bienne Moire (NH 32576 26551), Loch nam Freumh (NH 32795 26893) and Loch Caoireach (NH 32510 27196). The flows into Abhainn Deabhag at NH 31031 27715
Unnamed Water course	On-site, north	South	Sourced from NH 32194 26743 and likely flows into Allt an Fhasaich Mhoir. Has multiple tributaties and small pond/lochans associated to it.
Allt an Fhasaich Mhoir	On-site, southwest	Southeast	Sourced from Loch a' Ghreidlein at NH 31947 26044 and flows into Abhainn Deabhag at NH 30642 27390
Allt Bail a'Chladaich	On-site, the southwest	Southeast	Sourced from around NH 31539 23873 and convergences with Allt a' Bhuachaillie at NH 30012 26002. Flows into Abhainn Deabhag at NH 29694 26160

[4] The Coal Authority, 2023. *The Coal Authority Map Viewer* [online]. Available from: The Coal Authority Map Viewer (arcgis.com)
[5] SEPA, 2014. *Water Environment Hub* [online]. Available from: Water Environment Hub (sepa.org.uk)

Feature	Distance & Direction*	Flow Direction	Description
Allt a' Bhuachaillie	On-site, southwest	Southeast	Sourced from around NH 30885 25496and convergences with Allt Bail a'Chladaich at NH 30012 26002. Flows into Abhainn Deabhag at NH 29694 26160
Allt Bailen a h-Aibhne	18 m northeast	Southeast	Sourced from NH 33140 27876 and flows into the River Glass at NH 32009 29507
River Glass	146 m north	Northeast	River Glass is sourced from multiple rivers including convergence of River Affric and Abhainn Deabhag. River Affric is sourced from Loch Beinn a' Mheadhoin (NH 27391 27573) and Abhainn Deabhag is sourced from NH 18778 17241. These rivers flow northeast and converge at NH 31072 28754, forming the River Glass. The River Glass continues to flow northeast before converging with the River Farrar at NH 40786 39900 to form the River Beauly.

**All distance measured at closest point to the Site.*

According to the SEPA Water Environment Hub, the water features listed above drain into two Water Framework Directive (WFD) classified rivers: Abhainn Deabhag (SEPA ID 20235) and River Affric - Cannich to Loch Beinn a Mheadhoin (SEPA ID 20210). River Affric WFD body includes the River Affric and the River Glass. River Affric WFD has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on water storage for hydroelectricity generation. It also has an overall 'Good' classification from 2014. Adhainn Deabhag has a length of 20.4 km and also has an overall 'Good' classification from 2014.

The rivers noted in **Table 5-1** above are likely to be receptors as they are located on site or in the surrounding area. River Affric and Abhain Deabhag are passing through the north and at approximate distances of 500 m west of the Site, respectively. However, none are located in the area of the proposed Bingally Substation hence a low likelihood of impact on these is expected. Whilst some of the above features are in close proximity to the proposed access track area, impacts from the access track to surface water features are considered likely to be minimal.

5.5 Hydrogeology

Information from the Groundsure Report (**Appendix C**), BGS Onshore Geoindex[3] Aquifer Productivity (Scotland) GIS datasets Version 2 Revised Report[6] and the Scotland's Aquifers and Groundwater bodies[7] have been reviewed in relation to the aquifer classifications for superficial deposits and bedrock underlying the Site. These conclude that:

- Superficial deposits are not classified under a groundwater aquifer according to the BGS Geoindex. Similarly, the Groundsure Report does not classify the superficial deposits as a groundwater aquifer to the south of the Site. However, the report defines the superficial aquifer to the north and centre of the Site as a concealed aquifer of limited potential.
- According to BGS Geoindex, the bedrock deposits of the Loch Eil Group is characterised as a low productive aquifer. With small amounts of groundwater in near surface weathered zone and secondary fractures. The Groundsure report describes the flow as virtually all through fractures and other discontinuities.

Groundwater bodies are classified by SEPA under the WFD, whereby water bodies in Scotland are classed as High, Good, Moderate, Poor or Bad. A search of SEPA's online database[7] was conducted regarding the groundwater quality beneath the Site. The Site includes one bedrock water body, Northern Highlands (ID: 150701) which has a 'good' overall status (2022) according to SEPA with minor fracture flow.

Along the River Glass located within 1 km west and within the north of the Site is the Strathglass Sand and Gravel (ID: 150763) water body. This is a superficial aquifer which is dominated by intergranular flow. It has 19.23 km^2 area and a 'good' overall status (2022).

Groundwater flow direction within the aquifer units will likely be influenced by the local topography. Mapping indicates that the local topography falls downwards to the northwest. As such, groundwater is anticipated to flow in an approximate north westerly direction towards River Glass. However, the nature and extent of groundwater bodies within the area is unknown, as such limited certainty can be placed on groundwater this preliminary groundwater flow direction.

[6] BGS, 2015. *User Guide: Aquifer Productivity (Scotland) GIS datasets, Version 2. Revised Report* [online]. Available from: BGS Report, single column layout (nerc.ac.uk)
[7]BGS, 2015. *Scotland's aquifers and groundwater bodies* [online]. Available from: OR15028.pdf (nerc.ac.uk)

5.5.1 Private Water Supply (PWS)

Using data downloaded from THC's Open Map Data portal and the letter/questionnaire relating to PWS sent to properties surrounding the Site, there appear to be at least five PWS within 1 km of the Study Area. These are listed in **Table 5-2** below.

