Routeing Consultation Document
Spittal – Loch Buidhe - Beauly
400 kV OHL Reinforcement

August 2023

Scottish & Southern Electricity Networks

TRANSMISSION

Contents

Glossary

Term	Definition
Alternating Current (AC)	Type of electrical current in which the direction of flow of electrons switches back and forth at regular intervals or cycles.
Area of Search (Study Area)	A broad geographical area within which possible sites might be capable of identification within approximately 5km of the required connectivity point; usually determined by geographical features such as coastlines or hill/mountain ranges, or designation boundaries, such as National Park boundaries.
Consultation	The dynamic process of dialogue between individuals or groups, based on a genuine exchange of views and, normally, with the objective of influencing decisions, policies or programmes of action.
Distribution Network (DNO)	A licensed company that owns and operates the network of cables, transformers and towers that provide electricity.
Gigawatt (GW)	A unit of electrical power equal to one billion watts.
High Voltage Direct Current (HVDC)	HVDC is an effective way to transmit electricity and is primarily transmitted in this form by overhead lines or underground cables.
Holistic Network Design (HND)	Detailed report identifying the electricity network needs to enable connection of 23GW of offshore wind, including the needs associated with the offshore and onshore transmission network, facilitating the UK government offshore wind target of 50GW by 2030.
Kilovolt (kV)	A unit of electrical power equal to one thousand volts.

Glossary

Term	Definition
Kilowatt	A unit of electrical power equal to one thousand watts.
Local Development Plan (LDP)	LDP's are usually prepared by the Local Planning Authority and set out the proposals for future development and use of land in their area.
Megawatt (MW)	A unit of electrical power equal to one million watts.
Alternating Current (AC)	Type of electrical current in which the direction of flow of electrons switches back and forth at regular intervals or cycles.
National Planning Framework 4 (NPF4)	A broad geographical area within which possible sites might be capable of identification within approximately 5km of the required connectivity point; usually determined by geographical features such as coastlines or hill/mountain ranges, or designation boundaries, such as National Park boundaries.
Preferred Site	The Option that is the preferred choice, following Stage 2 – Detailed Site Selection based on environmental, engineering and cost perspectives and post consultation.
Overhead line (OHL)	An electric line installed above ground, usually supported by lattice steel structures or poles.
Stakeholders	Organisations and individuals who can affect or are affected by SSEN Transmission works.
Substation	A node on the network to allow safe control of the electricity network. This could include convergence of multiple circuits, transformation of voltage or other functions to maintain and operate the electricity network.
The National Grid	The electricity transmission network in Great Britain.
Volts	The international unit of electric potential and electromotive force.
Watts	The unit of measurement for the rate at which electrical energy is transferred or used.
Works	Constructing new transmission infrastructure such as substations, overhead lines, underground cables, major refurbishment of these, the dismantling and removal of any parts of the system; and associated works, which may include formation of access tracks, bridge and road improvements, tree cutting, drainage etc.

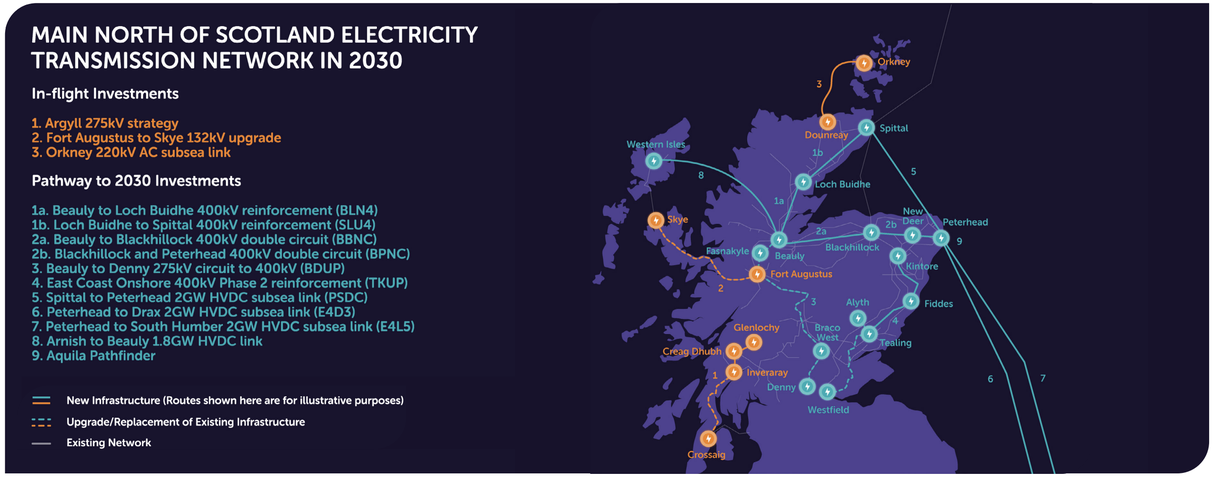
1 Introduction

This Consultation Document has been prepared by Scottish and Southern Electricity Networks Transmission (SSEN Transmission). SSEN Transmission, operating under licence held by Scottish Hydro Electric Transmission plc, owns, operates and develops the high voltage electricity transmission system in the north of Scotland and remote islands.

This Document describes the routeing process followed, route options identified, the appraisal undertaken, the alternatives considered during the selection of options and the highlighting of a Preferred Route. This Document supports the information made available to the public and statutory authorities in March 2023 through the consultation booklet, public event banners and the ArcGIS Storymaps site (Spittal to Loch Buid he to Beauly OHL Connection (arcgis.com)) and has been prepared in order to provide a more detailed overview of the process that we've followed to reach the current stage in the project.

We hope that in publishing this document we are facilitating a more standardised format for the public and statutory consultees alike to access the information previously presented and one which enables a wide range of information about the project to be easily downloaded.

Figure 1: Proposed new and upgraded/replacement infrastructure as part of the Pathway to 2030



1.1 Project Need

As a result of the Scottish and UK Governments' Net Zero climate change targets, together with requirements set out in the British Energy Security Strategy (BESS) (April 2022) and subsequently in National Grid Electricity System Operator's (ESO) "Pathway to 2030" Holistic Network Design (HND) (July 2022), significant increases in renewable generation capacity are required, resulting in significant investment in new transmission network infrastructure.

The BESS sets out the UK Government's plans to secure the country's future energy independence by reducing the dependence on, and price exposure to, volatile global wholesale gas markets. This will be achieved by accelerating the deployment of homegrown and affordable low carbon electricity generation, together with accelerating the enabling electricity network infrastructure required to connect and transport this power. The BESS included an increased ambition for offshore wind generation of 50GW by 2030, up from the previous target of 40GW.

To enable the connection of that 50GW of offshore wind by the 2030 target date, the GB Electricity System Operator (the ESO), working in collaboration with the three GB Transmission Owners, developed what is known as the 'Holistic Network Design' (the HND) . This sets out the onshore and electricity transmission infrastructure required across GB to deliver this UK Government target, including projects in SSEN Transmission's Licence Area across the north of Scotland.

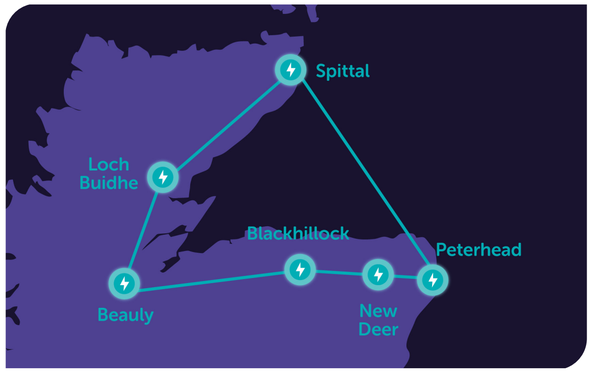
Caithness and the surrounding area are home to some of Scotland's best wind resources and the existing electricity transmission network is at full capacity, meaning the planned new renewable energy generation required by BESS can't connect without significant network reinforcement.

As part of the wider UK network reinforcements detailed in the BESS and HND, reinforcements required in SSEN Transmission's Licence Area include proposed new 400 kV links between Spittal and Beauly, and between Peterhead and Beauly to transmit electricity generated by renewables in the north / east of Scotland to areas of demand on the wider GB transmission network, as well as reinforcing the network in Scotland. In addition, new subsea links between Spittal and Peterhead, and from Peterhead to the north of England are required.

In December 2022, the energy regulator, Ofgem, approved the need for these projects as part of its Accelerated Strategic Transmission Investment (ASTI) framework decision.

These projects, alongside several other major network upgrades planned in the north of Scotland, are therefore part of a GB-wide programme of works that are required to meet UK and Scottish Government energy targets; there is a clear expectation from Government and the energy regulatory, Ofgem, that these projects will be delivered by 2030. More specifically, these projects are needed to deliver Government 2030 renewable targets set out in the BESS.

Figure 2: Locations of required new 400 kV Substations between Spittal, Beauly and Peterhead areas



1.2 Design Overview

The project involves the construction of a new 400 kV OHL between Spittal, Loch Buidhe and Beauly. The works will comprise of:

- Construction of approximately 85 km of a new 400 kV double circuit steel lattice OHL between the proposed new Spittal and Loch Buidhe 400kV substations.
- Construction of approximately 82km of a new 400 kV double circuit steel lattice OHL between the proposed new Loch Buidhe and Beauly 400 kV substations.
- Construction of temporary and permanent access tracks along the length of the OHL route.
- Rationalisation of existing high voltage and low voltage infrastructure at points of crossing along the new OHL routes, and around new and existing substation sites.

1.3 Strategic Considerations

The British Energy Security Strategy (BESS) and National Grid's subsequent 'Pathway to 2030' Holistic Network Design (HND) study concluded that both the onshore 400 kV Spittal to Beauly link and offshore Spittal to Peterhead 2 GW HVDC subsea link solutions are required to transport electricity around the country; in order to fully utilise any offshore systems, the onshore network is also required to be strengthened.

The HND explored additional solutions to coordinate offshore connections and to establish a bootstrap/link between two or more interface points on the onshore transmission system, which would potentially alleviate the need for onshore reinforcement. However, these additional offshore solutions were determined to be uneconomical compared to the onshore solutions, and the potential environmental and local community impact of these onshore solutions was deemed to be more preferential compared to the environmental impact of the offshore solutions and associated large increase in cost to the GB consumer of the ESO offshore solutions with the following key considerations:

- The high level cost assessment of both onshore and offshore solutions determined that an offshore option would be in the region of twice as expensive as the onshore option.
- An individual onshore solution is currently capable of transferring circa. 5GW of power which is more than double the transfer capability of an individual offshore solution at circa.1.3-2GW.
- In addition, an onshore overhead line AC solution can be modified over the course of its circa. 40-50 year asset life to further increase capacity (i.e. by changing conductor on the overhead line or operating the line at a hotter temperature) whereas the offshore HVDC solutions capacity is fixed as the subsea cable and AC to DC converters would need replaced.
- Finally, fault detection and restoration of onshore AC solutions is much easier and quicker compared to offshore solutions. A subsea cable fault could result in the outage of the entire offshore solution for circa. 6 months, compared to days/weeks for the onshore AC solution

Onshore 400 kV AC technology options are limited, resulting in a comparative analysis of overhead lines (supported on steel lattice towers) and underground cables. The table below presents a summary of their respective advantages and disadvantages.

Table 1.1 Comparison between overhead lines and underground cables

Overhead Lines	Underground Cables
Easier to cross challenging terrain like glens, hills, rivers, lochs, railways, roads and other utilities.	Routeing is more challenging as there is no option to cross challenging terrain.
Quicker, easier and cheaper to identify and repair faults compared to underground cable.	Fault detection of long cable sections is challenging, and repairs can take a substantial amount of time and cost.
Can travel long distances with no requirement of additional equipment/ expansion of substations to aid in stability of network.	Over long distances cables require additional equipment at substations to maintain stability of the network, resulting in larger substations and higher costs.
Lowest cost option when compared to underground cables.	Cable is much greater cost than overhead line to install and operate.
Potential for significant landscape and visual impacts.	Minimal landscape and visual impact from cables once construction has been completed.
Overhead lines are exposed to possible weather damage.	Due to being underground not subjected to same weather elements as overhead line.

The proposed technology for the new 400 kV link is a new double circuit 400 kV HVAC (High Voltage Alternating Current) overhead line supported on steel lattice towers (based on the Beauly-Denny suite). Although this has been identified as the preference, this does not mean that cable sections would not be considered where challenges are met for the consenting, construction and operation of an overhead line.

Each tower (often referred to as a pylon) will have six cross arms (the 'arms' coming off the centre of the tower) and a peak for lighting protection/ground wire. Each arm will support a cluster of 3 conductors (the long metal lines that travel from tower to tower). The conductors will be attached to the cross-arms via glass insulators.

1.4 Route Selection Process

The approach to route selection is informed by the following SSEN Transmission guidance:

- *Procedures for Routeing Overhead Lines and Underground Cables of 132 kV or above*, SSEN Transmission, 2020 (PR-NET-ENV-501) (Routeing Guidance); and
- *Biodiversity Net Gain Flow Chart, Guidance and Project Toolkit* (FC-NET-ENV-500).

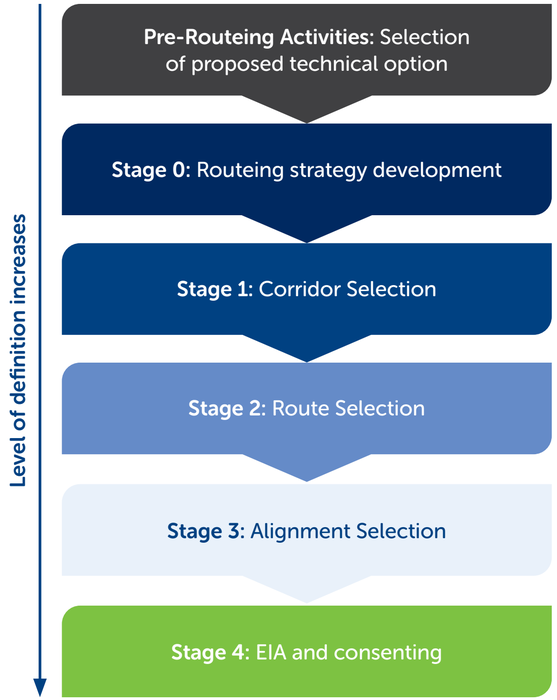
This guidance broadens the basis for routeing decisions to reflect contemporary practice, and ensures environmental (including social), technical and economic considerations are identified and appraised at each stage of the routeing process. It is important that the routeing and site selection processes are delivered by a multi-disciplinary project team. Identification of the most appropriate route for an OHL requires a balanced view, taking into account technical, environmental, economic, and grantor considerations.

The guidance sets out the SSEN Transmission approach to selecting a route for an OHL.

This document helps SSEN Transmission to meet its obligations under Schedule 9 of the Electricity Act 1989, which requires transmission license holders:

- to have a regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interests; and
- to do what they reasonably can to mitigate any effect that the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.

The guidance splits a project into six stages, as follows:



The stages that are carried out can vary depending on the type, nature of and size of a project and consultation is carried out at each stage of the process. The project is currently at Stage 2: Route Selection.

2. Stage 0: Routeing Strategy

The Routeing Strategy stage confirms our overall approach to the routeing process and the methods which will be adopted to identify, appraise and select options at each stage. It also identifies which stages, as set out within SSEN's Routeing Guidance, are applicable to the project and sets out the overall project specific consultation strategy; the background to the Routeing Strategy in terms of our Strategic Options is set out in Section 1.3.

For this project, the routeing strategy confirmed that all key stages as specified within the routeing guidance, namely corridor; route and alignment selection, would be undertaken in accordance with the guidance document.

A Consultation Strategy was also developed which identified that, since corridor and route options were not significantly different due to engineering, environmental and community constraints, that a combined corridor and routeing consultation exercise could be undertaken initially. Further consultation plans would be developed based on feedback received during initial consultation on potential route options.

3. Stage 1: Corridor Selection

The corridor selection stage seeks to identify a series of linear areas (corridors) capable of providing a continuous link between the defined connection points and delivering the required transmission connection.

Corridors should be as technically and economically efficient as practicable which are not constrained by, amongst other things, altitude or topography and which would have due regard to avoiding, where practicable, any interaction with man-made infrastructure and features of environmental or community sensitivity.

Corridors may be 1 km wide or may extend over many kilometres in width, depending on the scale and length of the project. In many cases due to the scale or nature of the project, Stage 1 Corridor Selection may not be justified, either as a consequence of earlier strategic decisions made, or due to physical overlap with Stage 2 Route Selection (i.e. where feasible corridors and routes are similar in width / location). A number of corridor options may exist and these are comparatively assessed using the RAG criteria within the Routeing Guidance.

A series of corridor options between Spittal and Loch Buidhe and Loch Buidhe and Beauly were identified in the early project stage in line with our routeing guidance. These were appraised against the engineering/, economic/people/environmental RAG criteria. The assessment identified no clear preferred corridor within which to accommodate the proposed new electricity transmission infrastructure due to the challenging terrain and large number of technical, environmental and community constraints within all corridor options.

The corridors were divided into two geographic areas: the Northern Corridor Options reflected the area between Spittal and Loch Buidhe, whilst the Southern Corridor options reflected the area between Loch Buidhe and Beauly.

The indicative corridor options identified in these areas are shown overleaf.

