LT521 – Bingally 400kV Substation

Flood Risk Assessment: Access Track

BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0006

Scottish & Southern Electricity Networks
TRANSMISSION

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1.0 INTRODUCTION

1.1 General

1.1.1 Fairhurst was appointed by Siemens Energy BAM Joint Venture (SEBAM) to carry out a Flood Risk Assessment (FRA) for a proposed substation development at Bingally near Cannich in the Highlands. A plan of the location of the proposed development in relation to the local area is provided in **Figure 1: Site Location Plan**.

1.1.2 Flood risk at the site has primarily been assessed in relation to fluvial and overland flooding; however, other potential sources of flood risk have also been considered.

1.1.3 The FRA should be read in conjunction with the Drainage Impact Assessment (DIA) report, BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0005, and the Drainage Strategy (DS) report, BING4-LT521-SEBAM-DRAI-ZZ-RTP-C-0004.

1.1.4 This report has been compiled to outline the flood risk associated with the access track to support the planning application for the proposed electrical substation at Bingally. A separate FRA report is provided for the substation platform (BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0003)

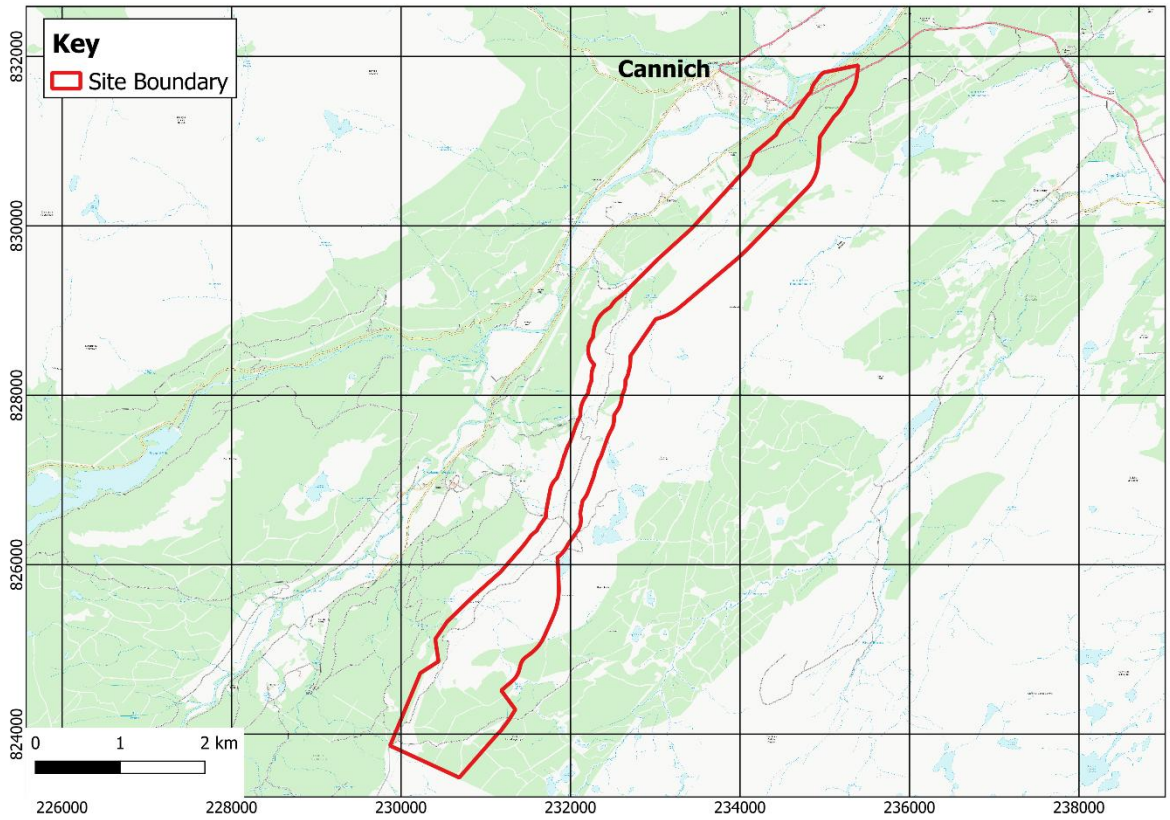


Figure 1: Site Location Plan

2.0 PLANNING POLICY

2.1 National Planning Framework 4

2.1.1 In consideration of planning applications, planning authorities require to be satisfied that due account has been taken of National Planning Framework 4 (NPF4), and the Scottish Government's online Planning Advice on Flood Risk. It is necessary to show that adequate protection against flooding exists or can be provided for the proposed development and that the development does not increase flood risk to others.