Table 5-2 PWS within 1 km of the Study Area

Name	National Grid Reference	Source	Use	Distance from Red Line Boundary
PWS Lillie Oak	NH 31268 27941	Unknown	Domestic	860 m downgradient
PWS SSE Substation - Fasnakyle	NH 31969 29977	Borehole	Substation	1000 m downgradient
PWS Invercannich Farm	NH 34300 32300	Spring	Domestic	830 m downgradient
PWS Higher Crochail	NH 36190 32459	Spring	Domestic	970 m downgradient
PWS The Frank	NH 31500 26800	Spring	Domestic	430m downgradient

Given the distance to these features from the Study Area, they are unlikely to represent potential receptors based on their distance from Study Area itself. As such, the PWS above are not considered further within this assessment.

5.6 Flood Risks

The SEPA Flood Maps for planning website[8] was reviewed on 10 May 2024 to assess potential flood risks at the Site, which are summarised below:

- **River Flooding** – the Site is not in an area of designated flood risk from river flooding, suggesting that the flood risk is <0.1% chance. An area to the immediate southeast of the Site, in the area of Loch a' Ghreidlein is shown as a high risk from river flooding. The Groundsure Report (**Appendix C**) shows some sporadic areas within the south and north of the Site to be at highest risk from river flooding of 1 in 30-year return period, these represent small areas immediately surrounding existing surface water features. Additionally, some areas in the centre and within 50 m centre of the Site are shown as highest risks of 1 in 100-year return period;
- **Coastal Flooding** - The Site is not at risk of coastal flooding. This is also confirmed by the Groundsure Report (**Appendix C**);
- **Surface Water Flooding** – SEPA flood mapping indicates areas across the Site to be of low to high risk from surface water flooding. This is also confirmed by the Groundsure Report (**Appendix C**), which describes the surface water flooding at highest risk of 1 in 30-year return period within the south, centre and north of the Site, and within 50 m distance from these. The elevated risk areas appear to be located in topographical low points and surrounding existing small surface water features; and
- **Groundwater Flooding** – The Groundsure Report (**Appendix C**) indicates that the Site lies predominantly within an area of negligible risk of flooding from groundwater. A small section within the north of the Site lies in an area of moderate risk from groundwater flooding. SEPA does not provide information on groundwater flooding risk.

The above does not constitute a formal flood risk assessment, which is out with the scope of this study.

5.7 Radon

The UK Health Security Agency's UK Radon website[9] was reviewed on 06 February 2025 to determine potential radon risks for the Site.

According to the website the majority of the Site including the proposed Bingally Substation area and the five temporary compounds are located within an area where 1-3% of homes are above the action level for radon gas. However, localised areas within the west and north of the Site comprise areas with radon potential of 3-5%. Localised areas within the east and north of the Site are shown as areas with radon potential of greater than 30%, however, these areas are in the footprints of the proposed access track and the western boundary of the substation

[8] SEPA, 2024. *SEPA Flood Maps* [online]. Available from: SEPA Flood Maps (arcgis.com)
[9] UK Health Security Agency, 2022. *UK maps of radon* [online]. Available from: UKradon - UK maps of radon

area only. Localised areas to the immediate west of the centre and southwest of the Site comprise radon potential of 5-10% and 30% respectively.

The above is also confirmed by the Groundsure Report (**Appendix C**), which proposes basic protection on the majority of the Site, and full protection in areas with radon potential of greater than 30%. It is therefore anticipated that radon protective measures will be necessary for the proposed Bingally Substation area for occupied buildings.

5.8 Environmental Designated Sites and Listed Buildings

The NatureScot Viewer[10] "Sitelink", was used on 16 February 2024 to identify environmental designated sites.

The database indicated that there are no recorded sensitive sites including Sites of Special Scientific Interest (SSSIs), Conserved Wetland Sites (Ramsar Sites), Special Areas of Conservation (SAC), Special Protection Areas (SPAs), National Nature Reserves (NNR), Local Nature Reserves (LNR), or Forest Parks within the development boundary. The closest ecological sensitive site is Glen Affric NNR (moorland) located at 182 m southwest of the Site. The nearest sensitive site relating to geology and soils is Strathglass Geological Conservation Review (GCR) site located 238 m north of the Site.

The above was confirmed as part of a review of the Groundsure Report except for Strathglass GCR (**Appendix C**). Additionally, approximately 34 areas of designated ancient woodland were indicated within 1 km west of the Site, with one to the east of the Site. However, none are located in the area of the proposed Bingally Substation. Balnahoun Wood and Kerrow Wood both of Ancient (of semi-natural origin) intersect the central area and north of the access track, respectively.

PASTMAP interactive mapping service[11], which provides access to the databases of Historic Environment Scotland (HES), and the Groundsure report were consulted regarding sites of potential historical and / or archaeological significance, and none were recorded within 1 km of the Site.