We include a summary below of corridor options considered on these two main sections:

Spittal to Loch Buidhe Corridor Options

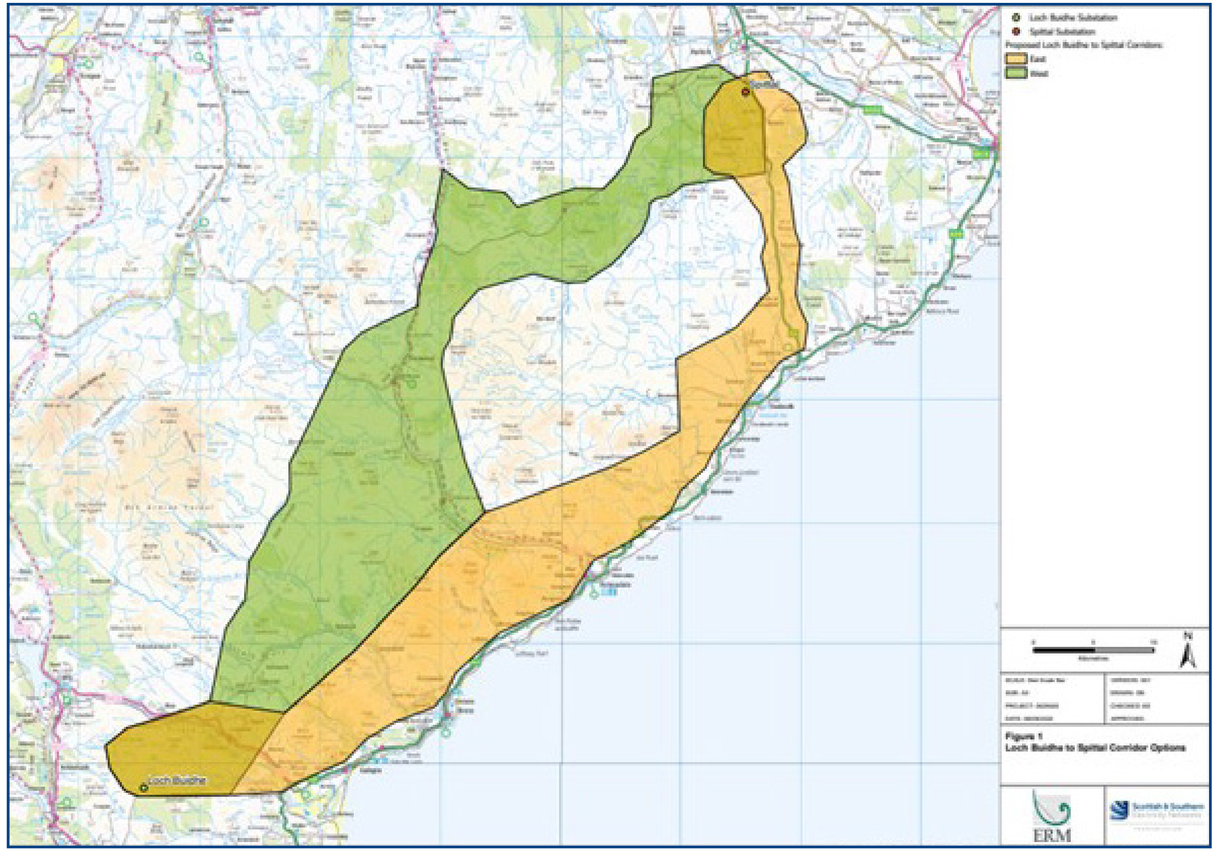
Two corridor options were identified on the northern section of the proposed OHL – a western corridor and an eastern corridor.

The Western Corridor follows the existing 275 kV OHL north from Loch Buidhe to the A897 where it turns north until Forsinard, the Corridor then continues north-east to Spittal, roughly following the route of the forest haul road and Thurso / Wick railway line. The length of the West Corridor is approximately 93 km.

The Eastern Corridor follows the existing 132 kV OHL north-east from Loch Buidhe to the A9 at Loch Fleet. From there it continues north along the coast to Dunbeath, where it turns inland to Spittal, following the route of the A9 road. The length of the East Corridor is approximately 90 km.

A comparison of the corridors shown in Fig 3 indicates that these broadly reflect the proposed route options covering the A and B sections of the proposed OHL that were subject to stakeholder consultation with communities and statutory consultees in early 2023.

Fig 3: Spittal to Loch Buidhe Corridor Options



Loch Buidhe to Beauly Corridor Options

Three corridor options were identified on the southern section of the proposed OHL – a western corridor, a central corridor and an eastern corridor.

The Western Corridor travels south-west from Loch Buidhe to the west of Strathpeffer and Ben Wyvis where it continues south-west to Beauly. The length of the West Corridor is approximately 70 km.

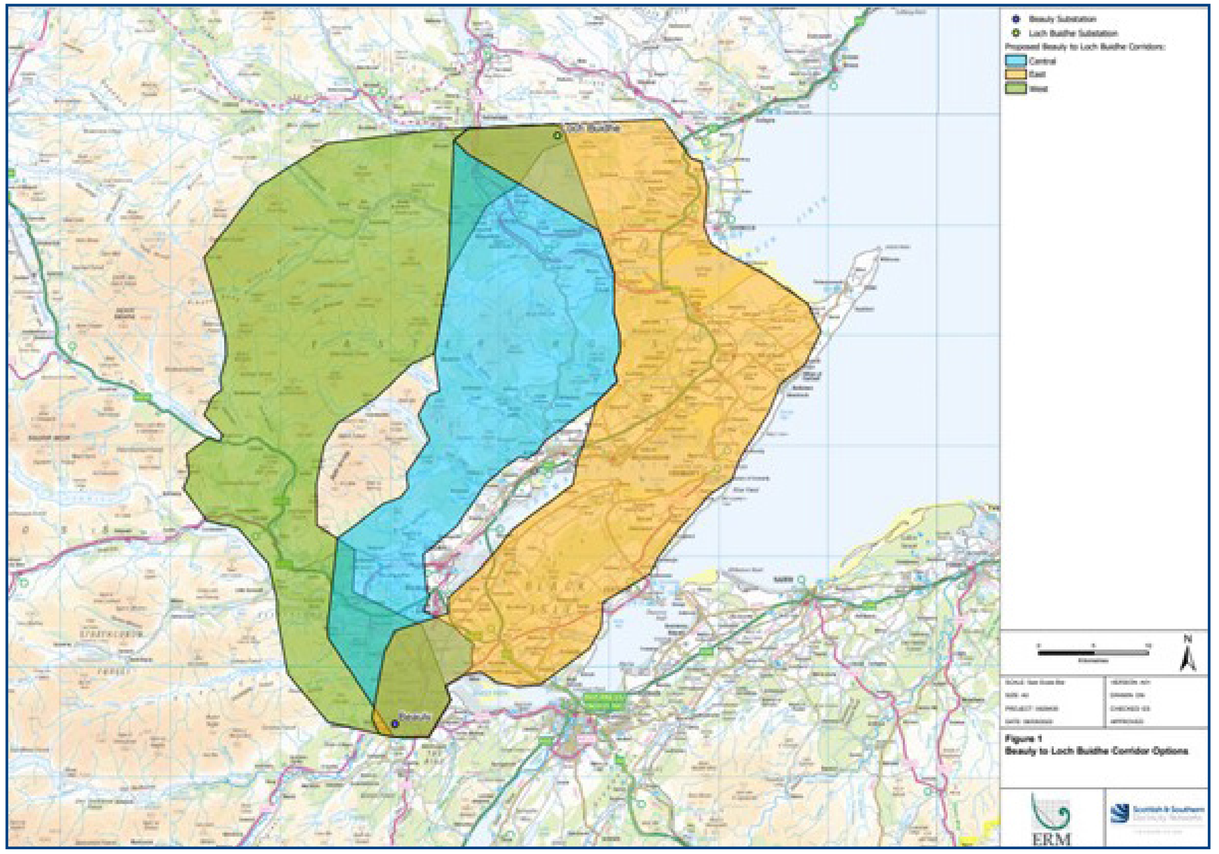
The Central Corridor travels south from Loch Buidhe to the west of Dingwall and continues south to Beauly. The length of the Central Corridor is approximately 58 km.

The East Corridor travels through the Black Isle, heading south from Loch Buidhe and crossing over the Dornoch Firth, before passing over the Cromarty Firth, keeping to the east of Dingwall, from where it travels south-west to Beauly. The length of the East Corridor is approximately 71 km.

The eastern corridor was considered significantly constrained on environmental, community and engineering grounds; the level of existing infrastructure (including existing overhead lines) and established large communities in the area, combined with the technical challenges of crossing two large bodies of water (Cromarty and Dornoch Firths) resulted in us presenting route options that focused on a central and western corridor which largely reflect those routes presented for consultation as D1, D2 and D3

A comparison of the corridors shown in Fig 4 indicates that the western and central corridors reflect the route options covering the C, D and E sections of the proposed OHL that were subject to stakeholder consultation with communities and statutory consultees in early 2023.

Fig 4: Loch Buidhe to Beauly Corridor Options



Corridor options were heavily constrained, largely as a result of the nature of the eastern area of northern Scotland. This meant that multiple route options within each of the corridors were unlikely to be identified.

As a result, the options for corridor and route selection were broadly similar; this led to our decision to consult the communities and statutory consultees when we had identified a number of preferred route options and not at early corridor identification stage in order to allow for a more targeted consultation process.

To support the routeing stage, SSEN Transmission engaged Continuum Industries to utilise their Artificial Intelligence (AI) based *Optioneer* software to identify route options to be considered at Stage 2: Route Selection.

4. Stage 2: Route Selection

Route Selection seeks to identify a route, or options for potential routes, which avoids where possible physical, environmental, community amenity and technical constraints, is likely to be acceptable to stakeholders, and is economically viable, taking into account design, construction and operation factors such as altitude, slope, ground conditions and access.

The dimensions of routes will depend on the context provided by the corridor. A route may be several kilometres in length and may range from 500 m to more than 1 km in width, depending on the scale of the project, the nature and extent of constraints and the character of the area in question. For some pinch points along the route options we may need to extend this area of search beyond 1km. A number of route options may exist within the corridor and these should be comparatively assessed using the RAG criteria within the Routeing Guidance.

The Optioneer software was used by the SSEN Transmission project team to identify route options that were technically feasible and that took environmental constraints into consideration. Sub options were identified where more than one option was identified to pass through an area. The Optioneer software identified an alignment and a 500m buffer either side was applied to create a route. These routes were modified in some areas to allow space for an alignment to avoid known constraints.

The appraisal of these potential route options has involved systematic consideration against the following topic areas:

Environment and Communities

- **Natural Heritage** - Designations; Protected species, Habitats, Ornithology, Hydrology and geology;
- **Cultural Heritage** – Designations, Cultural heritage assets;
- **People** – Proximity to dwellings;
- **Landscape** – Designations, Character and Visual; and
- **Land Use** – Agriculture, Forestry and Recreation.

Engineering

- **Infrastructure crossings** – Major crossings and Road crossings;
- **Environmental Design** – Elevation, Atmospheric pollution, Contamination and Flooding;
- **Ground Conditions** – Terrain and Peat;
- **Construction/Maintenance** – Access Road and Angle Tower; and
- **Proximity** – Clearance, Windfarms, Communication masts, Urban environments and Metallic pipelines.

Economic

- **Capital** – Construction, Diversions, Public Road Improvements, Tree Felling, Land Assembly, Consent Mitigations; and
- **Operational** – Inspections and Maintenance.

A red, amber, green (RAG) rating has been applied to each topic area within each section, indicating potential impacts. This rating is based on a four-point scale as follows:

Performance	Comparative Appraisal	
Most Preferred ↓ Least Preferred	**No Impact**	Negligible, or no potential effects
	Lower Impact / Technical Requirements	Potentially minor effects or technical challenges, with little or no requirement for mitigation
	Moderate Impact / Technical Requirements	Potentially moderate effects or technical challenges subsequent to appropriate mitigation
	Higher Impact / Technical Requirements	Potentially major effects or technical challenges which may be difficult to mitigate

4.1 Route Selection Process

Constraints between Spittal and Brora include local settlements such as Dunbeath and Helmsdale, alongside the Spittal Hill wind farm and a number of other proposed wind farms. In addition, there are numerous designated sites including Special Areas of Conservation (SACs), Special Protected Areas (SPAs) for birds and Sites of Special Scientific Interest (SSSIs), as well as the RSPB reserve, Causeymire – Knockfin Flows Wild Land Area and the Ben Klibreck – Armine Forest Wild Land Area. The terrain in the area is mix of moderate hills with some steep slopes, and then areas with more gradual undulated terrain.

Two main routes are identified, A1 and A2 as illustrated on Figure 3.1.

There are three pairs of sub options within Option A1. In order to assess which sub-route is preferential on environmental and engineering grounds, a comparative assessment of each of these pairs was undertaken, i.e. A1.1 compared against A1.2, A1.3 compared against A1.4, and A1.5 compared against A1.6. The results of these assessments are described in Tables 3.1, 3.2, and 3.3.

An overall RAG assessment of each pair of sub-routes is also included in order to demonstrate the differences or similarities of potential impact expected to arise if each route were chosen.

Following assessment, the least impactful of these sub-options, on balance, was then combined to form a composite route option for A1, which allowed for assessment against the route option A2. The assessment identified that in some cases there are differences between the sub-route option that is preferred from an environmental perspective versus that which is preferred from an engineering perspective; in such cases the combination of different sub-route options is highlighted clearly.

Our assessments on environmental, engineering and cost issues for the A1 sub-routes indicate that the overall preferred sub options included in A1 would be Option A1.1 and A1.5. Options A1.3 and A1.4 scored similarly across all themes. An assessment of the composite routes under Option A1 when compared with option A2 is included (see Tables 3.5, 3.6, and 3.7).

A summary of the comparisons within each route sub-option is included on following pages.

Figure 4 Section A Overview

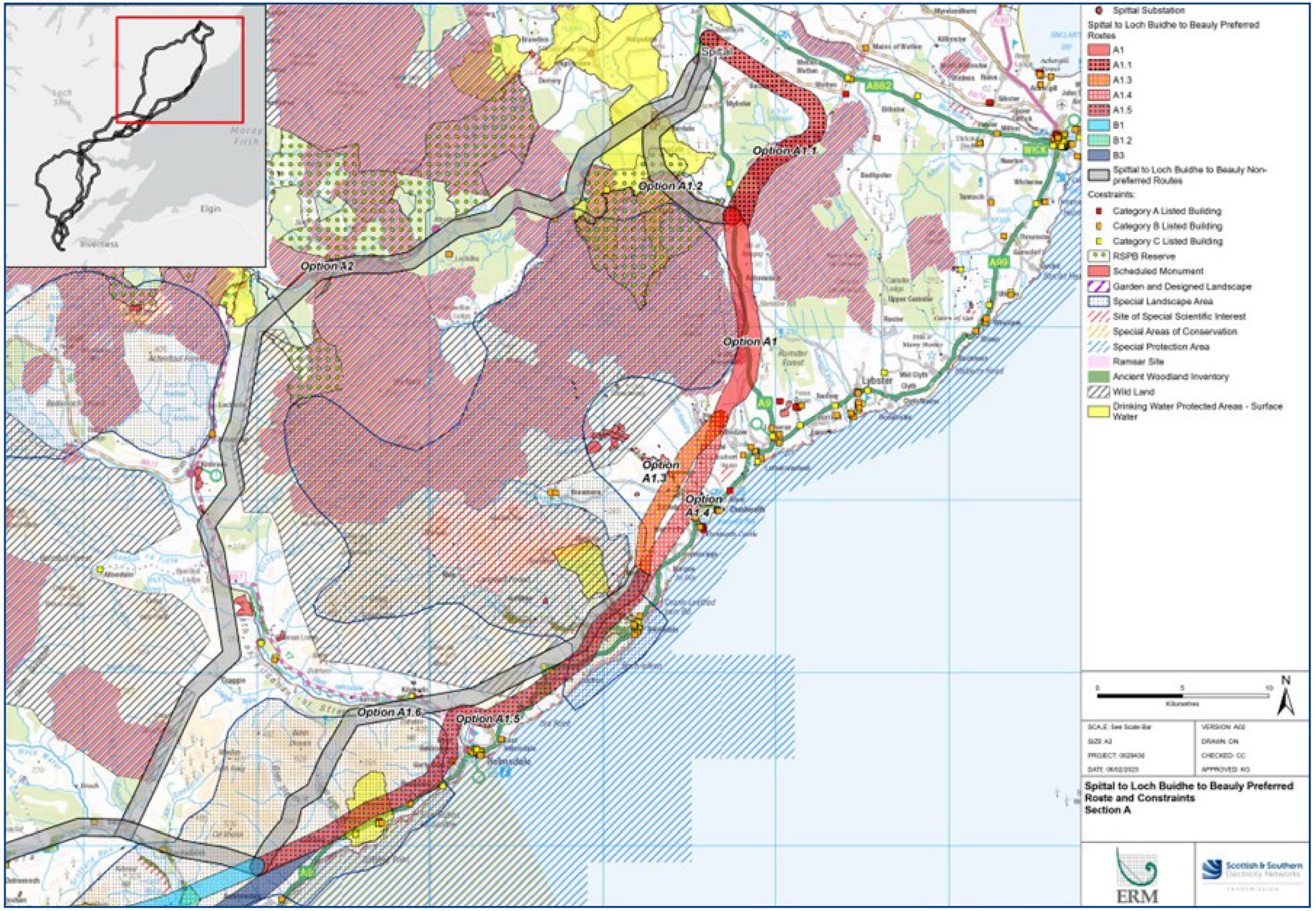


Table 3.1 Summary of key considerations for A1.1 v A1.2

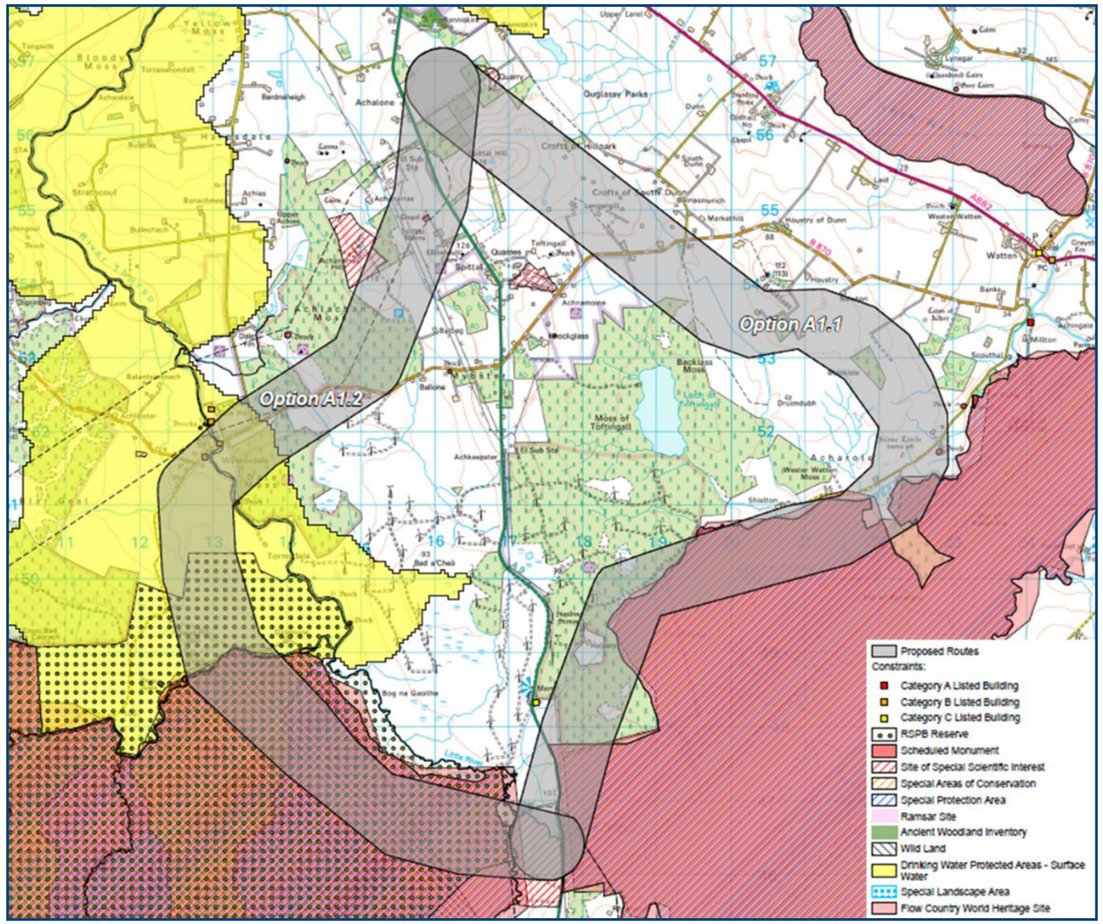
Option A1.1

Environment & Community

- Would pass through the Caithness and Sutherland Peatlands Special Protection Area, Ramsar and Special Area of Conservation, Shielton Peatlands Site of Special Scientific Interest and Leavad Site of Special Scientific Interest.
- Passes through the Flow Country potential World Heritage Site.