2.1.2 Policy 22 of the NPF4, Flood Risk and Water Management', sets out the requirements for development proposals at risk of flooding or in a flood risk area. The policy states:

a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:

i. essential infrastructure where the location is required for operational reasons;

ii. water compatible uses;

iii. redevelopment of an existing building or site for an equal or less vulnerable use; or.

iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long-term safety and resilience can be secured in accordance with relevant SEPA advice.

The protection offered by an existing formal flood protection scheme or one under construction can be taken into account when determining flood risk.

In such cases, it will be demonstrated by the applicant that:

- all risks of flooding are understood and addressed;
- there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;
- the development remains safe and operational during floods;
- flood resistant and resilient materials and construction methods are used; and
- future adaptations can be made to accommodate the effects of climate change.

Additionally, for development proposals meeting criteria part iv), where flood risk is managed at the site rather than avoided these will also require:

- the first occupied/utilised floor, and the underside of the development if relevant, to be above the flood risk level and have an additional allowance for freeboard; and
- that the proposal does not create an island of development and that safe access/ egress can be achieved.

b) Small scale extensions and alterations to existing buildings will only be supported where they will not significantly increase flood risk.

c) Development proposals will:

i. not increase the risk of surface water flooding to others, or itself be at risk.

ii. manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue-

green infrastructure. All proposals should presume no surface water connection to the combined sewer;

iii. seek to minimise the area of impermeable surface.

d) Development proposals will be supported if they can be connected to the public water mains. If connection is not feasible, the applicant will need to demonstrate that water for drinking water purposes will be sourced from a sustainable water source that is resilient to periods of water scarcity.

e) Development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported.

2.2 Local Planning Policy

2.2.1 The Highland-wide Local Development Plan 2012 sets out the Council's vision for development within the Highland Council area over the course of the next 20 years. The LDP was developed prior to the release of NPF4, and therefore still makes reference to Scottish Planning Policy (SPP).

2.2.2 Policy 64 'Flood Risk' states that:

"Development proposals should avoid areas susceptible to flooding and promote sustainable flood management.

Development proposals within or bordering medium to high flood risk areas, will need to demonstrate compliance with Scottish Planning Policy (SPP) through the submission of suitable information which may take the form of a Flood Risk Assessment.

Development proposals outwith indicative medium to high flood risk areas may be acceptable. However, where:

• better local flood risk information is available and suggests a higher risk;

• a sensitive land use (as specified in the risk framework of Scottish Planning Policy) is proposed, and/or;

• the development borders the coast and therefore may be at risk from climate change;

a Flood Risk Assessment or other suitable information which demonstrates compliance with SPP will be required.

Developments may also be possible where they are in accord with the flood prevention or management measures as specified within a local (development) plan allocation or a development brief. Any developments, particularly those on the flood plain, should not compromise the objectives of the EU Water Framework Directive.

Where flood management measures are required, natural methods such as restoration of floodplains, wetlands and water bodies should be incorporated, or adequate justification should be provided as to why they are impracticable."

3.0 DEVELOPMENT SITE

3.1 Existing Conditions

3.1.1 The proposed development site covers a total area of approximately 619 hectares (ha), comprising of agricultural land, as illustrated in **Figure 2**.

3.1.2 Presently, access is available from a turn off on the A831 prior to reaching the village of Cannich and along an access road approximately 9.5km long. Secondary access is available to the southern area of the site via an unnamed road just south of the village of Tomich.