5.9 Unexploded Ordnance

To assess the potential risks from Unexploded Ordnance (UXO) at the Site, the Zetica Unexploded Bomb Risk Map[12] was used on 10 May 2024.The Map indicated a Low risk for the Site and surrounding area, which is defined by Zetica as an '*area indicated as having 15 bombs per 1,000 acres or less*'.

A Zetica Pre-Desk Study Assessment (PDSA) has identified WWII military activities on or affecting the Site, which are presented in **Table 5-3** below. Zetica recommended that a detailed UXO desk study is commissioned to assess, and potentially zone, the UXO hazard level on the Site. The extended assessment is provided in **Appendix G**.

Table 5-3 Summary of WWII Military Activities On or Affecting the Site

Date	On or Affecting the Site
Pre-WWI Military Activity	
WWI Military Activity	None Identified
WWI Bombing	
WWII Military Activity on or affecting the Site	During WWII, the Glenorrin military training area was established on land encompassing the Site. 1No. military camp was established on land at Cannich, approximately 0.3 km northwest of the Site.
WWII Bombing	During WWII the Site was located in the Landward Area (LA) of Inverness-shire, which officially recorded 94No. High Explosive (HE) bombs with a bombing density of less than 0.1 bombs per 405 ha. No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified on the Site. After WWII, the military camp at Cannich was repurposed for civilian accommodation.

[10] NatureScot, 2024. *SiteLink Map Search* [online]. Available from: SiteLink - Map Search (nature.scot)
[11] Historic Environment Scotland, 2024. *PastMap* [online]. Available from: Pastmap | Pastmap
[12]ZeticaUxo, 2024. *UXB RiskMap* [online]. Available from: Risk Maps | Zetica UXO

5.10 Soil Classification

The National Soil Map of Scotland[13] was reviewed on 10 May 2024 to determine the soil type on site and within the surrounding area.

The National Soil Map of Scotland identifies the main soil type across the Site as humus-iron podzols with peaty gleyed podzols. Peaty gleys with dystrophic semi-confined peat is present within the south of the Site as well as out with the Site to the east. Locally, a small area of the Site is shown to be underlain by peaty gleyed podzols towards the center of the Site along the proposed access track. Locally, mineral alluvial soils with peaty alluvial soils are also shown within the northern extent of the Site and out with the Site within approximately 1 km west. Brown earths with humus-iron podzols are shown approximately 600 m northwest of the Site.

Areas of carbon-rich soil, deep peat and peatland habitats are mapped by the Carbon and Peatland Map 2016[14]. The top two classes, 1 and 2, taken together identify the nationally important resource. The classes identified within the Site are defined as follows:

- **Class 0:** Mineral soil - Peatland habitats are not typically found on such soils;
- **Class 1:** Nationally important carbon-rich soils, deep peat and priority peatland habitat, areas likely to be of high conservation value;
- **Class 2:** Nationally important carbon-rich soils, deep peat and priority peatland habitat, areas of potentially high conservation value and restoration potential;
- **Class 4:** Area unlikely to be associated with peatland habitats or wet and acidic type. Area unlikely to include carbon-rich soils; and
- **Class 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.

The predominant soil type within the Site and Study Area is Class 0 (mineral soils). Localised areas of Class 1 and 2 nationally important deposits are recorded within the Site in the south and underlying the proposed access track towards the centre of the Site. Area of Class 1 and 2 deposits are also recorded out with the Site, however, within the 250 m Study Area predominately to the east of the Site. Within the south of the Site and underlying the proposed footprint of the substation Class 5 peatland soils are recorded. Class 5 soils are also recorded to be predominant to the east of the Site within the Study Area.

5.11 Regulatory Database Review

This section presents a summary of current and historical regulatory database entries included within the Groundsure Report (**Appendix C**) pertaining to the Site and surrounding land within 250 m which could result in soil and groundwater contamination. For the location of the relevant sources identified below, reference should be made to the Groundsure Report.

Generally, sites with regulated processes, registered radioactive substances, licensed waste management facilities and landfills, hazardous substances, fuel station entries and selected contemporary trade directory entries within 250 m of the Site, could, depending upon the nature of their activities, represent potential sources of contamination.

Table 5-4 Summary of Regulatory Database and Records Review

Data Type	Onsite	Within 250m
Historical Industrial Land Uses	- Unspecified quarry within the southeast; and - Sand Pit within the northwest.	- Disused sewage beds 157 m northwest; and - Sand pit 208 m northwest.
Recent Industrial Land Uses	- Twenty -eight existing OHL towers in the west associated with the Beauly Denny OHL; - One mast within the centre of the Site; and - One disused quarry (unspecified quarry or mines) within the southeast.	- Works (Activity: Unspecified Works or Factories) 159 m west; - Sewage Works (Waste Storage, Processing and Disposal) 161 m west; - OHL towers 20 m northwest and 169 m northwest; and - Workings area within the centre.