Engineering

- Likely to cross the existing Loch Buidhe-Mybster 132kV OHL.



Option A1.2

Environment & Community

- Would pass through the Caithness and Sutherland Peatlands Special Protection Area, Ramsar and Special Area of Conservation, River Thurso Special Area of Conservation, Blar nam Faoileag Site of Special Scientific Interest and Leavad Site of Special Scientific Interest.
- Passes through the Flow Country potential World Heritage Site.
- Passes through the Causeymire-Knockfin Flows Wild Land Area.
- Passes through the Forsinard Flows RSPB Reserve.

Engineering

- Likely to cross the existing Loch Buidhe-Mybster 132 kV OHL as well as two double circuit existing Spittal-Mybster 132 kV OHLs.
- Highly likely to cross River Thurso but this crossing would be under 20m so likely not of concern but flooding in the area should be considered.
- Highly likely to cross the both the A9 twice and the B870 once.

Preferred Option

Option A1.1 is a more environmentally preferred option as it avoids the Causeymire-Knockfin Flows Wild Land Area and the Forsinard Flows RSPB Reserve. An alignment may be feasible along the boundary of the designated area.

Option A1.1 is a more technically preferred option from an engineering perspective as it avoids crossing the two existing overhead lines between Mybster and Spittal.

Option A1.1 is therefore overall a more preferred option from both environmental and engineering perspectives.

Table 3.2 Summary of key considerations for A1.3 v A1.4

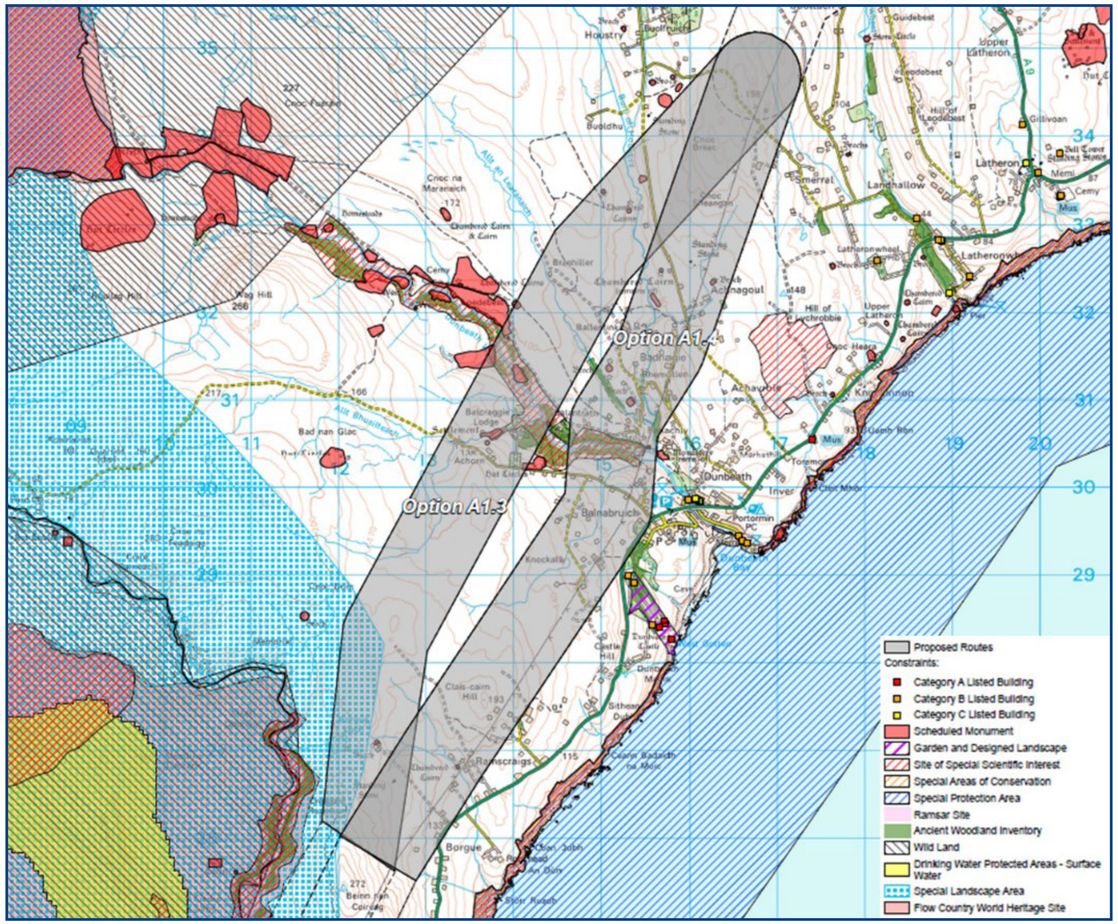
Option A1.3

Environment & Community

- Passes though the Dunbeath Water Site of Special Scientific Interest.
- Passes through ancient woodland.
- Passes adjacent to scheduled monuments and setting would be compromised.
- Passes through the Flow Country potential WHS and Berriedale Coast Special Landscape Area.

Engineering

- Will cross the River Dunbeath but this crossing would be under 10m so likely not of concern but flooding in the area should be considered.



Option A1.4

Environment & Community

- Passes through the Dunbeath Water Site of Special Scientific Interest.
- Passes through ancient woodland.
- Passes adjacent to the Dunbeath Castle Garden and Designed Landscape and scheduled monuments and setting may be compromised.

Engineering

- Will cross the River Dunbeath but this crossing would be under 10m so likely not of concern but flooding in the area should be considered.
- Likely to cross the existing Loch Buidhe-Spittal 132kV OHL.
- An intermediate risk of contaminated land due to more urban populations and coastal infrastructure.
- Passes through Rhemullen , Balnabruich, Borgue and is in close proximity of Dunbeath.

Preferred Option

Option A1.4 is a more environmentally preferred option as it avoids the Flow Country and Berriedale Coast Special Landscape Area. A1.4 has lower potential to impact scheduled monuments but is closer to the Dunbeath Castle Garden and Designed Landscape.

Option A1.3 is a more preferred option from an engineering perspective due to fewer OHL crossings, limited number of dwellings and subsequently no major issue identified in terms of proximity to existing third party infrastructure.

At this stage it is not clear whether sub-option A1.3 or A1.4 is preferred on balance. Although there are engineering challenges associated with A1.4 there is greater potential for environmental impact if A1.4 is not included.

Table 3.3 Summary of key considerations for A1.5 v A1.6

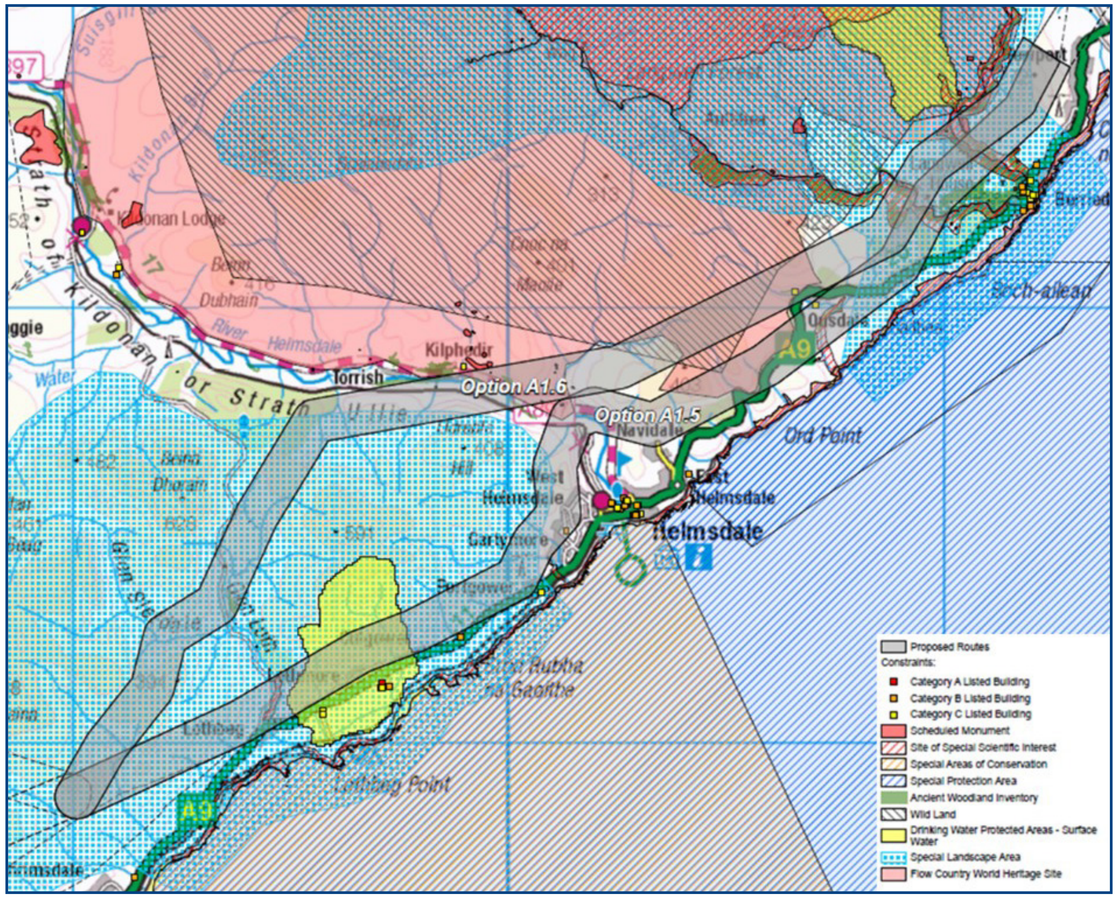
Option A1.5

Environment & Community

- Passes through the Berriedale and Langwell Waters Special Area of Conservation and Site of Special Scientific Interest.
- Passes through ancient woodland.
- Passes through a surface water drinking water protected area.
- Passes adjacent to scheduled monuments and Category C listed buildings with potential impact on setting.
- Passes through the Flow Country and Berriedale Coast Special Landscape Area and the Loch Fleet, Loch Brora and Glen Loth Special Landscape Area.

Engineering

- Likely to cross the existing Loch Buidhe-Spittal 132kV OHL at multiple locations. Will potentially cross the single-track railway near Helmsdale.
- Will cross the River Dunbeath at multiple but these crossings would be under 10m so likely not of concern but flooding in the area should be considered.
- Will cross both the A9 twice and the B870 once.



Option A1.6

Environment & Community

- Passes through the Berriedale and Langwell Waters Special Area of Conservation and Site of Special Scientific Interest.
- Passes through ancient woodland.
- Passes adjacent to scheduled monuments and Category C listed buildings with potential impact on setting.
- Passes through the Flow Country and Berriedale Coast Special Landscape Area and the Loch Fleet, Loch Brora and Glen Loth Special Landscape Area.

Engineering

- Will potentially cross the single-track railway near Helmsdale.
- Will cross the River Dunbeath at multiple points but these crossings would be under 10m so likely not of concern but flooding in the area should be considered.

Review of Preferred Option

Option A1.5 is considered a more environmentally preferred option as there is reduced potential to impact ancient woodland and it more closely follows the A9 reducing the potential landscape and habitat impact on the less developed interior. Option A1.5 is considered technically more preferred option compared to A1.6, because of less elevations and more accessibility from public roads. Construction within this route A1.6 will be more, detrimental, challenging and costly compared to Option A1.5 due to higher elevation, less accessibility from public roads and more area passing through peatland class1 & class 2. Option A1.5 will require less angle towers compared to A1.6. Option A1.6 is a more preferred option from an engineering perspective; construction within Option A1.5 will be comparatively more challenging and costly compared to Option A1.6, due to the requirement in A1.5 to locate infrastructure on sloping ground which creates significant challenges for access. Additionally, there are higher number of crossings within Option A1.5 than in A1.6, which add to construction and operational challenges. At this stage it is not clear whether sub-option A1.5 or A1.6 is preferred on balance.

Table 3.4 Section A – Spittal to Brora

Option	RAG Impact Rating – Environmental																RAG Impact Rating – Engineering																				
	Natural Heritage					Cultural Heritage		Peo -ple	Landscape			Land Use			Planning		Existing Infrastructure					Environmental Design				Ground Conditions		Construction & Maintenance			Proximity					
	Designations	Protected Species	Habitats	Ornithology	Geology, Hydrology and Hydrogeology	Designations	Cultural Heritage Assets	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy	Proposals	Existing OHL	Railway	River / Canal	Gas / Hydro pipelines	Road	Elevation	Atmospheric Pollution	Contaminated Land	Flooding	Terrain	Peatland	Route Length	Access	Angle Towers	Clearance Distance	Windfarms	Communication Masks	Urban Environment	Metallic Pipelines
A1.1	H	L	H	M	L	M	L	L	L	M	M	L	L	L	M	M	M	L	L	L	H	L	L	L	L	L	H	L	L	L	H	H	L	L	L
A1.2	H	L	H	M	M	M	L	L	H	M	M	L	L	M	M	M	H	L	L	L	H	L	L	L	L	L	H	L	L	L	H	H	L	L	L
Option A1.1 is the environmentally preferred option as it avoids the Causeymire-Knockfin Flows Wild Land Area and the Forsinard Flows RSPB Reserve.																	**Option A1.1** is the technically preferred option as it is unlikely to cross the two existing OHLs between Mybster and Spittal.																		
A1.3	H	L	H	M	L	H	L	L	M	M	M	L	L	L	M	M	L	L	H	L	L	M	H	H	H	L	H	L	L	L	M	M	L	L	L
A1.4	H	L	H	M	L	M	L	H	L	M	M	L	L	L	M	M	M	L	H	L	L	M	H	H	H	L	H	L	L	M	H	L	H	H	L
Option A1.4 is the environmentally preferred option as it avoids the Flow Country and Berriedale Coast SLA and has lower potential to impact scheduled monuments.																	**Option A1.3** is the technically preferred option due to lesser chances of OHL crossings, limited number of dwellings and subsequently no major issue identified in terms of proximity to existing third party infrastructure.																		
A1.5	H	L	H	M	M	M	L	H	H	M	L	L	L	L	M	M	M	H	H	L	M	M	H	M	M	M	M	L	L	M	H	L	H	H	L
A1.6	H	L	H	M	L	M	L	L	H	M	L	L	L	L	M	M	L	H	H	L	L	M	H	L	M	M	H	L	H	L	L	M	L	L	L
Option A1.5 is considered the environmentally preferred option as there is reduced potential to impact ancient woodland and it more closely follows the A9, reducing the potential landscape and habitat impact on the less developed interior.																	**Option A1.5** is considered technically preferred option despite of its higher ratings in assessments related to roads crossings, proximity to third party infrastructure. However, Option A1.6 terrain is expected to be more challenging with steeper slopes, inaccessible section with more access road challenges and significant areas of unavoidable peatland. Construction within this route will be more, detrimental, challenging and costly compared to Option A1.5.																		
A1	H	L	H	M	L	M	L	M	H	M	M	L	L	M	M	M	M	L	M	L	H	M	H	H	M	M	M	L	L	M	M	H	M	H	L
A2	H	L	H	M	M	H	L	L	H	M	M	L	L	M	M	M	M	L	M	L	L	M	M	L	L	M	H	L	M	L	L	L	L	L	L
Option A1 is considered the more environmentally preferred option than Option A1.2 as it avoids the Causeymire-Knockfin Flows WLA and the Forsinard Flows RSPB Reserve (which is also a part of the Caithness and Sutherlands SPA / SAC).																	**Option A1** is the technically more preferred option despite of its higher ratings in most of the assessments related to crossings and proximity to third party infrastructure. However, Option A2 terrain is expected to be more challenging with significant areas of unavoidable peatland. Also, the access and construction within this corridor will be more, detrimental, challenging and costly compared to Option A1.																		
Option A1 is the preferred route however there is no clear preference between A1.3 and A14.																																			