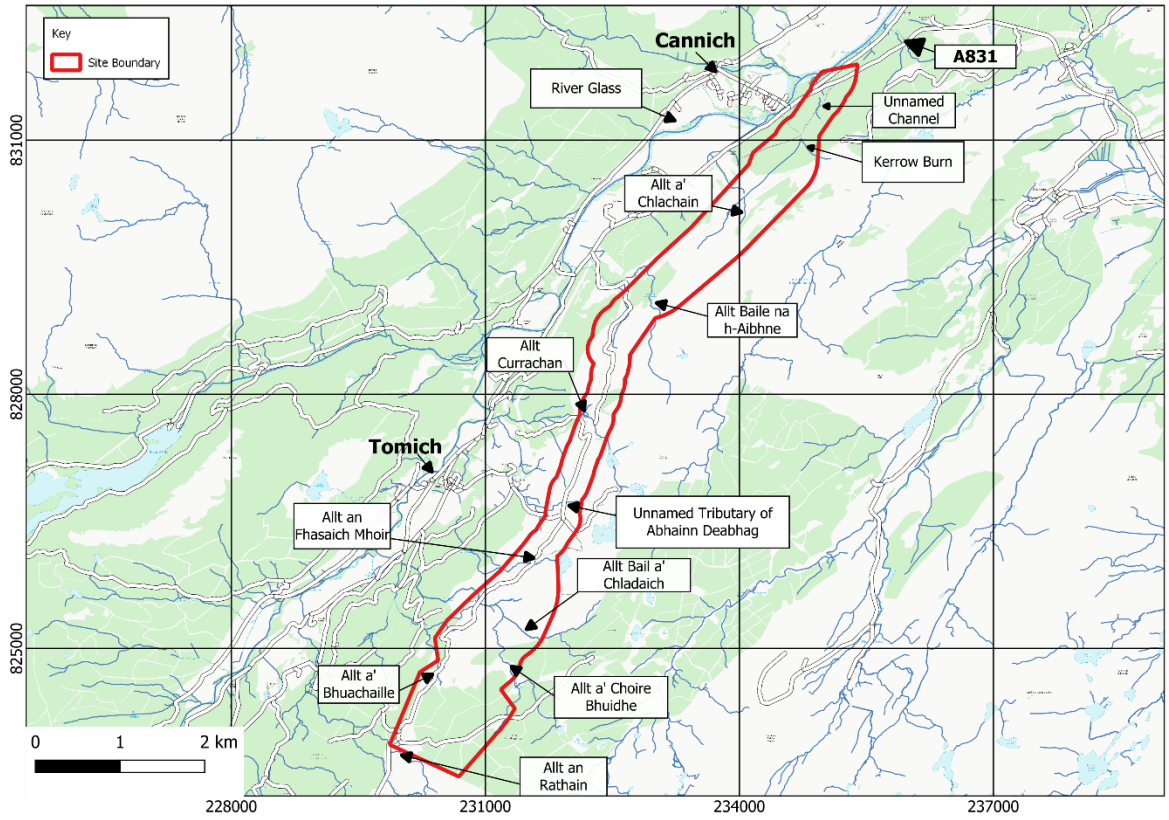


Figure 2: Existing Site Conditions

3.1.3 The site elevation ranges from ~ 91 mAOD at the north to 370 mAOD at the south eastern extent.

3.1.4 Numerous watercourses flow across the proposed access track route including:

- An unnamed channel discharging into River Glass,
- Kerrow Burn,
- Allt Baile na h-Aibhne,
- Allt Currachan,
- Unnamed tributary of Abhainn Deabhag,
- Allt an Fhaisaich Mhoir,
- Allt Bail a' Chladaich, and
- Allt a' Bhuachaille.

3.2 Proposed Development

3.2.1 The proposed development being considered in this FRA includes the construction of a 400kV substation and associated infrastructure. The proposed development being considered in this FRA consists of the 9.4km long access track running from the A831 to the substation platform area and the 0.6 km long access track branching off the main access track at the substation platform area.

3.2.2 The proposed access track layout is shown in Drawings BING4-LT521-SEBAM-DRAI-EXT-D-C-0584, **Appendix 1**.

3.3 Sources of Flood Risk Information

3.3.1 ***SEPA Flood Maps***

SEPA's flood maps provide guidance on the possible extent, depth and velocity for different likelihoods ('High, Medium and Low') of fluvial, coastal and pluvial flooding, alongside various associated information.

3.3.2 These maps are a strategic planning tool, the resolution of which does not take account of individual hydraulic structures or drainage infrastructure. These provide indicative flood risk information, rather than site-specific detail.