[13] ESRI, 2024. *UKSO* [online]. Available from: UK Soil Observatory (bgs.ac.uk)
[14]Scotland's environment, 2024. *Scotland's soils* [online]. Available from: Scotland's Soils - soil maps (environment.gov.scot)

Data Type	Onsite		Within 250m	
Gas Pipelines	-	None Recorded.	-	None Recorded.
Electricity Cables	-	None Recorded.	-	None Recorded.
Control of Major Accidents Hazards Sites (COMAH)	-	None Recorded.	-	None Recorded.
Regulated explosive sites	-	None Recorded.	-	None Recorded.
Hazardous Substance Storage/Usage	-	None Recorded.	-	None Recorded.
Part A (1) IPPC and Historic IPC Authorisations; Part B Authorisations	-	None Recorded.	-	None Recorded.
Pollution Inventory Substances/Inventory Waste Transfers/Inventory Radioactive waste	-	None Recorded.	-	None Recorded.
Sites determined as Contaminated Land	-	None Recorded.	-	None Recorded.
Historical Tanks	-	None Recorded.	-	None Recorded.
Historical energy features	-	None Recorded.	-	None Recorded.
Historical / Current petrol stations and garages	-	None Recorded.	-	None Recorded.
Registered Landfill or Historical BGS Recorded Landfill Sites	-	None Recorded.	-	Refuse tip 211 m northwest.
Licensed Waste Management Facilities	-	None Recorded.	-	None Recorded.
Historical Waste Sites	-	None Recorded.	-	None Recorded.
British Pits	-	Guisachan Forest Pit within the southeast of the Site, of sand & gravel, and with a ceased status.	-	Guisachan Forest Pit 10 m west of the Site, of igneous & metamorphic rock, and with a ceased status.
Surface Ground Workings	-	Sand pit within the north.	-	Water body 155 m northwest; - Disused sewage beds 157 m northwest; and - Sand Pit 208 m northwest and 368 m northwest.

6 Preliminary Conceptual Site Model

6.1 General

The approach adopted by AECOM to assess risk associated with land contamination is in line with the Scottish Government's approach outlined in Planning Advice Note (PAN) 33 Development of Contaminated Land. The Scottish Government considers that the most appropriate approach is a 'suitable for use' one in which risks to human health and the wider environment are assessed within the context of the current or proposed use of the land in question.

The risk assessment described below follows the methodology set out in the Environment Agency's Land Contamination Risk Management (LCRM) guidance which was published in October 2020 and updated in 2023. The LCRM guidance has now replaced the earlier Model Procedures for the Management of Land Contamination (CLR11), which has been withdrawn. AECOM understands that at the time of writing, SEPA and the Scottish Government have not yet formally made their position clear on the published LCRM guidance. However, given that the methodology in the LCRM guidance is essentially the same as that in CLR11, the key difference being some of the terminology used, AECOM has adopted the more recent guidance in this assessment.

The basic approach to risk assessment, as followed in this report, involves four steps:

- **Hazard Identification** – establishing contaminant sources, pathways and receptors (the conceptual site model);
- **Hazard Assessment** – analysing the potential for unacceptable risks (what contaminant linkages could be present, what the effects could be);
- **Risk Estimation** – aiming to establish the magnitude and probability of the possible consequences (what degree of harm might result and to what receptors, and how likely is it); and
- **Risk Evaluation** – evaluating whether the predicted risk is unacceptable.

The LCRM guidance provides the following staged approach to aid the management of land contamination:

- **Stage 1:** Risk Assessment;
- **Stage 2:** Options Appraisal; and
- **Stage 3:** Remediation.

This assessment undertakes only the Stage 1 Risk Assessment, which LCRM guidance presents as three tiers:

- Preliminary Risk Assessment (Tier 1);
- Generic Quantitative Risk Assessment (GQRA) (Tier 2); and
- Detailed Quantitative Risk Assessment (DQRA) (Tier 3).

This report has been provided to meet the requirements for a Preliminary Risk Assessment (Tier 1).

The methodology adopted is described in detail in LCRM and relies on the development of a site-specific CSM consisting of contaminant linkages. A contaminant linkage requires three components:

- A source of contamination, for example due to historical site operations;
- A pathway, a route by which receptors can become exposed to contaminants. Examples include vapour inhalation, soil ingestion and groundwater migration; and
- A receptor, a target that may be exposed to contaminants via the identified pathways. Examples include human occupiers / users of the Site, the water environment, property or ecosystems.

For a potential risk to either environmental and / or human receptors to exist, a plausible contaminant linkage involving each of these components must exist. If one of the components is absent then a contaminant linkage, and thereby a potentially unacceptable risk, is also unlikely to exist. Where all three components are present, a potentially complete contaminant linkage can be considered to exist. This does not automatically imply the presence of unacceptable risk, but that further investigation of the potential contaminant linkages is required.

6.2 Preliminary Conceptual Site Model

The preliminary CSM has been developed to identify potentially complete contaminant linkages that may require further investigation to assess their existence and / or potential significance. The potential sources of contamination on or in the vicinity of the Site, receptors on or near the Site, and pathways on or near the Site are discussed within the following sub-sections.

The preliminary CSM assesses the potential risks / liabilities and constraints associated with the Site in its current condition, prior to any proposed redevelopment. Risks associated with the proposed re-development have also been assessed based on expected environmental and ecological sensitivity in line with the planning application and development description.

6.2.1 Potential Sources of Contamination

This section uses the information described in earlier sections of this report to identify potential sources of contamination on and within 250 m of the Site.