Table 3.5 Engineering Comparison of Overall Options

		A1	A2
Infrastructure Crossings	Major Crossings	Likely to cross Loch Buidhe-Spittal 132kV OHL crossings at different locations. Railway track crossing near Helmsdale. Passes by Loch Brora, River Brora, River Helmsdale, River Dunbeath	Loch Buidhe-Spittal 132kV OHL Crossing near Spittal Substation, crossing 275kv OHL Loch Buidhe – Connagill. Crosses Single-track railway crossing near Kinbrace. Passes through Cluster of Lochs on approach to Spittal namely Loch Eileanach, Loch Gaineimh and Lochan Dubh nan Geodh.
	Minor Crossings	Crosses A9 Road several times (3+) and Road B870 Once	Crosses Road A897 and Road A9 once
Environmental Design	Elevation	75% of the route has elevation 0m-200m and 25% of route has elevation between 200m-450m. Route has average elevation 160m, min elevation 19m and max elevation is383m.	60% of route is between 100m-200m. 75% of the route has elevation between 0m-200m. 25% route has elevation between 200m-450m. Route has average elevation 161m, min elevation 34m and max elevation 313.
	Atmospheric Pollution	Route is within 10km from Coastal line.	Further inland, lesser atmospheric pollution concerns
	Contamination	Intermediate risk of contaminated land due to more urban populations and coastal infrastructure. Small UXO* risk due to coastal infrastructure, no landfill or COMAH sites	Low risk area from UXO*, no landfill or COMAH sites
	Flooding	3% of the route in flood risk area	6% of the route in flood risk area
Ground Conditions	Terrain	82% of route has slope between 01-20 degrees and 12.1% route has slope between 20-40 degrees, with Max Slope-49°	91% of route has slope between 01-20 degrees and 2% of route has slope between 20-60 degrees with Max Slope-32°
	Peat	Peatland Class1 – 21% of the total length. Peatland Class2 – 21% of the total length.	Peatland Class1 – 31% of the total length. Peatland Class2 – 25% of the total length.
Construction and Maintenance	Access Road	85% of route has available access through 50m to 1000m 10% of route has available access through 1000m to 10000m	65% of route has available access through 50m to 1000m 27% of route has available access through 1000m to 10000m
	Angle Towers	No of angle towers - 22	No of angle towers - 18
Proximity	Clearance	Few Properties	No risk of properties
	Windfarms	Buolfruich Windfarm (Existing), Bad Fearn Wind Farm (Scoping), Halsary, Bad a Cheo windfarm (Existing), Achlanchan windfarm (Existing)	Gordonbush Wind Farm (Existing)
	Communication Masts	Risk of communication mast due to populated area	No known communication masts
	Urban Environment	Helmsdale, Portgower and Culgower	No urban areas within route
	Metallic Pipeline	No known pipelines	No known pipelines

**Unexploded Ordnance*

Table 3.6 Environmental Comparison of Overall Options

		A1	A2
Natural Heritage	Designations	Passes through the Dunbeath Water SSSI, Berriedale and Langwell Waters SAC and SSSIs. Caithness and Sutherland Peatlands SPA, Ramsar and SAC, Shielton Peatlands SSSI, Coire na Beinne Mires are within the route. Areas of ancient woodland within the route.	Passes through the Caithness and Sutherland Peatlands SPA, Ramsar and SAC and Strathmore Peatlands SSSI. Ramsdale Peatlands SSSI, Slettill Peatlands SSSI, Forsinard Flows NNR and Coir' an Eoin SSSI are within the route. Areas of ancient woodland within the route.
	Protected Species	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.
	Habitats	Likely to compromise Annex 1 habitat with high potential for ground water dependent terrestrial ecosystems.	Likely to compromise Annex 1 habitat with high potential for ground water dependent terrestrial ecosystems.
	Ornithology	May compromise the conservation status of Schedule 1 bird species or their habitats.	May compromise the conservation status of Schedule 1 bird species or their habitats.
	Hydrology/ Geology	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.
Cultural Heritage	Designations	May compromise the setting of scheduled monuments and Dunrobin Castle GDL.	Likely to compromise the designating features or setting of scheduled monuments and the Flow Country potential WHS.
	Cultural Heritage Assets	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.
People	Proximity to dwellings	Helmsdale, Portgower and Culgower	No urban areas within route
Landscape	Designations	Passes through the Flow Country and Berriedale Coast SLA and the Loch Fleet, Loch Brora and Glen Loth SLA and the setting of Dunrobin Castle GDL	Passes through the Causeymire-Knockfin Flows WLA and the Ben Klibreck - Armine Forest WLA.
	Character	May compromise characteristic elements of a given landscape.	May compromise characteristic elements of a given landscape.
	Visual	May compromise the view or visual amenity of individual properties.	May compromise the view or visual amenity of individual properties.
Land Use	Agriculture	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1).	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1)
	Forestry	Avoids interaction with areas of commercial forestry.	Avoids interaction with areas of commercial forestry.
	Recreation	Potential to compromise the recreational amenity of core paths.	Potential to compromise the recreational amenity of core paths and the Forisinard Flows RSPB Reserve.
Planning	Policy	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.
	Proposals	May be inconsistent with other third party proposals known to the planning system including Causeymire, Halsary and Bad a Cheo Windfarms at Mybster.	May be inconsistent with other third party proposals known to the planning system including Strathbrora Windfarm.

Table 3.7 Economic Comparison of Overall Options

Cost		RAG	Site Comparison Notes
A1.1	Sub-option comparison		More economic option compared to alternative sub route A1.2.
A1.2			Route A1.2 is a less economic option when compared to A1.1. This is due to an increase in the number of OHL crossings, increased requirement for tree felling and an increase in the need for crossing protection.
A1.3	Sub-option comparison		More economic option compared to alternative sub route A1.4.
A1.4			Route A1.4 is a slightly less economic option when compared to A1.3. This is primarily due to a higher number of 11 kV crossings.
A1.5	Sub-option comparison		Route A1.5 is a slightly less economic option than A1.6 mainly due to a higher number of 11 kV crossings and an increase in crossing protection requirements.
A1.6			More economic option compared to alternative sub route A1.5.
A1 (with A sub-options)	Full A option comparison		More economic option compared to route A2.
A2			Route A2 was the less economic route when compared to A1 (with A sub-options) due to the increased requirement for crossing existing HV lines. There is also a significantly higher need for tree felling as well as increased costs for crossings' protection.

Option A1 (incorporating sub options A1.1, A1.4 and A1.5) is considered a more preferred option from environmental and cost perspectives due to the reduced potential to impact designated sites, peat, habitat and landscape character, including areas designated as wild land and an RSPB reserve. Option A1 (incorporating sub options A1.1, A1.3 and A1.5) is considered a more preferred route option from engineering perspective.

Despite a greater number of red and amber ratings in most of the assessments related to crossings and proximity to third party infrastructure, Option A2's terrain is expected to be more challenging with significant areas of unavoidable peatland and the access and construction within this corridor will be more detrimental, challenging and costly compared to Option A1. Option A1 is a more economically preferred option between Option A1 and A2.

4.2 Section B – Brora to Loch Buidhe

Constraints between the villages of Brora and Golspie include a number of designated areas including the Strath Carnaig and Strath Fleet Moors Special Protection Area and Site of Special Scientific Interest, the Dornoch Firth and Loch Fleet Ramsar and Special Protection Area, Mound Alderwoods Special Area of Conversion and Site of Special Scientific Interest and Strathfleet Site of Special Scientific Interest.

The terrain in this section has a mix of high hills and steep slopes and as such there are a number of wind farms to avoid including the constructed Kilbraur wind farm and the consented Kilbraur extension. On the approach to the Loch Buidhe substation, there are overhead lines to be avoided where possible.

Three main route options are identified, those being B1, B2 and B3 as illustrated on Figure 4.1, shown overleaf.

There are two sub options within Option B1. In order to assess which combination of B route and sub-route has potential to be most preferrential on environmental and engineering grounds, a comparative assessment of the B1 options and sub-options was undertaken, i.e. B1 compared against sub-option B1.1 and B1 compared against sub-option B1.2; the results of these assessments are described in Tables 4.1 and 4.2. The more preferred combination of sub options within B1 is then assessed against Option B2 and B3.

An overall RAG assessment of each of the sub-routes is also included in order to demonstrate the differences or similarities of potential impact expected to arise if each route were chosen.

Following assessment, the least impactful of these sub-options, on balance, was then combined to form a composite route option for B1, which allowed for assessment against the route options B2 and B3.

An assessment of the composite routes under Option B1 when compared with options B2 and B3 is included (see Table 4.3).

Figure 4.2 Section B Overview

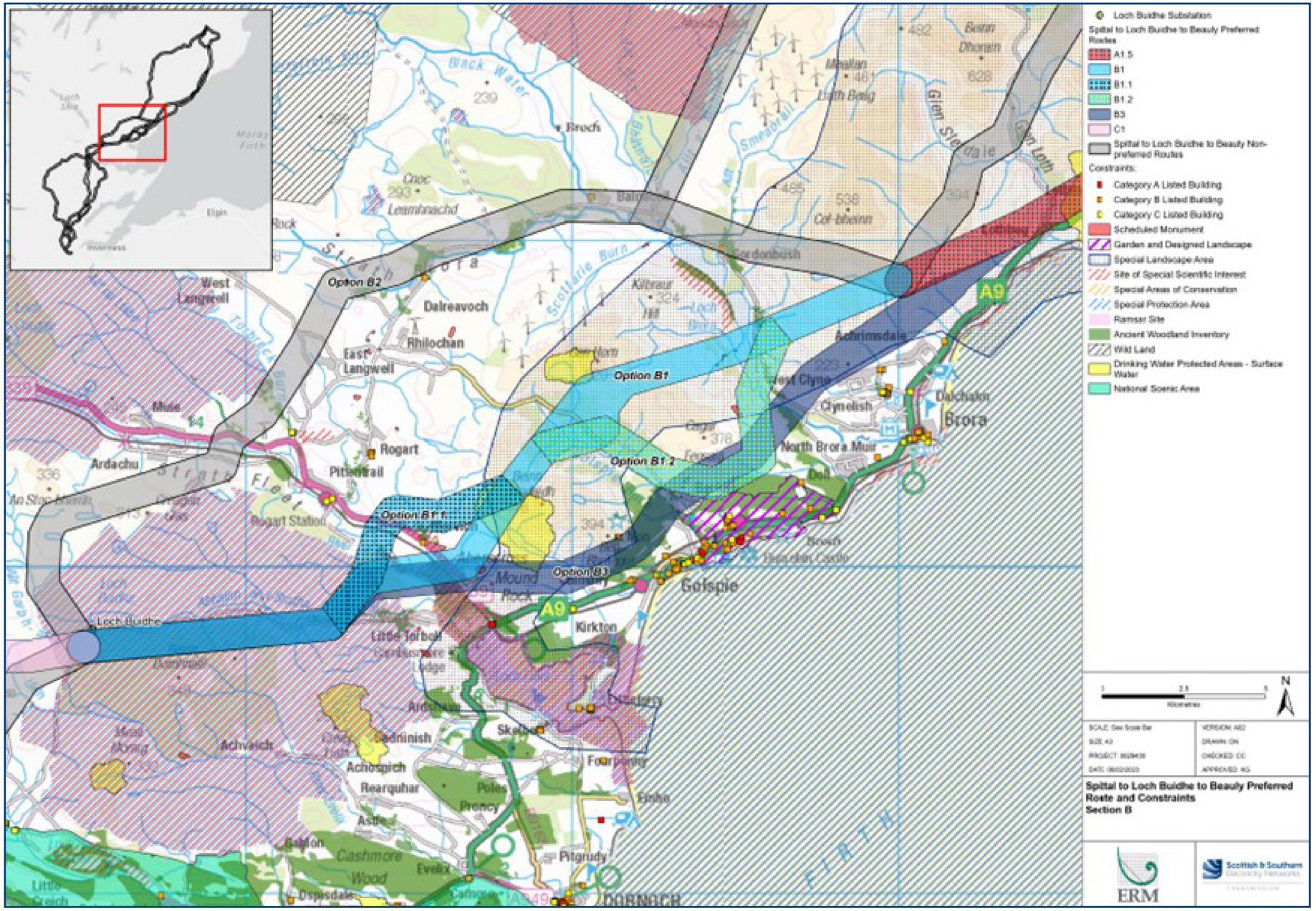


Table 4.1 Summary of key considerations for B1 v B1.1

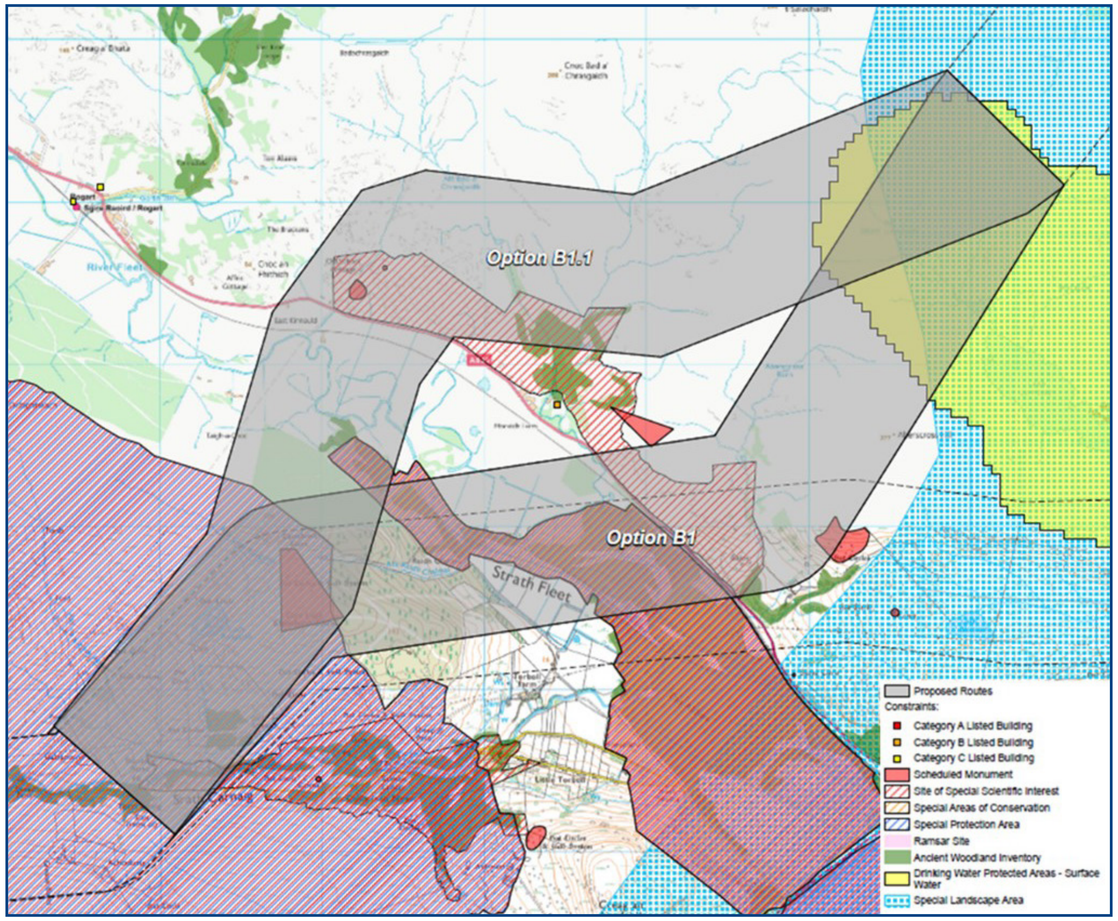
Option B1

Environment & Community

- Passes through the Strath Carnaig and Strath Fleet Moors Special Protection Area and Site of Special Scientific Interest, the Dornoch Firth and Loch Fleet Ramsar and Special Protection Area, Mound Alderwoods Special Area of Conservation and Site of Special Scientific Interest and Strathfleet Site of Special Scientific Interest.
- Passes through ancient woodland.
- Passes adjacent to scheduled monuments and setting may be compromised.
- Passes through the Loch Fleet, Loch Brora and Glen Loth Special Landscape Area.

Engineering

- Will potentially cross the existing Loch Buidhe-Spittal 132kV OHL and will likely cross the single-track railway at Morvich.
- Greater flood risk.
- Passes through an area of Class 2 peatland.



Option B1.1

Environment & Community

- Passes through the Strath Carnaig and Strath Fleet Moors Special Protection Area and Site of Special Scientific Interest, the Dornoch Firth and Loch Fleet Ramsar and Special Protection Area, Mound Alderwoods Special Area of Conservation and Site of Special Scientific Interest and Strathfleet Site of Special Scientific Interest.
- Passes through ancient woodland.
- Passes adjacent to scheduled monuments and setting may be compromised.
- Passes through the Loch Fleet, Loch Brora and Glen Loth Special Landscape Area.

Engineering

- Will potentially cross the existing Loch Buidhe-Spittal 132kV OHL and will likely cross the single-track railway at Morvich.
- Exposed to steep slopes with very steep gradients.
- Passes through an area of Class 2 peatland.

Preferred Option

Option B1.1 is a more environmentally preferred option as it reduces the potential for direct impact on natural heritage designations and ancient woodland.

Option B1.1 is considered a more preferred option from an engineering perspective due to a less steep hill crossing however it needs larger valley crossing span to avoid foundations in flood prone areas.

At this stage it is not clear whether sub-option B1 or B1.1 is preferred on balance. Although there are engineering challenges associated with B1 there is greater potential for environmental impact if B1.1 is not included.