3.3.3 The River Glass, which runs through the north western extent of the site boundary, is shown to have out-of-bank flows in the 1 in 200 year plus climate change and 1 in 1000 year return periods. Flood extents within the site boundary are limited to the lower lying grounds along the eastern bank of the river and flows are likely to be routed to the lower lying grounds to the north of the site. Therefore, the watercourse is considered not to pose a flood risk to the site.

3.3.4 The watercourses within the site are too small to be included in the SEPA Fluvial Flood Maps, however they are indicated in the SEPA surface water and small watercourses flood maps.

3.3.5 The Surface Water And Small Watercourses Maps show flood risk along some of the watercourses along the proposed access track route including an unnamed channel discharging into the River Glass, Kerrow Burn, Allt a' Chlachain, Allt Baile na h-Aibhne, Allt Currachan, an unnamed tributary of Abhainn Deabhag, Allt an Fhasaich Mhoir, Allt Bail a'

Chladaich, Allt a' Bhuachaille and Allt a' Choire Bhuidhe in both a 1 in 200 year plus climate change and 1 in 1000 year flood event.

3.3.6 The SEPA Surface Water Flood Extents also indicate small isolated pockets of surface water flood risk at localised low points within the site.

3.3.7 Whilst the flood maps can be a useful tool for initially considering whether a site may be at risk of flooding, the following caveat is attached to their use:

> *"The Flood Maps are indicative and of a strategic nature. Whilst all reasonable effort has been made to ensure that the Flood Maps are accurate for their intended purpose, no warranty is given by SEPA in this regard… It is inappropriate for these Flood Maps to be used to assess flood risk to an individual property."*

More detailed analysis is required to fully understand the flood risk to any development site and is provided in **Section 5** of this report.

3.3.8 ***SEPA Reservoirs Map***

In order to implement the Reservoirs (Scotland) Act 2011, SEPA produced reservoir inundation maps (RIMs). These maps illustrate the areas likely to be flooded by an uncontrolled release of water from a reservoir with storage volume of 25,000 m^3 or more.

3.3.9 The RIMs indicate that the proposed access track route is at risk of flooding due to the failure of the Loch Na Beinne Moire reservoir. In this event, flows would be routed through the Allt Currachan watercourse and into the Abhainn Deabhag, before discharging into the River Glass to the north west of the site.

3.3.10 The proposed access track crosses the Allt Currachan watercourse and could potentially be affected in the event of failure.

4.0 POTENTIAL SOURCES OF FLOOD RISK

There are several potential sources of flooding that require consideration.

4.1 Coastal flooding

4.1.1 Extreme sea levels and coastal waves have the potential to cause rapid inundation of a development, posing a threat to the welfare of occupants and potentially preventing emergency access to properties and essential infrastructure

4.2 Overland flow

4.2.1 Overland flow occurs when the infiltration capacity of the ground is exceeded in a storm event. This could result in water travelling as sheet flow overland or excess water being conveyed from one location to another via local road networks.

4.3 Infrastructure failure

4.3.1 The failure of conveyance infrastructure such as culverts or bridges, or the failure of any man-made water storage or conveyance infrastructure that could increase the risk of flooding at the site.

4.4 Sewer flooding

4.4.1 If the capacity of sewers is exceeded in an extreme event, or a blockage occurs, surcharging of the network can result in surface flooding. The local drainage network should be considered with a view to assessing flood risk to the site.

4.5 Groundwater

4.5.1 High groundwater levels could exacerbate flooding occurring at low points on any given site, potentially contributing to flood risk from other sources.

5.0 FLOOD RISK ANALYSIS

Potential sources of flood risk identified for consideration in **Section 4** are discussed below.

5.1 Coastal Flooding

5.1.1 The proposed development is located over 34km from the nearest coast and at over 91mAOD. The inland location and elevation of the site mean it is not at risk from tidal inundation or coastal waves.

5.2 Fluvial Flows

Existing Scenario

5.2.1 SEPA fluvial maps show flood risk along some of the watercourses within the maps including an unnamed channel discharging into the River Glass, Kerrow Burn, Allt a' Chlachain, Allt Baile na h-Aibhne, Allt Currachan, an unnamed tributary of Abhainn Deabhag, Allt an Fhasaich Mhoir, Allt Bail a' Chladaich, Allt a' Bhuachaille and Allt a' Choire Bhuidhe in both a 1 in 200 year plus climate change and 1 in 1000 year flood event.