It should be noted that the historical use of the Site and surrounding area has presented limited potential for significant contamination to be present. Soil and groundwater contamination within the Site boundary or close proximity is considered unlikely, and should any minor contamination exist it is unlikely to represent an impact due to the absence of receptors.

Table 6-1 Potential Sources of On-site Contamination

Potential On-site Source	Potential Contaminants	Area On-Site Affected	Current / Historical
Potential Made Ground associated with construction of the of the existing OHL towers, the workings area and potential quarry / pit infilling.	Metals, pH, Polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) including benzene, toluene, ethylbenzene, xylene (BTEX) and methyl-tert-butyl-ether (MTBE), SVOCs, VOCs, sulphates and sulphides.	Existing OHL towers to the west of the Site. Access tracks passing through the Site. Disused quarry within the south-east of the Site and former sand pit in the northwest.	Current and Historical
Peat, made ground	Ground gas	Disused quarry within the south-east of the Site and former sand pit in the northwest. Peat areas.	Current and Historical
Road and access tracks	PAH, TPH	Access tracks passing through the Site.	Current and Historical

Table 6-2 Potential Sources of Off-site Contamination (within 250 m of proposed re-development area)

Potential Off-site Source	Potential Contaminants	Current / Historical
Potential Made Ground associated with construction of the boathouse, the Comar bridge, the sluice, weir, dam, construction and decommissioning of nearby sewage works/beds, infilled pits	Metals and inorganic compounds, pH, PAHs, TPH including BTEX and MTBE, SVOCs, VOCs, sulphates, sulphides, phenols.	Current and Historical.
Road and access tracks	PAH, TPH.	Current and Historical.
Sheepfold	Arsenic and pesticides.	Current and Historical.

6.2.2 Potential Receptors

The following potential receptors for contamination have been identified:

Table 6-3 Potential Receptors

Receptor	Description
Human Health	• Current and future site users, i.e. visitors to site (members of the public) and substation engineers. • Future on-site construction and maintenance workers.
The Water Environment	• River Glass; Abhainn Deabhag; Kerrow Burn; Allt a Chlachain; Allt Bailen a h-Aibhne; Allt Currachan; Allt an Fhasaich Mhoir; Allt Bail a'Chladaich; Allt a' Bhuachaillie.

Receptor	Description
	• Groundwater within superficial deposits. • Groundwater within the underlying bedrock aquifer (Loch Eil Group, low productivity aquifer).
The Built Environment	• Buildings within the proposed development including concrete foundations. • Future Public Water Supply in the area of the proposed Bingally Substation for maintenance purposes.
Sensitive Ecological Sites	• Strathglass (GCR) and Glen Affric (NNR - moorland), located at approximately 238 m north and 182 m southwest.

6.2.3 Potential Pathways

Potential pathways have been identified, which could link the potential sources with the potential receptors. These pathways are discussed by receptor type below in consideration of the proposed development of the Site.

Table 6-4 Potential Pathways

Pathway	Description
Human Health	• Industrial land users (current site users) and future on-site workers by direct contact and/or ingestion of contaminated soil, dust and / or groundwater, inhalation of windblown dust. The presence of airborne dust may be exacerbated by construction work; • Visitors to the Site area using the access track (no public presence within the substation is considered likely); and • Inhalation of ground gas / radon within occupied buildings.
The Water Environment	• Groundwater within the superficial deposits by leaching and migration of contaminants via shallow Made Ground (if present) and natural superficial deposits; • Groundwater within the bedrock aquifer by leaching and migration of contaminants via shallow Made Ground and natural superficial deposits; • Surface water via surface water run-off, and lateral migration of contaminants via shallow deposits and service runs; and • Surface water by migration of contaminants via groundwater and introduction to river baseflow.
The Built Environment	• Concrete construction materials by direct contact with contaminated soil and groundwater (e.g. hydrocarbons) and aggressive ground conditions (pH and sulphate); • Direct contact of contaminated groundwater used within a PWS; and • Migration and build-up of ground gas / radon within buildings.

6.2.4 Discounted Sources / Pathways / Receptors

The following sources, pathways and receptors are discounted from the conceptual site model with the justification presented:

- Sources (off-site):
- Nearby forestry use is generally not considered as a source of contamination, given the periodic machinery use only;
- The sheepfold shown on historical map 1872 only so it is unlikely to be a source of contamination today; and
- The Site is greenfield with no past historical construction, no asbestos is anticipated. Moreover, any buildings built after 2000 are not expected to have asbestos[15].
- Receptors:
- Off-site third-party neighbours (excluding general visitors) - There are no occupied buildings within 1 km of the Site; and
- Archaeological Receptors – No archaeological features have been identified within 1 km of the Site.

[15]UKHSA, 2024. *Asbestos: General information* [online]. Available from: Asbestos: general information - GOV.UK (www.gov.uk)

6.2.5 Qualitative Assessment of Source-Pathway-Receptor

Based on the information provided in this report, the following preliminary risk assessment tables have been formulated, with each identifying possible contaminants and contaminant linkages in the context of the current and proposed development.

At this stage, a qualitative risk assessment has been undertaken for these potential source-pathway-receptor linkages based on current DEFRA (Guidelines for Environmental Risk Assessment and Management)[16], CIRIA C552[17] (see extract of the guidance in **Appendix H** including the coloured legend).