Table 4.2 Summary of key considerations for B1 v B1.2

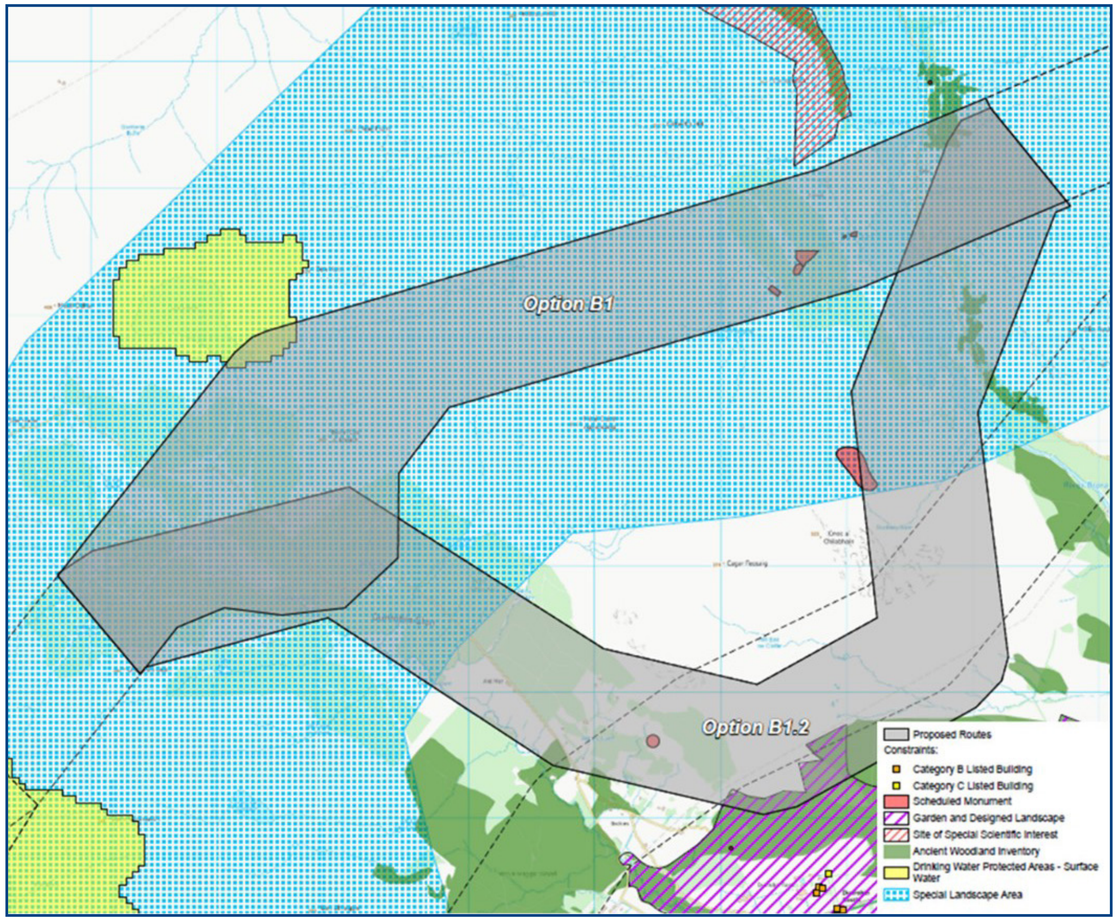
Option B1

Environment & Community

- Passes through ancient woodland.
- Passes adjacent to scheduled monuments and setting would be compromised.
- Passes through the Loch Fleet, Loch Brora and Glen Loth Special Landscape Area.

Engineering

- Will potentially cross the existing Loch Buidhe-Spittal 132kV OHL and will likely cross the single-track railway at Morvich.
- Exposed to steep slopes with very steep gradients but can be avoided with careful route alignment.
- Passes through areas of both Class 1 and 2 peatlands.
- Length.



Option B1.2

Environment & Community

- Passes through ancient woodland.
- Encroaches on the northern section of the Dunrobin Castle Garden and Designed Landscape.
- Passes adjacent to scheduled monuments and setting would be compromised.
- Passes through the Loch Fleet, Loch Brora and Glen Loth Special Landscape Area.

Engineering

- Will potentially cross the existing Loch Buidhe-Spittal 132kV OHL and will likely cross the single-track railway at Morvich.
- Close proximity to residential properties and there is risk of audible noise issues.
- Very challenging with respect to construction and installation of towers at the slopes.
- Passing through Class 2 peatlands.
- 27% more route length compared to other option.

‘Preferred Option

There is no clear more preferred option from an environmental perspective although option B1 reduces potential impact on the Garden and Designed Landscape of Dunrobin Castle. Option B1. is considered a more preferred option from an engineering perspective due to comparatively less construction challenges and away from residential properties. Route length is also shorter compared to B1.2.

Option B1. is considered a more preferred option.

Table 4.3 Section B – Brora to Loch Buidhe

Option	RAG Impact Rating – Environmental																RAG Impact Rating – Engineering																	
	Natural Heritage					Cultural Heritage		Peo -ple	Landscape			Land Use			Planning		Existing Infrastructure					Environmental Design				Ground Conditions		Construction & Maintenance			Proximity				
	Designations	Protected Species	Habitats	Ornithology	Geology, Hydrology and Hydrogeology	Designations	Cultural Heritage Assets	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy	Proposals	Existing OHL	Railway	River / Canal	Gas / Hydro pipelines	Road	Elevation	Atmospheric Pollution	Contaminated Land	Flooding	Terrain	Peatland	Route Length	Access	Angle Towers	Clearance Distance	Windfarms	Communication Masks	Urban Environment	Metallic Pipelines
B1	H	L	H	M	M	M	L	L	H	M	M	L	L	L	M	M	M	M	H	L	L	M	H	M	M	M	H	L	M	M	M	L	L	L	L
B1.1	H	L	H	M	M	M	L	L	H	M	M	L	L	L	M	M	M	M	L	L	L	H	H	M	M	H	H	L	M	M	M	L	L	L	L
Option B1.1 is the environmentally preferred option as it reduces the potential for direct impact on natural heritage designations and ancient woodland.																	**Option B1** is considered the technically preferred option due to lesser steep hill crossing however need larger valley crossing span to avoid foundations in flood prone area.																		
B1	H	L	H	M	M	H	L	L	H	M	M	L	L	L	M	M	M	M	L	L	L	H	H	M	M	H	H	L	H	M	M	L	L	L	L
B1.2	H	L	H	M	M	H	L	L	H	M	M	L	L	L	M	M	M	M	L	L	L	M	H	M	M	M	M	L	M	M	M	L	L	L	L
Environmentally there is no clear preferred option although **option B1** reduces potential impact on Dunrobin Castle GDL.																	**Option B1.2** is considered the technically preferred option due to comparatively lesser steep mountains and lower elevations. Also has lesser the access road challenges and comparatively less sections of class-1 peat.																		
B1	H	L	H	M	M	H	M	L	H	M	M	L	L	L	M	M	L	M	L	L	L	H	M	M	M	H	H	L	M	M	M	L	L	L	L
B2	H	L	H	M	L	L	L	L	H	M	M	L	L	L	M	M	H	M	L	L	L	M	M	M	M	H	H	L	M	M	L	L	L	L	L
B3	H	L	H	M	M	H	L	L	H	M	M	L	L	L	M	M	M	M	M	L	L	M	H	M	M	M	M	L	L	M	M	L	M	M	L
All options perform similarly however on balance **Option B2** is the environmentally preferred option. Option B1 and B3 have a greater potential to impact the SLA designation and associated listed buildings including the Grade A listed Dunrobin Castle itself.																	**Option B3** is considered the technically preferred option due to comparatively lesser steep mountains and lower elevations. Option B3 will likely have comparatively less construction challenges and access road requirements and lesser sections of class-1 peat. Option B1 can highly be challenging with respect to Operation and Maintenance.																		
There is currently no clear preferred option for Section B due to the environmental constraints associated with Options B1 and B3 and the technical constraints associated with B2 and B3.																																		

Table 4.4 Engineering Comparison of Overall Options

		B1 (B1 and B1.2)	B2	B3
Infrastructure Crossings	Major Crossings	HV OHL Crossings: One existing Loch Buidhe-Spittal 132kV OHL Railway Crossings: likely to cross Single-track railway crossing at Morvich. River and Loch Crossings: Crosses Loch Brora (50-350m)	HV OHL Crossings: One existing Fyrish-Loch Buidhe (FYL1 & FYL2)275kV OHL, One 275kV Loch Buidhe -Dourney (LNG2 & LT1) OHL, two Nos. 132kV OHLs (Loch Buidhe-Shin (LS1 & LS2) and Loch Buidhe-Dalchork (DLB1 & DLB2) OHLs) Railway Crossings: likely to cross Single-track railway crossing at Morvich. River and Loch Crossings: Crosses Loch Brora (50-350m)	HV OHL Crossings: One existing Loch Buidhe-Spittal 132kV OHL Railway Crossings: likely to cross Single-track railway crossing at Morvich. River and Loch Crossings: Crosses Loch Brora at multiple locations with average riverbed width of 10m
	Minor Crossings	Crosses Road A839 once and local roads Dunrobin Glen Rd and Gordonbush Rd once	Crosses A839 once	Crosses A839 once
Environmental Design	Elevation	57 % of the route has elevation between 0m-200m. 43% of route has elevation between 200m-450m. Route has average elevation 179m, min elev. 3m and max elevation is 435m.	68.5% of the route has elevation between 0m-200m. 31.5% of route has elevation between 200m-450m. Route has average elevation 172m, min elevation 29m and max elevation is 357m.	74.5% of the route has elevation between 0m-200m. 25.3% of route has elevation between 200m-450m. Route has average elevation 152m, min elevation 2m and max elevation is 273m.
	Atmospheric Pollution	Route is within 10km from Costal line, passes near Rhemusaig, Morvich and east kinnauld	Further inland, portion of route passes near loadge, Dalmore, Rossal	Route is within 10km from Costal line, passes near Brora, Golspie, Backies
	Contamination	Intermediate UXO risk recorded due to coastal infrastructure at Brora.	Low risk area from UXO, no landfill or COMAH sites	Intermediate UXO risk recorded due to coastal infrastructure at Brora.
	Flooding	5% of the route in flood risk area	4% of the route in flood risk area	6% of the route in flood risk area
Ground Conditions	Terrain	89% of route has slope between 01-20 degrees. 7.1% of route has slope between 20-60 degrees Max Slope-56°	79% of route has slope between 01-20 degrees. 16.1% of route has slope between 20-60 degrees. Max Slope-42°	78% of route has slope between 01-20 degrees. 14.5% of route has slope between 20-60 degrees. Max Slope-58°
	Peat	Peatland Class1 – 5% of the total length. Peatland Class2 – 38% of the total length.	Peatland Class1 – 22% of the total length. Peatland Class2 – 24% of the total length.	Peatland Class1 – 3% of the total length. Peatland Class2 – 25% of the total length.
Construction and Maintenance	Access Road	65% of route has available access through 50m to 1000m. 32% of route has available access through 1000m to 10000m.	63% of route has available access through 50m to 1000m. 28% of route has available access through 1000m to 10000m.	82% of route has available access through 50m to 1000m. 11% of route has available access through 1000m to 10000m.
	Angle Towers	No of angle towers - 6	No of angle towers - 16	No of angle towers - 14
Proximity	Clearance	Few Properties	Few properties with some pinch points	Few properties with some pinch points constraining the route option.
	Windfarms	No wind farms in the route. South Kilbraur Wind Farm (Scoping).	No wind farms in the route	No wind farms in the route
	Communication Masts	No known communication masts	No known communication masts	Risk of communication mast due to populated area
	Urban Environment	No urban areas within route	No urban areas within route. dispersed properties within the route	No urban areas within route. dispersed properties within the route
	Metallic Pipeline	No known pipelines	No known pipelines	No known pipelines

Table 4.5 Environmental Comparison of Overall Options

		B1 (B1 and B1.2)	B2	B3
Natural Heritage	Designations	Encroaches on the Strath Carnaig and Strath Fleet Moors SPA and SSSI, the Dornoch Firth and Loch Fleet Ramsar and SPA, Mound Alderwoods SAC and SSSI, Strathfleet SSSI and ancient woodland.	Encroaches on the Strath Carnaig and Strath Fleet Moors SPA and SSSI and ancient woodland.	Encroaches on the Strath Carnaig and Strath Fleet Moors SPA and SSSI, the Dornoch Firth and Loch Fleet Ramsar and SPA, Mound Alderwoods SAC and SSSI, Strathfleet SSSI and ancient woodland.
	Protected Species	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.
	Habitats	Likely to compromise Annex 1 habitat with high potential for ground water dependent terrestrial ecosystems.	Likely to compromise Annex 1 habitat with high potential for ground water dependent terrestrial ecosystems.	Likely to compromise Annex 1 habitat with high potential for ground water dependent terrestrial ecosystems.
	Ornithology	May compromise the conservation status of Schedule 1 bird species or their habitats.	May compromise the conservation status of Schedule 1 bird species or their habitats.	May compromise the conservation status of Schedule 1 bird species or their habitats.
	Hydrology/ Geology	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.	Unlikely to result in water flow pathway(s) to surface and groundwaters.	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.
Cultural Heritage	Designations	Likely to compromise the designating features or setting of scheduled monuments and the Dunrobin Castle GDL.	Unlikely to compromise designating features or setting.	Likely to compromise the designating features or setting of scheduled monuments and the Dunrobin Castle GDL.
	Cultural Heritage Assets	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.
People	Proximity to dwellings	No urban areas within route	No urban areas within route. Dispersed properties within the route	No urban areas within route. Dispersed properties within the route
Landscape	Designations	Passes through the Loch Fleet, Loch Brora and Glen Loth SLA and the Dunrobin Castle GDL..	Passes through the Loch Fleet, Loch Brora and Glen Loth SLA.	Passes through the Loch Fleet, Loch Brora and Glen Loth SLA and the Dunrobin Castle GDL.
	Character	May compromise characteristic elements of the landscape character.	May compromise characteristic elements of the landscape character.	May compromise characteristic elements of the landscape character.
	Visual	May compromise the view or visual amenity of individual properties.	May compromise the view or visual amenity of individual properties.	May compromise the view or visual amenity of individual properties near Brora and Golspie.
Land Use	Agriculture	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1*)	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1*)	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1*)
	Forestry	Avoids interaction with areas of commercial forestry.	Avoids interaction with areas of commercial forestry.	Avoids interaction with areas of commercial forestry.
	Recreation	Unlikely to compromise the recreational amenity of core paths.	Unlikely to compromise the recreational amenity of core paths.	Unlikely to compromise the recreational amenity of core paths.
Planning	Policy	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.
	Proposals	May be inconsistent with other third party proposals known to the planning system.	May be inconsistent with other third party proposals known to the planning system.	May be inconsistent with other third party proposals known to the planning system.

**'Land Capability for Agriculture' as defined by the Hutton Institute (formerly the Macaulay Land Institute)*

Table 4.6 Cost Comparison of Overall Options

Cost		RAG	Site Comparison Notes
B1.1	Sub-option comparison		Most economic option compared to alternative sub route B1 (for B1.1)
B1 (for B1.1)			Less economic compared to sub route B1.1 due to an additional 11kV OHL crossing.
B1.2	Sub-option comparison		Less economic compared to alternative sub route B1 (for B1.2). Due to an increase in route length, increase in OHL crossings and an increase in the requirement for tree felling.
B1 (for B1.2)			Most economic option compared to alternative sub route B1.2
B1 with B1.1	Full B option comparison		Most economic option compared to B2 and B3.
B2			Route option is least economic option when compared to B1 with B1.1 and B3, due to longer route length, increase in the number of OHL crossings and more crossing protection requirements.
B3			Neither least nor most economic option when compared with B1 with B1.1 and B2, due to an increase in route length and additional OHL crossings.

From an environmental perspective, all options perform similarly, however Option B2 is considered a more preferred option. Option B1 and B3 have a greater potential to impact the Special Landscape Area designation and the setting of the Dunrobin Castle Garden and Designated Landscape and scheduled monuments.

Option B1 via B1.1 is considered a more preferred option from an engineering perspective due to the greater constraints associated with Options B2 and B3 including terrain, steep gradients, peat and construction/maintenance challenges. From a cost perspective Route B1 using the B1.1 sub section is a more preferred route.

At this stage there is no overall preferred option for Section B due to the environmental constraints associated with B1 and B3 and the engineering constraints associated with B2 and B3. A preferred route will be informed through consultation feedback and further environmental and engineering studies.

4.3 Section C – West of Dornoch

Two route options are identified, options C1 and C2 as illustrated on Figure 5.1.

Proximity to local properties around the areas of Bonar Bridge, Culrain, Carbisdale. Drumaliah and Tulloch were noted as a constraint in this section.

Other constraints in this section included a number of natural heritage designations such as the Dornoch Firth National Scenic Area , Strath Carnaig and Strath Fleet Moors Special Protection Area and Site of Special Scientific Interest, the River Oykel Special Area of Conservation and Kyle of Sutherland Marshes Site of Special Scientific Interest.

There are a number of scheduled monuments and listed buildings, the Battle of Carbisdale Registered Battlefield and areas of ancient woodland within this section.

Given the limited length of proposed OHL in this area, we have not identified any sub-routes under either Section C1 or C2. As there are no sub-route options within this section we have not included a summary table as this was principally used for sub option comparisons. Rather, this section focusses on the RAG ratings of each of Options C1 and C2 from the environmental, engineering and cost perspectives.