5.2.2 Given the general topography of the land, out-of-bank flow from these channels is likely to be routed towards the lower lying ground to the north and west of the site, and there is the potential for fluvial flows to affect the access track itself.

Proposed Scenario

5.2.3 Watercourse crossings including bridges and culverts are to be installed as part of the proposed development. Bridges are to be installed across the Allt Bail a' Chladaich and its tributaries, Allt Currachan, an unnamed tributary of the Abhainn Deabhag, Allt an Fhaisaich Mhoir, Allt Bail a' Chladaich and Allt a' Bhuachaille and culverts are to be installed across the unnamed channel discharging into the River Glass and twice across the Kerrow Burn.

5.2.4 The installation of watercourse crossing structures has the potential to influence the river hydraulics and subsequently the conveyance of water within the channel. The proposed crossings will be designed to convey the 1 in 200 year return period flows with an appropriate freeboard included, as per the SSE guidelines for operational areas (SSEN, SP-NET-CIV-502). The crossings will also be designed to ensure no flood risk to the proposed access track in a 1 in 200 year + climate change event and no increase in flood risk elsewhere compared to existing.

5.2.5 Fluvial flood risk to the access track is therefore considered to be low for a 1 in 200 year plus climate change return period. Residual risk of fluvial flooding can be mitigated by installing adequate track drainage, ensuring the road has sufficient camber to allow water to run off and by profiling ground levels to route flow around and away from sensitive infrastructure.

5.3 Overland Flow

5.3.1 Overland flow can occur when the infiltration capacity of the ground is exceeded during periods of prolonged or intense rainfall.

5.3.2 As seen in **Figure 3**, the site and its surroundings generally slope from the east to the west. Surface water generated within the site will be routed from the higher lying grounds to the

western extent of the site, before flowing out of the site to the lower lying grounds to the west and north west of the site.

5.3.3 Based on existing topography, there are localised low points along the proposed access track route where surface water has the potential to pond according to the SEPA surface water maps. The proposed drainage infrastructure will mitigate this.