It must be noted that the following assessment is based solely on desktop study information and will require revision following any recommended intrusive site investigation works. The following assessment is based on consideration of both:

- The **likelihood** of an event (probability – takes into account both the presence of the hazard and receptor and the integrity of the pathway); and
- The **severity** of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

The risks associated with potential on and off-site contaminants identified are detailed in the **Table 6-5** below. The risk matrix colour coding is presented in **Appendix H**:

[16] DEFRA, 2011. *Guidelines for Environmental Risk Assessment – Green Leaves III* [online]. Available from: Guidelines for Environmental Risk Assessment and Management - Green Leaves III (publishing.service.gov.uk)
[17] Lancefield, Mayell & Rudland, 2001. *Contaminated Land Risk Assessment – A guide to good practice* [online]. Available from: c552 (ciria.org)

Table 6-5. Summary of Preliminary CSM and Risk Assessment

Source	Receptor		Exposure Pathway	Probability	Consequence	Risk Category	Justification
On-site Contamination sources including Made Ground associated with construction of the of the existing OHL towers, access roads and tracks, construction of the monument at Beinn Mhor the workings area and the potential infilling of the former quarries / gravel pits and peat.	**Human Health – On-site**	Future site users post development	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of contaminants in soil-derived dust.	Unlikely	Medium	**Low Risk**	The recent ground investigation did not encounter significant Made Ground on site, with only isolated areas of re-worked natural material encountered. Concentrations of chromium recorded within the ground investigation which exceeded the assessment criteria are likely to be representative of natural background concentrations. Given the remote location of the Site and anticipated short duration visits, these concentrations are unlikely to represent a significant risk. For construction workers who would have increased exposure, this would be controlled by good site practice and health and safety legislation. The absence of recorded contamination (other than chromium) within the proposed Bingally Substation area significantly reduces risks to site users in future. Whilst contamination within the access track areas is currently unknown, the presence of contamination is not anticipated, and (if present at all) is likely to be isolated to localised areas only. Due to the nature of the Site, limited public access is expected. In addition, the use of appropriate PPE, good hygiene practice and adherence to construction health and safety legislation should mitigate against potential for exposure to construction workers. Radon risks will require management via the installation of radon protection measures within occupied buildings. Ground gas risks associated with peat deposits may warrant further consideration during below ground or confined space working should this be undertaken.
			Inhalation of ground gas / vapour	Unlikely	Medium[18]	**Low Risk**	
			Inhalation of radon	Likely	Medium	**Moderate Risk**	
		General public post development	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of contaminants in soil-derived dust.	Unlikely	Medium	**Low Risk**	
		Construction / Maintenance Workers	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of ground gas, and contaminants in soil-derived dust.	Unlikely	Medium	**Low Risk**	
			Inhalation of radon	Likely	Medium	**Moderate Risk**	
	Water Environment-On-site and Off-site	Superficial and Bedrock Aquifers	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Unlikely	Medium	**Low Risk**	The recent ground investigation undertaken within the south of the Site records groundwater strikes in 16 boreholes and 24 trial pits in the Peat and Granular Glacial Deposits between 0.10 m (TP34) and 3.20 m bgl (BH28). Hydraulic continuity between shallow and deep groundwater is unknown but should be assumed. The limited extent of Made Ground in the area of the proposed Bingally Substation and access track, the
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Unlikely	Medium	**Low Risk**	

[18] Source severity has been downgraded to 'Medium' as ground gas sources identified have a 'Very Low or 'Low' ground gas generation potential and vapour sources are considered to be limited in potential concentration and extent. Therefore, vapour and ground gas are unlikely to generate significant concentrations capable of meeting the 'Severe' severity rating as defined in CIRIA C552.

Source	Receptor		Exposure Pathway	Probability	Consequence	Risk Category	Justification
							absence of contamination recorded in samples and the lack of potentially contaminative historical land uses further decreases the risk to groundwater.
		Surface Water Features inc. River Glass and streams (Abhainn Deabhag; Kerrow Burn; Allt a Chlachain; Allt Currachan; Allt an Fhasaich Mhoir; Allt Bail a'Chladaich; Allt a' Bhuachaillie)	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow.	Unlikely	Medium	**Low Risk**	Due to the presence of peat deposits and free draining soils, and the topography of the Site, the risk to surface water features via shallow deposits and/or surface run-off cannot be discounted. Several watercourses are present across the Site (**section 5.4**). However, there is limited potential of contaminants on site, which has been confirmed within the substation platform area by the recent ground investigation.
			Discharge of contaminants entrained in surface water run-off followed by overland flow and discharge.	Unlikely	Medium	**Low Risk**	Contamination migration via granular superficial deposits is possible, though the general absence of significant potential contamination sources reduce risks. Overall risk of contaminated surface runoff and / or groundwater migration is considered to be low due to expected lack of significant sources of contamination on-site. None of the water features are located in the area of the proposed Bingally Substation though some are in close proximity to the access track, with appropriate mitigation measures the risk to these are low.
	The Built Environment	Future Structures	Direct contact of contaminants in soil and/or groundwater or migration and buildup of ground gas.	Unlikely	Mild	**Very Low Risk**	Whilst risks cannot be entirely discounted, potential impacts are considered unlikely due to the isolated location of the Site and the general low level of development of the surrounding area. The recent ground investigation records generally low concentrations of ground gas, with generally low flows recorded.
Off-site contamination sources including off-site made ground associated with construction of the boathouse, the Comar bridge, the sluice, weir, dam, construction and decommissioning of nearby sewage works	**Human Health – On-site**	Site users post development	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of ground gas, and contaminants in soil-derived dust.	Unlikely	Medium	**Low Risk**	Off-site contamination from neighbouring sources is a possibility, though the limited occupation of the Site to routine maintenance visits reduces risks.
		Construction / Maintenance Workers	Inhalation of asbestos fibres.	Unlikely	Medium	**Low Risk**	Risks to construction workers will be managed via adherence to health and safety legislation and regulations.
			Inhalation of radon	Likely	Medium	**Moderate Risk**	Radon risks will require management via the installation of radon protection measures within occupied buildings.