Figure 5.1 Section C Overview

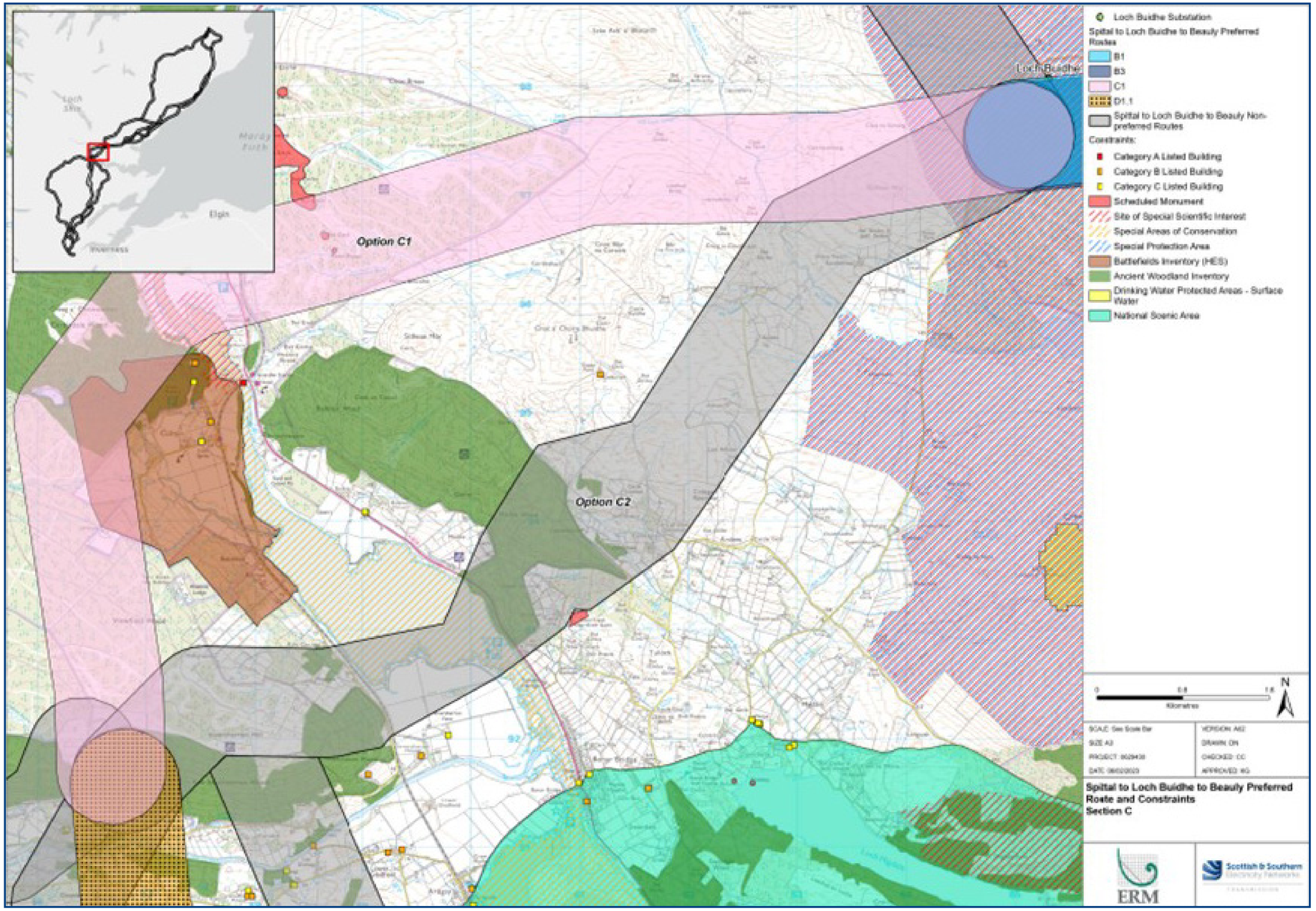


Table 5.1 Section C – West of Dornoch

Option	RAG Impact Rating – Environmental																RAG Impact Rating – Engineering																	
	Natural Heritage					Cultural Heritage		Peo -ple	Landscape			Land Use			Planning		Existing Infrastructure					Environmental Design				Ground Conditions		Construction & Maintenance			Proximity				
	Designations	Protected Species	Habitats	Ornithology	Geology, Hydrology and Hydrogeology	Designations	Cultural Heritage Assets	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy	Proposals	Existing OHL	Railway	River / Canal	Gas / Hydro pipelines	Road	Elevation	Atmospheric Pollution	Contaminated Land	Flooding	Terrain	Peatland	Route Length	Access	Angle Towers	Clearance Distance	Windfarms	Communication Masks	Urban Environment	Metallic Pipelines
C1	H	L	M	M	L	H	L	L	L	M	M	L	M	M	M	M	M	M	M	L	L	M	M	M	L	L	L	L	L	L	L	L	M	L	L
C2	H	L	M	M	L	M	L	L	L	M	M	L	M	M	M	M	M	M	M	L	L	M	M	M	H	L	M	L	M	L	M	L	M	M	L
	Environmentally there is no clear preferred option. Both options pass through areas of ancient woodland and natural heritage designations including the Strath Carnaig and Strath Fleet Moors SPA and SSSI and the River Oykel SAC. Option C1 also passes through the Kyle of Sutherland Marshes Site of Special Scientific Interest and Battle of Carbisdale Registered Battlefield. Option C2 is more visible from Bonar Bridge and closer to residential property at Tulloch.																**Option C1** is considered the technically preferred option as it gives easy crossing to Kyle of Sutherland at narrow end. However, crossing span for Option C2 is more challenging with respect to Construction, Operation and Maintenance.																
Option C1 is the preferred route due to the technical constraints associated with Option C2.																																		

Table 5.2 Engineering Comparison of Overall Options

		C1	C2
Infrastructure Crossings	Major Crossings	HV OHL Crossings: One existing Beauly-Shin (BSE & BSW) 132kV OHL Railway Crossings: likely to cross Single-track railway. River and Loch Crossings: Crosses Kyle of Sutherland (100-370m)	HV OHL Crossings: One existing Beauly-Shin (BSE & BSW) 132kV OHL and one existing 275kV Fyrish - Loch Buidhe (FYL1 & FYL2) OHL Railway Crossings: likely to cross Single-track railway River and Loch Crossings: Crosses Kyle of Sutherland (250-1200m)
	Minor Crossings	Crosses A836 once	Crosses A836 once
Environmental Design	Elevation	87% of the route has elevation between 0m-200m. 13% of route has elevation between 200m-450m. Route has average elevation 138m, min elevation 0m and max elevation is 221m.	89% of the route has elevation between 0m-200m. Route has average elevation 126m, min elevation 0m and max elevation is 232m.
	Atmospheric Pollution	Routes is crossing Kyle of Sutherland and entire section is within 10km from coastal area.	Routes is crossing Kyle of Sutherland and entire section is within 10km from coastal area.
	Contamination	Intermediate UXO risk recorded due to coastal infrastructure	Intermediate UXO risk recorded due to coastal infrastructure
	Flooding	9% of the route in flood risk area	10% of the route in flood risk area
Ground Conditions	Terrain	95% of route has slope between 01-20 degrees. Max Slope-20°	87% of route has slope between 01-20 degrees. 3% of route has slope between 20-60 degrees. Max slope-28°
	Peat	Peatland Class1 – 4% of the total length. Peatland Class2 – 33% of the total length.	Peatland Class1 – 4% of the total length. Peatland Class2 – 35% of the total length.
Construction and Maintenance	Access Road	57% of route has available access through 50m to 1000m. 33% of route has available access through 1000m to 10000m	79% of route has available access through 50m to 1000m.
	Angle Towers	No of angle towers - 7	No of angle towers - 7
Proximity	Clearance	Few properties	Few properties with pinch points
	Windfarms	Garvary Wind Farm (Scoping)	No wind farm as per our record
	Communication Masts	No known communication masts	No known communication masts
	Urban Environment	No urban areas within route	No urban areas within route
	Metallic Pipeline	No known pipelines	No known pipelines

** Unexploded Ordnance*

Table 5.3 Environmental Comparison of Overall Options

		C1	C2
Natural Heritage	Designations	Passes through Strath Carnaig and Strath Fleet Moors SPA and SSSI. River Oykel SAC and Kyle of Sutherland SSSI are within the route. Will result in loss of ancient woodland.	Passes through Strath Carnaig and Strath Fleet Moors SPA and SSSI. River Oykel SAC is within the route. Will result in loss of ancient woodland.
	Protected Species	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.
	Habitats	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.
	Ornithology	May compromise the conservation status of Schedule 1 bird species or their habitats.	May compromise the conservation status of Schedule 1 bird species or their habitats.
	Hydrology/ Geology	Unlikely to result in water flow pathway(s) to surface and groundwaters.	Unlikely to result in water flow pathway(s) to surface and groundwaters.
Cultural Heritage	Designations	Passes through the Battle of Carbisdale battlefield and is likely to compromise the designating features or setting	Adjacent to Drumliah scheduled monument and may compromise the setting.
	Cultural Heritage Assets	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.
People	Proximity to dwellings	No urban areas within route	No urban areas within route
Landscape	Designations	Unlikely to compromise the special qualities of a designated landscape.	Unlikely to compromise the special qualities of a designated landscape.
	Character	May compromise characteristic elements of the landscape character.	May compromise characteristic elements of the landscape character.
	Visual	May compromise the view or visual amenity of individual properties and recreational areas including those at Culrain and Invershin.	May compromise the view or visual amenity of individual properties and recreational areas including those at Drumliah, Tulloch and Maikle Wood.
Land Use	Agriculture	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1)	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1)
	Forestry	Interaction with forestry operations may compromise the commercial returns from the forestry.	Interaction with forestry operations may compromise the commercial returns from the forestry.
	Recreation	Potential to compromise the recreational amenity of core paths including those at Culrain and Carbisdale Castle.	Potential to compromise the recreational amenity of core paths in Maikle Wood.
Planning	Policy	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.
	Proposals	Intersects edge of proposed Garvary Wind Farm.	No other projects known to the planning system have been identified, which may interact with the option.

Table 5.4 Cost Comparison of Overall Options

Cost	RAG	Site Comparison Notes
C1		Least economic option when compared with option C2. Elements leading to cost increase are due to an increase in OHL crossings.
C2		Most economic option

From an environmental perspective there is no preferred option. Both options pass through areas of ancient woodland and natural heritage designations including the Strath Carnaig and Strath Fleet Moors SPA and SSSI and the River Oykel SAC. Option C1 also passes through the Kyle of Sutherland Marshes Site of Special Scientific Interest and Battle of Carbisdale Registered Battlefield. Option C2 is more visible from Bonar Bridge and closer to residential property at Tulloch.

Option C1 is a more preferred option from an engineering perspective as it crosses the Kyle of Sutherland at a narrower section. For Option C2, there are significant areas of coastal flooding and the span crossing Kyle of Sutherland is more challenging with respect to construction, operation and maintenance.

Option C2 is a more preferred option from an economic perspective. Although the difference in cost is 17%, this is entirely due to additional 11kV overhead line crossings, the amount of which may be reduced once alignment has been decided.

Option C1 is a more preferred overall route as there are fewer engineering constraints associated with crossing the Kyle of Sutherland.

4.4 Section D – Dornoch to Dingwall

Local settlements including Ardross, Alness, Dingwall, Evanton, Contin and Strathpeffer are key constraints in this section.

Other constraints include commercial forestry areas and areas of ancient woodland, the Novar Special Protection Area, the Amat Wood Special Area of Conservation and Site of Special Scientific Interest, Category A listed buildings such as the Ardross Castle, and the Ardross Castle Garden and Designed Landscape.

There are a number of existing overhead lines within this section including the existing 132kV Beauly – Shin and 275kV Beauly – Loch Buidhe.

The terrain in this section varies with large sections comprising very challenging hilly terrain.

Three routes are identified as D1, D2 and D3 as illustrated on Figure 6.1, overleaf.

There is one sub option for each of options D1 and D2. In order to assess which combination of D route and sub-route has potential to be most preferrential on environmental and engineering grounds, a comparative assessment of each sub option has been undertaken. i.e. D1 compared with D1.1 and D2 compared with D2.1; the results of these assessments are described in Tables 6.1 and 6.2.

An overall RAG assessment of each of the sub-routes is also included in order to demonstrate the differences or similarities of potential impact expected to arise if each route were chosen.

Following assessment, the least impactful of these sub-options, on balance, was then combined to form a composite route option, which allowed for assessment of the D1 options against the route options D2 and D3.

Route Option D1 including D1.1 is considered to be more preferred than D1, and Option D2 is considered to be more preferred than Option D2 including sub option D2.1. Options D1 and D2 were then compared.

Figure 6.1 Section C Overview

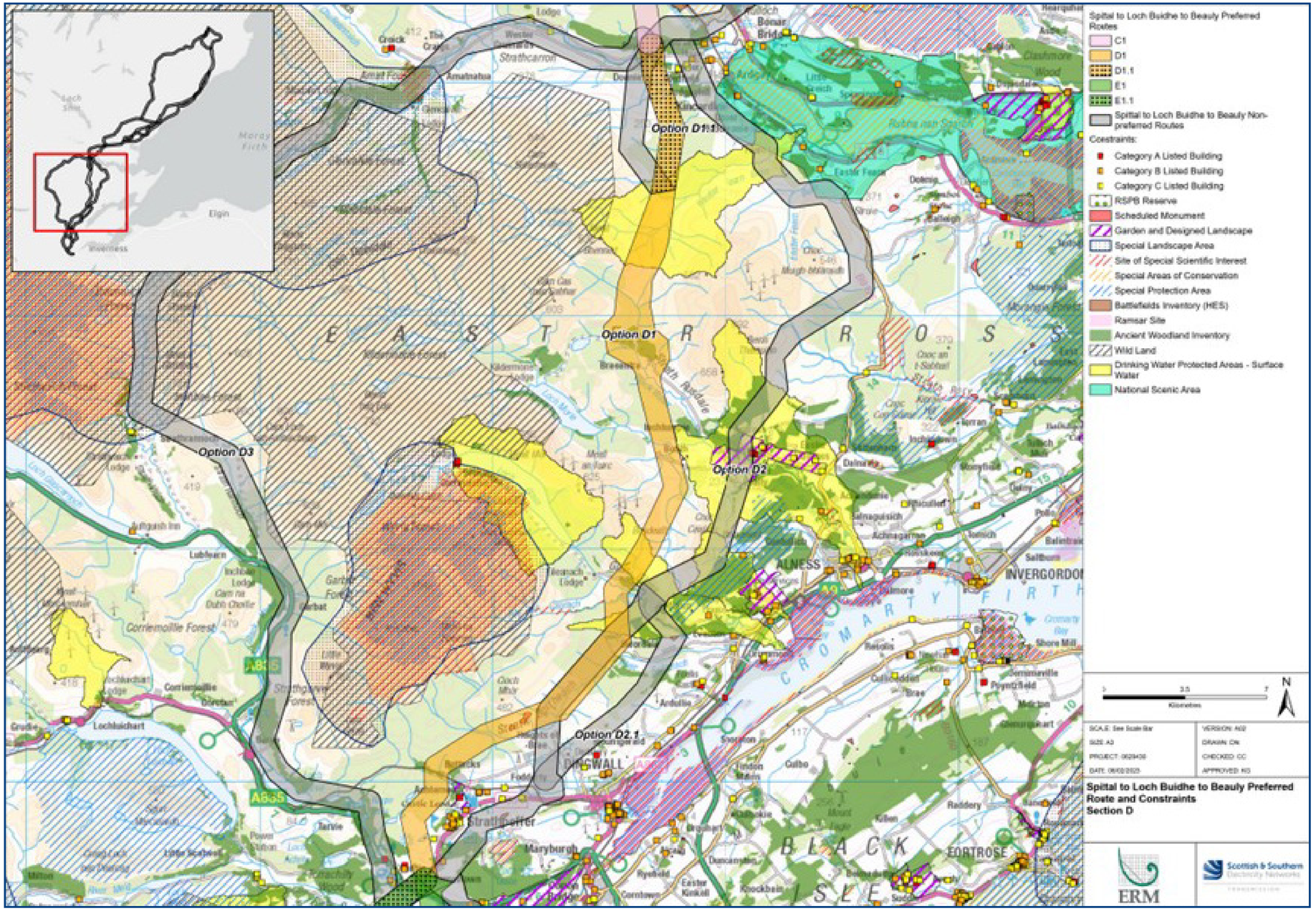


Table 6.1 Summary of key considerations for D1 v D1.1

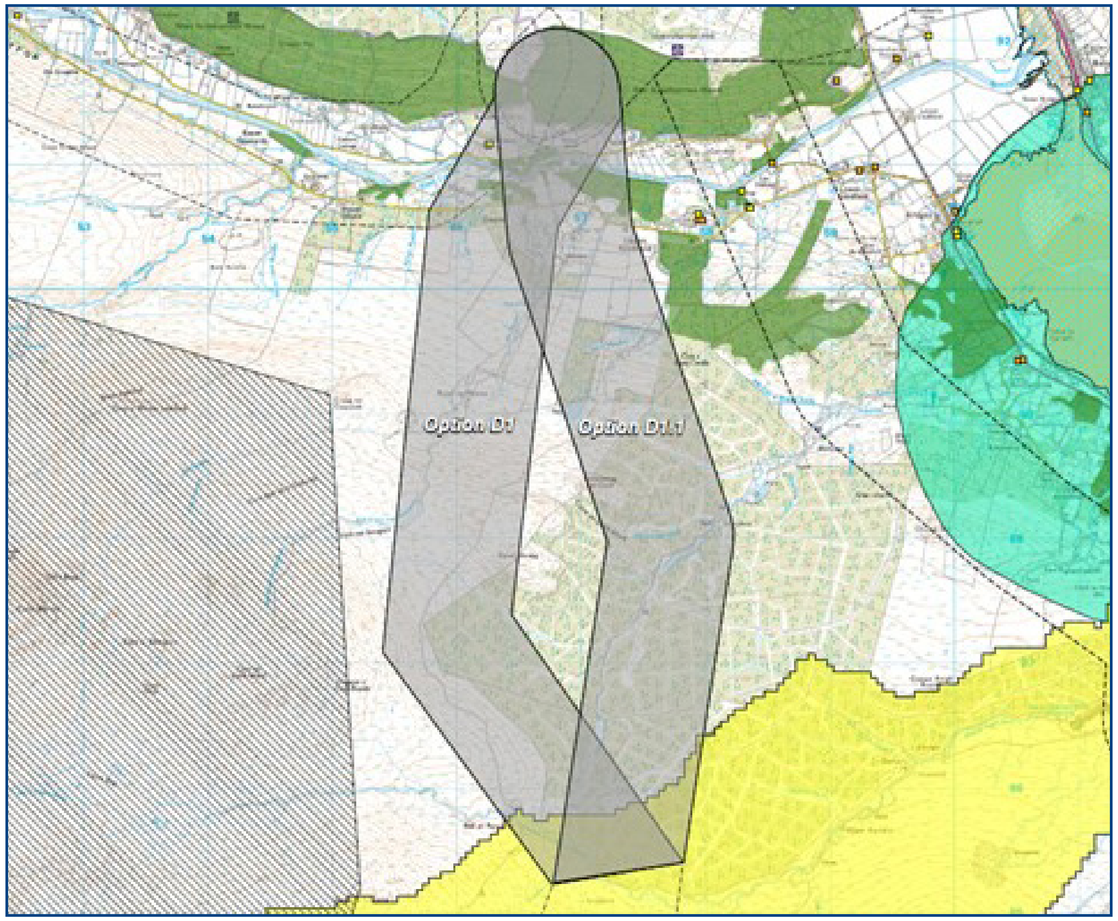
Option D1

Environment & Community

- Higher potential to impact on peat habitat.
- More visible from area of wild land.

Engineering

- Passes through greater areas of both Class 1 and 2 peatlands.



Option D1.1

Environment & Community

- Higher potential to impact on commercial forestry.
- Higher potential to impact on recreational use of core paths.

Engineering

- Lesser elevation.
- Greater challenges with clearance from dwellings so more angle towers required.

Preferred Option

Environmentally there is no clear distinction between Options D1 and D1.1. D1 has a higher potential to impact peat habitat and would be more visible from the wild land area. D1.1 has higher potential to impact commercial forestry and higher potential impact on core paths.

Option D1.1 is considered a more preferred option from an engineering perspective as it less steep and has lesser elevation as such likely to provide lesser challenges with respect to Construction, Operation and Maintenance.

Option D1.1 is considered a more preferred option overall.

Table 6.2 Summary of key considerations for D2 v D2.1

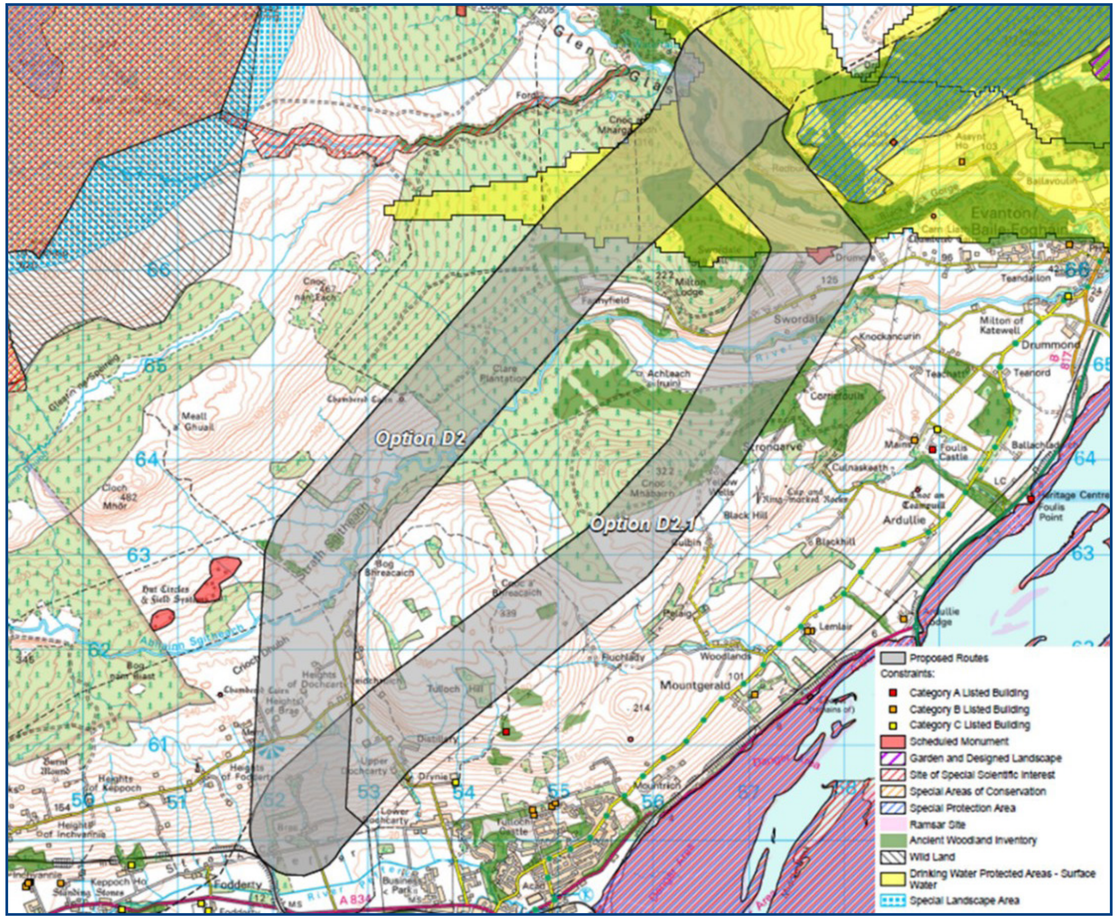
Option D2

Environment & Community

- Potential for visual impacts.
- Passes through ancient woodland.
- Impact on commercial forestry.

Engineering

- Greater flood risk.



Option D2.1

Environment & Community

- Scheduled Monument within the route.
- Potential for visual impacts.
- Passes through ancient woodland.
- Impact on commercial forestry.

Engineering

- Parallel to the 132kV Beauly-Shin and 275kV Fyrish – Beauly OHLs.
- Greater challenge with terrain in areas including north of Strathpeffer and Tulloch Hill.

Preferred Option

Environmentally Option D2 is a more preferred environmental option due to the presence of the scheduled monument within D2.1. Option D2 is a more preferred option from an engineering perspective considering terrain challenges. Option D2.1 is paralleling to existing overhead lines and requires 132kV to be undergrounded in that parallel section.

Option D2 is considered a more preferred option overall.

Table 6.3 Section D – Dornoch to Dingwall

Option	RAG Impact Rating – Environmental																RAG Impact Rating – Engineering																
	Natural Heritage					Cultural Heritage		Peo -ple	Landscape			Land Use			Planning		Existing Infrastructure					Environmental Design				Ground Conditions		Construction & Maintenance			Proximity				
	Designations	Protected Species	Habitats	Ornithology	Geology, Hydrology and Hydrogeology	Designations	Cultural Heritage Assets	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy	Proposals	Existing OHL	Railway	River / Canal	Gas / Hydro pipelines	Road	Elevation	Atmospheric Pollution	Contaminated Land	Flooding	Terrain	Peatland	Route Length	Access	Angle Towers	Clearance Distance	Windfarms	Communication Masks	Urban Environment	Metallic Pipelines
D1	M	L	M	M	L	L	L	L	L	M	M	L	M	M	M	M	L	L	L	L	L	H	L	L	L	H	L	L	H	M	L	L	L	L	L
D1.1	M	L	M	M	L	L	L	L	L	M	M	L	M	M	M	M	L	L	L	L	L	L	L	L	L	L	M	L	M	L	L	L	L	L	L
Environmentally there is no preference between Options D1 and D1.1.																	**Option D1.1** is considered the technically preferred option as it less steep and lesser elevation as such likely to provide lesser challenges with respect to Construction, Operation and Maintenance.																					
D2	H	L	M	M	M	L	L	M	L	M	M	L	L	M	M	M	L	L	L	L	L	M	L	L	L	M	L	L	L	L	L	H	M	M	L
D2.1	H	L	M	M	L	M	L	M	L	M	M	L	L	M	M	M	H	L	L	L	L	M	L	L	L	M	L	L	L	L	L	H	H	M	L
Environmentally Option D2 is a more preferred environmental option due to the presence of the scheduled monument within D2.1.																	**Option D2** is the preferred option technically considering terrain challenges. Option D2.1 is paralleling existing overhead lines and requires 132kV to be undergrounded in that parallel section.																					
D1	H	L	M	M	M	M	L	L	L	M	M	L	M	M	M	M	L	M	M	L	L	L	L	L	M	L	H	L	M	L	M	H	M	M	L
D2	H	L	M	M	M	H	H	L	H	H	M	L	L	M	M	M	H	M	M	L	L	M	L	L	M	M	M	M	L	M	H	H	H	H	L
D3	H	L	M	M	M	M	L	L	H	H	M	L	L	M	M	M	L	M	H	L	L	H	L	L	M	H	M	H	H	H	L	L	L	L	L
Option D1 is the environmentally preferred option as it avoids direct impact on SAC, SPA and SSSI sites and has lower potential for impact on cultural heritage receptors and landscape character and designations.																	**Option D1** is considered the technically preferred option due to comparatively lesser steep mountains and lower elevations. Option D1 will likely have comparatively less construction challenges and access road requirements and lesser interaction with existing infrastructure and dwellings. Option D3 can highly be challenging with respect to Construction, Operation and Maintenance and Access issues.																					
Option D1 is the preferred option.																																			

Table 6.4 Engineering Comparison of Overall Options

		D1	D2	D3
Infrastructure Crossings	Major Crossings	HV OHL Crossings: No Crossings Railway Crossings: likely to cross Railway line (single track) near Dingawll River and Loch Crossings: River Sgitheach, River Glass, River Averon and River Carron at a few locations besides crossing several burns and water channels but spannable	No potential Crossings But one of the parallel lines (132kV Beauly-Shin (BSE & BSW) and 275kV Fyrish – Beauly (BFY1 & BFY2) need to be undergrounded due to consenting purpose.	HV OHL Crossings: No Crossings Railway Crossings: likely to cross Railway line (single track) near Dingawall River and Loch Crossings: goes along with Black Water for a few kilometres, and a few kilometers with Abhainn Srath Raininch. D3 also goes parallel with Abhainn a Ghlinne Mhoir and crosses River Caron at a few locations
	Minor Crossings	Crosses A834 once	Crosses A834 once	No Major Road Crossing
Environmental Design	Elevation	27% of the route has elevation between 0m-200m. 73% of route has elevation between 200m-450m. Route has average elevation 227m, min elevation 17m and max elevation is 428m.	47% of the route has elevation between 0m-200m. 53% of route has elevation between 200m-450m. Route has average elevation 216m, min elevation 7m and max elevation is 420m.	52% of the route has elevation between 0m-200m. 48% of route has elevation between 200m-450m. Route has average elevation 183m, min elevation. 14m and max elevation is 368m.
	Atmospheric Pollution	Route is within 10km of coastal area	Route is within 10km of coastal area. Passes near Dingwall , Ardullie, Strathpeffer	Further inland, no atmospheric pollution concerns
	Contamination	No major contamination recorded.	No major contamination recorded.	No major contamination recorded.
	Flooding	3% of the route in flood risk area	4% of the route in flood risk area	12% of the route in flood risk area
Ground Conditions	Terrain	95% of route has slope between 01-20 degrees. 3.1% of route has slope between 20-60 degrees. Max Slope-41°	87% of route has slope between 01-20 degrees. 10.5% of route has slope between 20-60 degrees. Max Slope-49°	82% of route has slope between 01-20 degrees. 12.5% of route has slope between 20-60 degrees. Max Slope-41°
	Peat	Peatland Class1 – 7% of the total length. Peatland Class2 – 4% of the total length.	Peatland Class1 – 14% of the total length. Peatland Class2 – 2% of the total length.	Peatland Class1 – 6% of the total length. Peatland Class2 – 2% of the total length.
Construction and Maintenance	Access Road	74% of route has available access through 50m to 1000m. 10% of route has available access through 1000m to 10000m	78% of route has available access through 50m to 1000m. 11% of route has available access through 1000m to 10000m	61% of route has available access through 50m to 1000m
	Angle Towers	No of angle towers - 19	No of angle towers - 23	No of angle towers - 32
Proximity	Clearance	Several properties	Several properties with pinch points	Several properties with pinch points
	Windfarms	Novar Wind Farm (Constructed) NatureScot windfarm(scoping)	Strathrory Wind Farm (Approved), NatureScot (Approved Scoping)	No wind farm as per our record
	Communication Masts	Lesser dwellings	Risk of communication mast due to populated area	In countryside area
	Urban Environment	No urban areas within route. Several dispersed properties within the route	No urban areas within route. Several dispersed properties within the route	No urban areas within route. Several dispersed properties within the route
	Metallic Pipeline	No known pipelines	No known pipelines	No known pipelines

Table 6.5 Environmental Comparison of Overall Options

		D1	D2	D3
Natural Heritage	Designations	Interests the Allt nan Caorach SSSI, though likely to avoid direct impact. Areas of ancient woodland within the route.	Encroaches on and adjacent to the Novar SPA. Areas of ancient woodland within the route.	Direct impact on the Amat Wood SAC and SSSI. Encroaches on the Beinn Dearg SAC and SSSI. Areas of ancient woodland within the route.
	Protected Species	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.
	Habitats	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.
	Ornithology	May compromise the conservation status of Schedule 1 bird species or their habitats.	May compromise the conservation status of Schedule 1 bird species or their habitats.	May compromise the conservation status of Schedule 1 bird species or their habitats.
	Hydrology/ Geology	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.
Cultural Heritage	Designations	May compromise the setting of scheduled monuments.	Potential to interact with scheduled monuments and the Ardross Castle GDL compromising the designating features through changes to their setting.	May compromise the setting of scheduled monuments.
	Cultural Heritage Assets	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.	Likely to disturb the setting of Category A listed buildings including Ardross Castle.	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.
People	Proximity to dwellings	No urban areas within route. Several dispersed properties within the route	No urban areas within route. Several dispersed properties within the route	No urban areas within route. Several dispersed properties within the route
Landscape	Designations	Unlikely to compromise the special quality of any nationally, regionally or locally important designated landscape.	Within the Dornoch Firth National Scenic Area and Likely to compromise the special qualities. Potential to interact with Ardross Castle GDL.	Passes though both the Rhiddoroch - Beinn Dearg - Ben Wyvis WLA and the Fannichs, Beinn Dearg and Glencalvie SLA and is likely to compromise the special qualities of these designated landscapes.
	Character	May compromise the characteristic elements of the landscape character.	Likely to compromise the characteristic elements of the landscape character.	Likely to compromise the characteristic elements of the landscape character.
	Visual	May compromise the view or visual amenity of individual properties and recreational areas including those in the Strathpeffer area.	May compromise the view or visual amenity of individual properties and recreational areas including those in the Strathpeffer and Dingwall area.	May compromise the view or visual amenity of individual properties and recreational areas including those in the Contin area.
Land Use	Agriculture	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1)	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1)	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1)
	Forestry	Interaction with forestry operations may compromise the commercial returns from the forestry.	Avoids interaction with areas of commercial forestry.	Avoids interaction with areas of commercial forestry.
	Recreation	Potential to compromise the recreational amenity of core paths including those west of Strathpeffer.	Potential to compromise the recreational amenity of core paths including those between Dingwall and Strathpeffer.	Potential to compromise the recreational amenity of core paths including those near Contin and Rogie.
Planning	Policy	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.
	Proposals	Adjacent to proposed Abhainn Dubh proposed wind farm.	Adjacent to proposed Abhainn Dubh proposed wind farm.	No other projects known to the planning system have been identified, which may interact with the option.

Table 6.6 Cost Comparison of Overall Options

Cost		RAG	Site Comparison Notes
D1.1	Sub-option comparison		Very small cost increase when compared with D1 (for D1.1). This is due to an increase in tree felling requirements.
D1 (for D1.1)			Most economic option compared to alternative sub route D1.1
D2.1	Sub-option comparison		Least economic option when compared with D2 (for D2.1) due to an increase in route length and more OHL crossings.
D2 (for D2.1)			Most economic option compared to alternative sub route D2.1
D1	Full D option comparison		Most economic option when compared to D2 and D3.
D2			Second most economic option when compared with D1 and D3. The additional costs are due to the longer route length.
D3			Least economic option when compared with D1 and D2. This is due to a longer route length and an increase in requirement for tree felling.

Option D1 is a more preferred option from both an environmental and engineering perspective as it avoids direct impact on a Special Area of Conservation, Special Protection Area and Sites of Special Scientific Interest and also has lower potential for impact on cultural heritage receptors as well as landscape character and designations. In addition it has comparatively lower gradients with fewer construction challenges and access road requirements. It also has fewer interactions with existing infrastructure and dwellings.

Option D1 is a more preferred economic option, sub routes D1 (for D1.1) and D2 (for D2.1) are most economic sub routes and an option to make up route D1 if required.

Option D1 is overall considered to be a more preferred option.

4.5 Section E – Dingwall to Beauly

Three route options are identified, E1, E2 and E3 as illustrated on Figure 7.1.

One sub option for E1 has been identified, E1.1. In order to assess which combination of E route and sub-route has potential to be most preferential on environmental and engineering grounds, a comparative assessment of the main route option and sub route option has been undertaken. i.e. E1 compared with E1.1; the results of this assessments are described in Table 7.1.

An overall RAG assessment of each of the routes is also included in order to demonstrate the differences or similarities of potential impact expected to arise if each route were chosen.

Following assessment, the least impactful of these sub-options, on balance, was then combined to form a composite route option, which allowed for assessment of the E1 options against the route optionsE and E3.

Constraints in this section included areas of ancient woodland, the Fairburn Garden and Designed Landscape and Grade A-listed Fairburn Tower, Conon Islands Special Area of Conservation and Lower River Conon Site of Special Scientific Interest, and the Brahan Garden and Designed Landscape.

There are a number of existing OHLs in the area including the 132kV Beauly – Corriemoillie OHL near to Muirton Mains and Loch Achonachie.

Proximity to properties in this area was also a key consideration.