Source	Receptor		Exposure Pathway	Probability	Consequence	Risk Category	Justification
/ beds, and ground gas from infilled pits			Inhalation of ground gas / vapour	Unlikely	Medium	**Low Risk**	
	The Built Environment	Existing and future structures	Direct contact of contaminants in soil and/or groundwater and buildup of ground gas.	Unlikely	Mild	**Very Low Risk**	No ground investigation was undertaken off-site. Although, the GI undertaken on-site records generally low concentrations of ground gas, with generally low flows recorded, this is not guaranteed for off-site conditions. Whilst risks cannot be entirely discounted, potential impacts can be managed by relatively inexpensive engineered mitigation measures.

7 Conclusions and Recommendations

7.1 Conclusions

Potential sources of contamination within the Site boundary are considered limited and relate to Made Ground associated with the construction of the OHL towers (on-site), paths and access tracks (on-site and off-site), the boathouse (off-site), construction of the Comar bridge (off-site), construction of the sluice, weir, dam (off-site), construction of the monument at Beinn Mhor (onsite), construction and decommissioning of nearby sewage works / beds (off-site), surrounding plant and equipment use in the forestry industry (on-site and off-site). Made Ground may also be associated with the workings area and the potential infilling of the quarries (both on-site) and a former gravel pit. However, the recent 2023 ground investigation (within the proposed Bingally Substation site only, not including the proposed access track area) did not encounter significant Made Ground on site, with only isolated areas of reworked natural material encountered. Historical Sheepfold (off-site) may also be a source of contamination.

Contamination from these aforementioned potential sources could pose potential risks to human health, the water environment and the built environment if present, but it is considered to be unlikely. There is potential for contaminants to migrate off-site via surface water run-off and transportation through granular and organic soils. However, given the likely limited extent of contaminant sources, it is unlikely to represent a significant impact.

The Proposed Development of the Site comprising construction of the proposed Bingally Substation on a greenfield site and temporary construction works reduces potential impacts to off-site human health and environmental receptors by severing pathways. Furthermore, the Site being located on greenfield land with no past construction history severely limits the potential of asbestos fibres. No asbestos was identified in the recent 2023 ground investigation.

The water environment is considered at low risk, due to expected lack of significant sources of contamination on-site. None of the surface water features are located in the area of the proposed Bingally Substation, with appropriate mitigation measures the risk to these are low. Additionally, the Site would have limited access to the public and any workers / staff on site will wear appropriate PPE and health and safety trained prior to any works being undertaken.

Finally, potential ground gas could be generated from infilled quarry (on-site/off-site) and peat deposits (on-site / off-site), with pathways to human health receptors via inhalation, migration/ build-up of ground gas / explosive risk, respectively. However, the risk rating is low as the recent ground investigation records generally low concentrations of ground gas, with generally low flows. It is considered that construction workers who are required to work in confined spaces / excavations must ensure that the potential risks from ground gas are taken into account of within their health and safety practice. Future site users post development (employees working in offices) are the most sensitive receptors via radon pathway. However, radon protection measures will be installed and controlled within occupied buildings.

Based on the available desk study information and the proposed Bingally Substation and access track development, the Site is classified overall as having a **Low risk** with respect to contaminated land.

Peat is recorded across much of the Site, particularly underlying and in the vicinity of the proposed Bingally Substation and southern extent of proposed access track. Investigations for the substation in the south of the Site positively identify peat deposits up to 3.50 m in thickness. Peat probing undertaken as part of the investigation around the proposed Bingally Substation site, typically agrees with the exploratory holes positively identifying the peat with the probing indicating the peat is typically less than 2.0 m in thickness, although local deeper deposits are present. Additional peat probing along the proposed access track within the Site, estimated peat deposits were typically less than 1 m in thickness, although areas of deeper peat were encountered. The desk-based sources indicates the peat generally falls within Class 5 peatland habitat, however, Class 1 and 2 Nationally important peatland habitats are recorded within the Site underlying the proposed access track and in the immediate vicinity of the proposed Bingally Substation.

Based on the available desk study information and the proposed Bingally Substation and access track layouts, the Site is classified as having a risk with respect to peat and peatland habitat.

7.2 Recommendations

The Desk Study has not identified unacceptable risks in accordance with Land Contamination Risk Management guidance at the Site. However, it is possible that risks to human health and the water environment receptors are present on-site without having been recorded or reported. It is recommended that the following further work / assessment is undertaken to constrain potential risks and liabilities:

- Undertake an Environmental Appraisal (EA) report including the findings of this report, to assess the significance of potential environmental effects that the proposed construction may have on the natural environment.
- Submission of this report to The Highland Council Contaminated Land Officer to obtain their approval of the report's findings. Furthermore, the scope of the Geo-environmental Desk Study has provided a preliminary characterisation of the Site's risk profile, however, as with all desk based studies there is a degree of uncertainty associated with them. In addition, as with any site there may be localised differences in Made Ground thicknesses, the presence of obstructions and physical or chemical composition, and unrecorded surface or ground disruptions and site activities. It is recommended that the client and their construction contractors have an unexpected contamination strategy in place throughout the construction of the proposed development. If contamination is identified at any point during construction work, then contact should be made with a suitably competent environmental consultant for further risk assessment to be undertaken.

The Desk Study has identified peat is present within the Site and underlying the Proposed Development works covered by this report. Peat can pose a significant risk to the works throughout all phases and is required to be assessed and considered further, especially as Class 1 and 2 Nationally important peat and peatland habitats have been recorded within the Site. As such, the following recommendations for the peat are provided:

- Undertake an EA to assess the significance the proposed works may have on the peatland.
- The design for the Proposed Development should aim to avoid the excavation and removal of peatland and the Proposed Development layouts should look to avoid areas of deep peat (>1.0 m in thickness) where possible.
- A Peat Management Plan (PMP) should be undertaken to provide details on the volumes of peat estimated to require removal as part of the works and how the peat will be reused. The PMP shall also provide details and guidance on how peat will be excavated, handled, stored, reused, etc. The PMP will require updating throughout each phase of the works.
- A Peatland Landslide Hazard and Risk Assessment (PLHRA) in accordance with Energy Consents Unit guidance document Peat Landslide Hazard and Risk Assessment: Best Practice Guide for Proposed Electricity Generation Developments (April, 2017) should be undertaken. This will identify any areas where an unacceptable risk of a peat landslide is present and provide mitigation measures to reduce the risk and/or impact of such an event.

Appendix A – Figures and Drawings

Appendix B – Site Photographs

Appendix C - Groundsure Report

Appendix D – Existing Information Review

Appendix E - Local Authority Consultation

Appendix F – BGS Borehole Records

Appendix G – UXO Pre-Desk Study Assessment (PDSA)

Appendix H - Approach to Risk Assessment

H.1 Risk Assessment Principles

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on LCRM.

For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessments of risks associated with each of these contaminant linkages are discussed in the following sections.

Using criteria broadly based on those presented in the CIRIA C552 guidance ("*Contaminated land risk assessment, a guide to good practice*"), the magnitude of the risk associated with potential contamination at the Site has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity);
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table **H-1**.

H.2 Risk Assessment Framework

Table H-1 Description of Severity of Risk

Severity	Definition	Examples (as defined by CIRIA C552)
Severe	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIA. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism for4ming part of such ecosystem (note: the definitions of eco9logical systems within the Draft Circular on Contaminated Land, DETR, 2000).	• High concentrations of cyanide on the surface of an informal recreation area. • Major spillage of contaminants from site into controlled water • Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied). –
Medium	Chronic damage to human health ("significant harm" as defined in DETR,2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution) a significant change in a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems system within Draft Circular on Contaminated Land, DTR, 2000)	• Concentration of a contaminant from site exceed the generic, or site-specific assessment criteria • Leaching of contaminants from a site to a major or minor aquifer. – Death of a species within a designated nature reserve
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	• Pollution of non-classified groundwater • Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability) –
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expensive to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.) easily repairable effects of damage to buildings, structures and services	• The presence of contaminants at such concentrations that protective equipment is required during site works • The loss of plants in a landscaping scheme – Discolouration of concrete

The probability of the risk occurring is classified according to the criteria in **Table H-2**.

Table H-2 Likelihood of Risk Occurrence

Likelihood	Definition
High	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstance are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low	There is a pollution linkage and circumstances are possible under which an event could occur.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in **Table H-3.**

Table H-3 Risk based on Comparison of Likelihood and Severity

		Severity			
		SEVERE	**MEDIUM**	**MILD**	**MINOR**
Likelihood	**HIGH**	Very High	High	Moderate	Moderate / Low
	LIKELY	High	Moderate	Moderate / Low	Low
	LOW	Moderate	Moderate / Low	Low	Very Low
	UNLIKELY	Moderate / Low	Low	Very Low	Very Low

Further definitions of each risk category as well as potential action that might be required – as described within CIRIA C552 – are as follows:

Very high risk

There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening.

This risk, if realised, is likely to result in a substantial liability.

Urgent investigation (if not undertaken already) and remediation are likely to be required.

High risk

Harm is likely to arise to a designated receptor from an identified hazard.

Realisation of the risk is likely to present a substantial liability.

Urgent investigation (if not undertaken already) is likely to be required and remedial works may be necessary in the short term and are likely over the longer term.

Moderate risk

It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.

Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability.

Some remediation works may be required in the longer term.

Low risk

It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk

There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.