Figure 7.1 Section E Overview

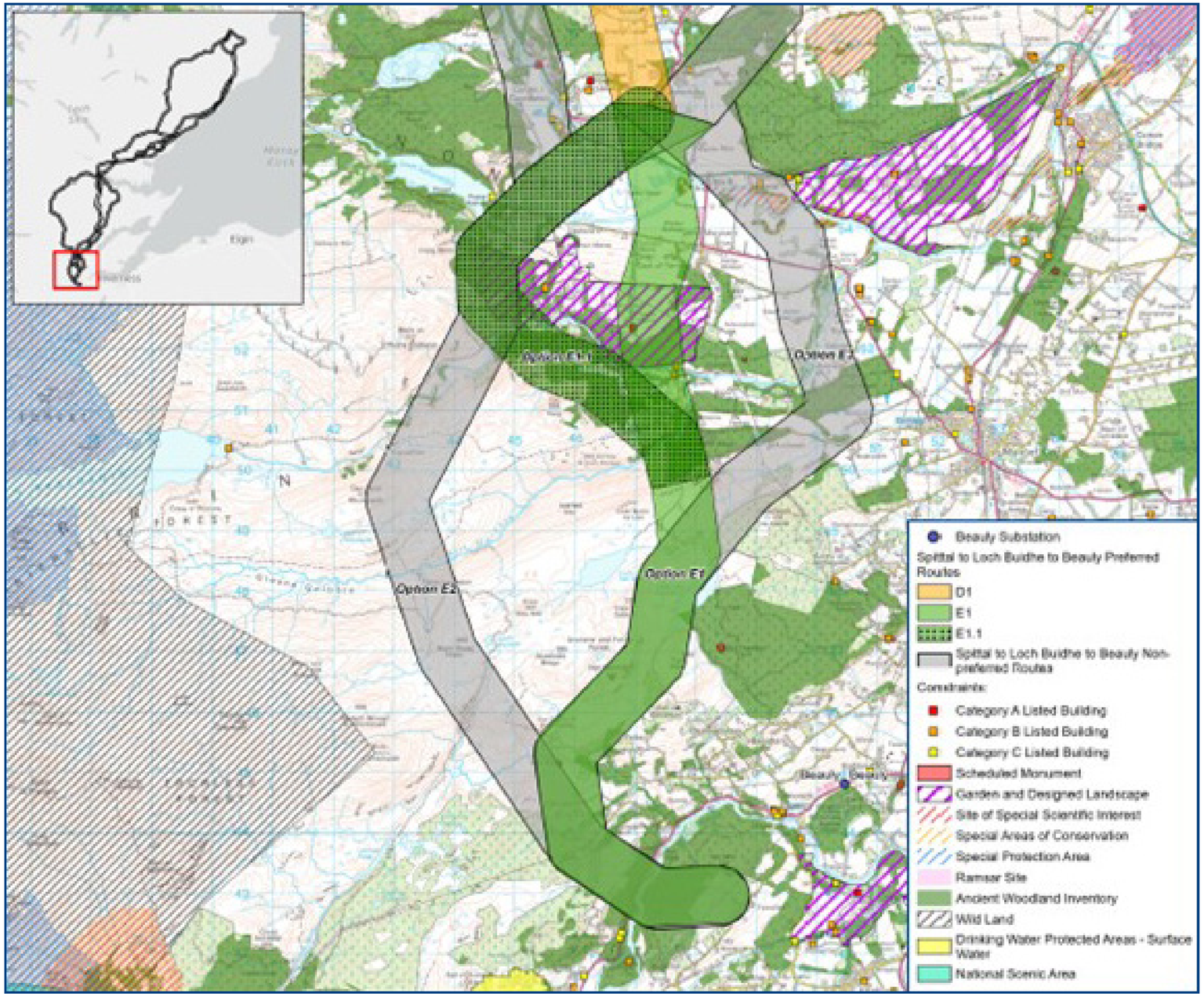


Table 7.1 Summary of key considerations for E1 v E1.1

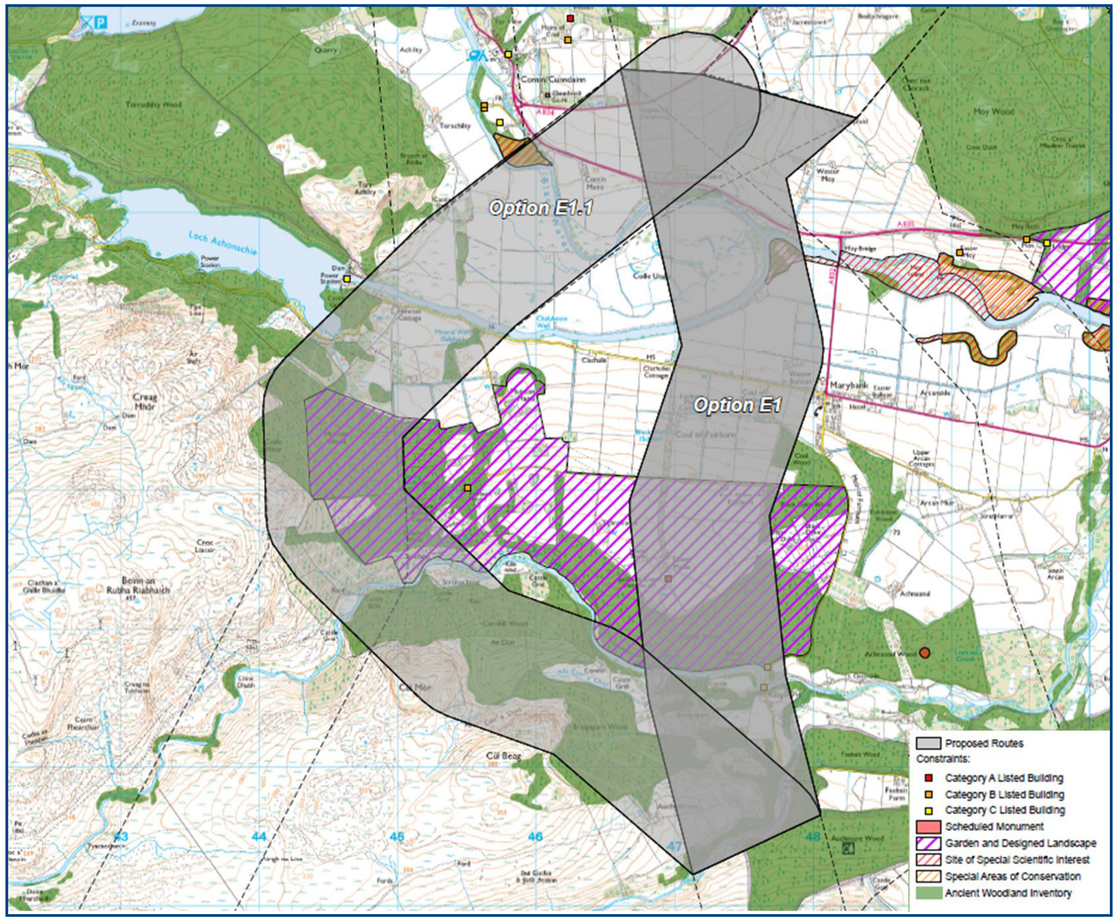
Option E1

Environment & Community

- Passes directly through central section of Fairburn Garden and Designed Landscape.
- Passes adjacent to the Fairburn tower category A listed building and setting would be compromised.
- Passes through ancient woodland.

Engineering

- Will cross the existing 132kV Beauly – Corriemoillie OHL.
- Fewer angle towers required.



Option E1.1

Environment & Community

- Passes through western edge of Garden and Designed Landscape.
- Passes through large area of ancient woodland.

Engineering

- Will cross the existing 132kV Beauly – Corriemoillie OHL.
- Exposed to steeper slopes with steeper gradients.

Preferred Option

Option E1.1 is a more preferred environmental option as it reduces the potential impact on the Fairburn Garden and Designed Landscape and the Grade A listed Fairburn Tower.

Option E1 is a more preferred option from an engineering perspective considering ease of access, construction and less terrain/ elevation challenges. It is considerably shorter in length and would require a fewer number of angle towers.

At this stage it is not clear whether the final route should include sub option E1.1. Although there are engineering challenges associated with E1.1, there is greater potential for environmental impact on the Fairburn Garden and Designed Landscape if E1.1 is not included.

Table 7.2 Section E – Dingwall to Beauly

Option	RAG Impact Rating – Environmental																RAG Impact Rating – Engineering																	
	Natural Heritage					Cultural Heritage		Peo -ple	Landscape			Land Use			Planning		Existing Infrastructure					Environmental Design				Ground Conditions		Construction & Maintenance			Proximity				
	Designations	Protected Species	Habitats	Ornithology	Geology, Hydrology and Hydrogeology	Designations	Cultural Heritage Assets	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy	Proposals	Existing OHL	Railway	River / Canal	Gas / Hydro pipelines	Road	Elevation	Atmospheric Pollution	Contaminated Land	Flooding	Terrain	Peatland	Route Length	Access	Angle Towers	Clearance Distance	Windfarms	Communication Masks	Urban Environment	Metallic Pipelines
E1	H	L	M	L	M	H	M	L	H	M	M	M	M	M	M	M	H	L	M	L	L	L	L	L	M	L	L	L	L	L	L	L	L	L
E1.1	H	L	M	L	M	H	M	L	H	M	M	L	M	M	M	M	H	L	M	L	L	H	L	L	M	H	L	H	M	H	L	L	L	L	L
Option E1.1 is preferred as it reduces the potential impact on the Fairburn GDL and the Grade A listed Fairburn Tower.																	**Option E1** is the preferred technical option considering ease of access, construction and less terrain/ elevation challenges. It is considerably shorter in length and has lesser number of angle towers.																			
E1	H	L	M	L	M	H	M	L	H	M	M	M	L	M	M	M	H	L	M	L	L	M	L	L	M	M	L	L	M	M	L	L	M	M	L
E2	H	L	H	L	L	H	M	L	H	M	M	L	L	M	M	M	H	L	M	L	L	H	L	L	M	H	H	L	H	M	L	L	M	M	L
E3	H	L	M	L	M	M	L	L	M	M	H	M	L	M	M	M	H	L	M	L	L	M	L	L	M	M	L	L	M	M	L	M	H	H	L
There is no clear environmentally preferred option. However, on balance, **Option E1** (with sub option E1.1) presents the best opportunity to reduce impact on the Fairburn Garden and Designed Landscape, Fairburn tower, category A listed building, visual receptors and Annex I habitat.																	**Option E1** is considered the technically preferred option considering ease of access, construction and less terrain/ elevation challenges. It is considerably shorter in length and avoids peatland.																			
Option E1 is the preferred route option however it is not clear preference whether the route will incorporate sub option E1.1.																																		

Table 7.3 Engineering Comparison of Overall Options

		E1	E2	E3
Infrastructure Crossings	Major Crossings	HV OHL Crossings: crossing 132kV OHL Beauly – Corriemoillie (BM1 & BM2) near Muirton Mains and 132kV OHL Beauly - Deanie North (BDN & BDS) River and Loch Crossings: crosses River Beauly, River Orrin and Allt Goibhre and two small burns	HV OHL Crossings: crossing 132kV OHL Beauly – Corriemoillie (BM1 & BM2) near Muirton Mains and 132kV OHL Beauly - Deanie North (BDN & BDS) River and Loch Crossings: crosses River Beauly, River Orrin and Allt Goibhre and two small burns	HV OHL Crossings: crossing 132kV OHL Beauly – Corriemoillie (BM1 & BM2) near Muirton Mains and 132kV OHL Beauly - Deanie North (BDN & BDS) River and Loch Crossings: crosses River Beauly, River Orrin and Allt Goibhre and two small burns
	Minor Crossings	Crosses A835 and A831 once	Crosses A835 and A831 once	Crosses A835 and A832 once
Environmental Design	Elevation	68% of the route has elevation between 0m-200m. 32% of route has elevation between 200m-450m. Route has average elevation 167m, min elevation 13m and max elevation is 325m.	57% of the route has elevation between 0m-200m. 44% of route has elevation between 200m-450m. Route has average elevation 192m, min elevation 14m and max elevation is 385m.	70% of the route has elevation between 0m-200m. 30% of route has elevation between 200m-450m. Route has average elevation 141m, min elevation 9m and max elevation is 327m.
	Atmospheric Pollution	90% route is within 10km from costal area. Passes near Black Dyke, Fairburn, , Aultvaich, Farley, Kilmorack	20% route is within 10km from costal area. Passes near Black Dyke, Fairburn, Aultvaich, Farley, Kilmorack	100% route is within 10km from costal area. Passes near Muir of Ord, Aultvaich, Farley, Kilmorack
	Contamination	No major contamination recorded.	No major contamination recorded.	No major contamination recorded.
	Flooding	5% of the route in flood risk area	5% of the route in flood risk area	15% of the route in flood risk area
Ground Conditions	Terrain	79% of route has slope between 01-20 degrees. 16% of route has slope between 20-60 degrees. Max Slope-39°	82% of route has slope between 01-20 degrees. 12% of route has slope between 20-60 degrees. Max Slope-39°	87% of route has slope between 01-20 degrees. 5% of route has slope between 20-60 degrees. Max Slope-36°
	Peat	Peatland Class1 – 3% of the total length. Peatland Class2 – 6% of the total length.	Peatland Class1 – 10% of the total length. Peatland Class2 – 15% of the total length.	Peatland Class1 – 1% of the total length. Peatland Class2 – 4% of the total length.
Construction and Maintenance	Access Road	82% of route has available access through 50m to 1000m. 8% of route has available access through 1000m to 10000m.	85% of route has available access through 50m to 1000m. 8% of route has available access through 1000m to 10000m.	86% of route has available access through 50m to 1000m. 7% of route has available access through 1000m to 10000m.
	Angle Towers	No of angle towers – 14	No of angle towers – 9	No of angle towers - 11
Proximity	Clearance	Several properties with pinch points.	Several properties.	Several properties with pinch points
	Windfarms	One Auchmore wind Turbine (Constructed)	Fairburn Wind Farm (Constructed), Fairburn Extension windfarm (withdrawn)	No wind farm as per our record
	Communication Masts	Risk of communication mast due to populated area	Low Risk of communication mast	Risk of communication mast due to populated area
	Urban Environment	No urban areas within route	No urban areas within route	No urban areas within route
	Metallic Pipeline	No known pipelines	No known pipelines	No known pipelines

Table 7.4 Environmental Comparison of Overall Options

		E1	E2	E3
Natural Heritage	Designations	Encroaches on the Conon Islands SAC, Lower River Conon SSSI and ancient woodland. Likely to avoid tower positions within the SAC and SSSI.	Encroaches on the Conon Islands SAC, Lower River Conon SSSI and ancient woodland. Likely to avoid tower positions within the SAC and SSSI.	Encroaches on the Conon Islands SAC, Lower River Conon SSSI and ancient woodland. Likely to avoid tower positions within the SAC and SSSI.
	Protected Species	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.	Unlikely to compromise the conservation status or essential suitable habitat.
	Habitats	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.	Likely to compromise Annex 1 habitat with high potential for ground water dependent terrestrial ecosystems.	May compromise Annex 1 habitat with potential for ground water dependent terrestrial ecosystems.
	Ornithology	Unlikely to compromise the conservation status of Schedule 1 bird species or their habitats.	Unlikely to compromise the conservation status of Schedule 1 bird species or their habitats.	Unlikely to compromise the conservation status of Schedule 1 bird species or their habitats.
	Hydrology/ Geology	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.	Unlikely to result in water flow pathway(s) to surface and groundwaters.	May compromise quality and or quantity of surface or groundwaters of local importance, during construction only.
Cultural Heritage	Designations	Likely to compromise the designating features or setting of the Fairburn GDL.	Likely to compromise the designating features or setting of the Fairburn GDL.	May compromise designating features or setting of the Brahan GDL.
	Cultural Heritage Assets	Potential to impact setting of Fairburn tower, category A listed building.	Potential to impact setting of Fairburn tower, category A listed building.*	Unlikely to compromise the integrity of a conservation area, setting of an A listed building or directly disturb a B/C listed building.*
People	Proximity to dwellings	No urban areas within route	No urban areas within route	No urban areas within route
Landscape	Designations	Passes through Fairburn GDL.**	Passes through Fairburn GDL.**	May compromise designating features or setting of the Brahan GDL.
	Character	May compromise characteristic elements of a given landscape.	May compromise characteristic elements of a given landscape.	May compromise characteristic elements of a given landscape.
	Visual	May compromise the view or visual amenity of individual properties.	May to compromise the view or visual amenity of individual properties.	Likely to compromise the view or visual amenity of individual properties at Muir of Ord.
Land Use	Agriculture	Passes through prime agricultural land (LCA 1, 2 and 3.1)	Avoids interaction with prime agricultural land (LCA 1, 2 and 3.1).	Passes through prime agricultural land (LCA 1, 2 and 3.1)
	Forestry	Avoids interaction with areas of commercial forestry.	Avoids interaction with areas of commercial forestry.	Avoids interaction with areas of commercial forestry.
	Recreation	Potential to compromise the recreational amenity of core paths.	Potential to compromise the recreational amenity of core paths.	Potential to compromise the recreational amenity of core paths.
Planning	Policy	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.	May be contrary to national, regional or local planning policy due to potential for impact on habitats and designations.
	Proposals	No other projects known to the planning system have been identified, which may interact with the option.	No other projects known to the planning system have been identified, which may interact with the option.	No other projects known to the planning system have been identified, which may interact with the option.

**Please note, in the Consultation Booklet issued to accompany the public consultation events in February and March 2023 the ratings for E2 and E3 were incorrectly assigned to each other. These have therefore been amended in the table as part of this consultation document.*

*** Please note that in the assessments conducted prior to the public consultations in early 2023, the Fairburn GDL was considered only as part of the cultural heritage designations and not within the landscape designations. The rating has been updated to reflect this.*

Table 7.5 Cost Comparison of Overall Options

Cost		RAG	Site Comparison Notes
E1.1	Sub-option comparison		Less economic option when compared with E1 (including E1.1) due to longer route length and therefore requirement for more materials. A slightly higher amount of tree felling is required for this route which also contributes to higher costs.
E1 alternate route			More economic option compared to alternative sub route E1.1
E1 (with E1.1)	Full E option comparison		Less economic route option when compared with E2 and E3. This is due to an increase in route length, an increase in the requirement of tree felling and a higher number of OHL crossings.
E2			Second most economic option when compare with E1 (with E1.1) and E3. This is due to an increase in the requirement for crossing protection.
E3			More economic option when compared with options E1 (including E1.1) and E2.

There is no clear distinction between options from an environmental perspective. However, Option E1 (with sub option E1.1) presents the best opportunity to reduce impact on the Fairburn Garden and Designed Landscape, Fairburn tower, category A listed building, visual receptors and Annex 1 habitat.

Option E1 (without sub option E1.1) is considered a more preferred option from an engineering perspective considering ease of access, construction and less terrain/gradient challenges; it is considerably shorter in length and avoids slopes and areas of peat.

Option E3 is a more preferred route from a cost perspective.

Whilst Option E1 is considered a more preferred route option overall, at this stage it is not clear whether the final route should include sub option E1.1. Although there are engineering challenges associated with E1.1, there is greater potential for environmental impact via incursion on the Fairburn Garden and Designed Landscape if E1.1 is not included.

5. Alignment Selection Process

Stage 3: Alignment Selection follows on from Stage 2: Route Selection and seeks to further refine the routeing process with the objective of defining an indicative proposed alignment which can, where necessary, be taken forward into the consenting (and if appropriate, EIA) processes.

The objective of this stage will be to define a proposed alignment, this includes:

- Identification of alignment options, indicating the locations of support structures and interface or transition points between OHL and UGC (for example, sealing end compounds) where appropriate (but not a detailed schedule);
- Stakeholder consultation on alignment options, following which amendments may be made to reflect stakeholder feedback, to arrive at an indicative proposed alignment and proposed LOD which would form the parameters of the Section 37 consent.
- Limits of Deviation (LOD) either side of the alignment, to allow for micrositing of individual support structures or cable alignment – this should be as wide as necessary to accommodate reasonable flexibility for micrositing but as narrow as possible to minimise avoidable environmental impact and provide a level of certainty for consenting authorities;
- An access strategy, setting out how access to the alignment will be provided to facilitate construction e.g. the nature, indicative location and extent of temporary access tracks, permanent, tracks and road improvements;

6. Next Steps

Following the assessment of route options, SSEN Transmission has undertaken consultation with statutory and non-statutory stakeholders and held a series of public exhibitions along the route options under consideration.

The responses received from the public exhibitions, statutory consultees and other key stakeholders will inform our further work to address concerns and constraints identified along the route, together with potential alternative route options before we begin to look to Stage 3: Alignment Selection Process.

Once we have collated and reviewed all feedback from communities and other stakeholders in response to our consultation on the route options along the route, we will produce a ‘Report on Consultation’ which will document the themes of consultation responses received and the decisions made in light of these responses. This will be made available to the public through the project website and issued directly to statutory and non-statutory stakeholders.

Following the identification of the preferred route options we will then undertake further technical and environmental work to identify the proposed alignment options.

At this point, we anticipate that consultation on the proposed alignment options will take place towards the end of 2023 and be undertaken through public events and meetings with statutory and non-statutory stakeholders.