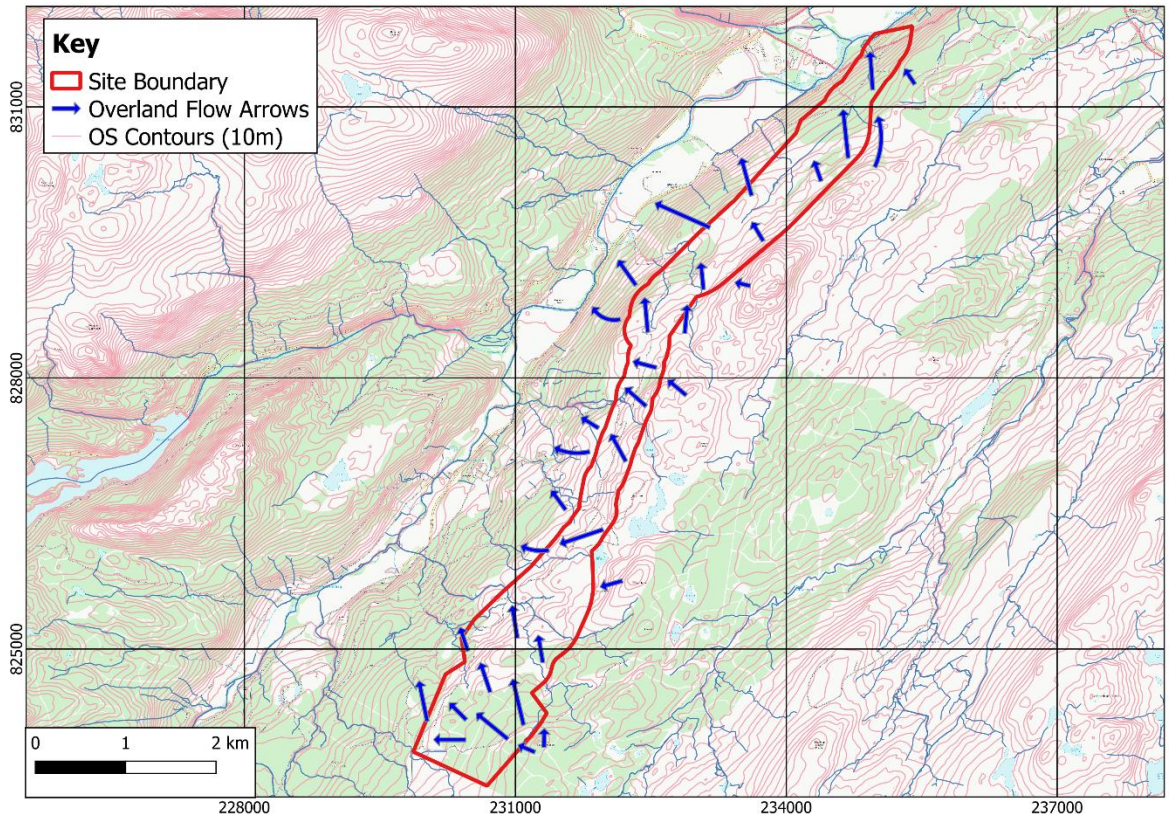


Figure 3: Overland Flow

5.3.4 Surface water runoff generated within the proposed development site will be dealt with by a dedicated drainage system designed to appropriate standards and by incorporating Sustainable Drainage Systems (SuDS).

5.3.5 Residual flood risk should be mitigated by installing cut-off ditches or profiling ground levels to route flow around and away from sensitive infrastructure. With this mitigation implemented, the risk of surface water flooding is considered to be low.

5.4 Infrastructure Failure

5.4.1 Reservoir Failure

The SEPA reservoir inundation mapping indicates the areas at flood risk from the failure of Loch Na Beinne Moire reservoir along the Allt Currachan watercourse.

The Loch Na Beinne Moire reservoir is registered and regulated under the Reservoirs (Scotland) Act 2011 and subject to an inspection and monitoring regime, therefore failure is very unlikely. SEPA guidance states that: “Flooding from reservoirs is very unlikely to occur and there has been no loss of life from reservoir failure in the UK since reservoir safety legislation was introduced in 1930.”

It is therefore considered that there is little to no risk to the proposed access track from failure of these reservoirs.

5.4.2 Watercourse Crossing Blockage

Existing Scenario

During extreme flood events, there is potential for watercourse crossing structures to become blocked with debris or sediment, thereby increasing flood levels or changing out-of-bank flow patterns.

Some of the watercourses flowing through the site have existing crossing structures. These include Kerrow Burn, a tributary of Allt Baile na h-Aibhne, a tributary of the Abhainn Deabhag, Allt an Fhasaich Mhoir, and Allt a’ Bhuachaille.

Out-of-bank flows from these watercourses will follow the topography of the land and flow towards the lower lying ground to the west of the site. Blockage of these existing culverts does not therefore currently pose a flood risk to the site.

5.4.3 Proposed Scenario

The proposed access track route crosses several watercourses and will entail the installation of new culvert structures with a minimum size of 1500mm and bridge structures with a minimum span of 9m. These structures will be designed to convey 1 in 200 year flood flows, with additional freeboard to soffit levels as per the SSE guidelines for operational areas (SSEN, SP-NET-CIV-502).

Given the size of the culverts and the span of the bridges the potential for a significant blockage of the structures is considered to be low, however, should this occur flood water could spill over the track and back into the channel downstream. Alternative access to the proposed substation platform is available to the southern area of the site via an unnamed road just south of the village of Tomich.

5.5 Sewer Flooding

5.5.1 There is presently no drainage infrastructure within the site area, and therefore there is no risk of flooding from this source. Surface water flow generated within the site should be dealt

with by a dedicated drainage system, designed to appropriate standards and incorporating Sustainable Drainage Systems (SuDS). .

5.6 Groundwater Flooding

5.6.1 Groundwater is generally a contributing factor to flooding rather than the primary source. SEPA flood maps indicate areas where groundwater could influence the duration and extent of flooding from other sources.

5.6.2 The majority of the proposed site is situated outwith groundwater influenced flood extents shown on these maps except a small extent of the north eastern extent of the site just off the A831.

5.6.3 In the event groundwater levels exceed the ground levels at the site, the excess water would follow the same flow patterns as for overland flow.

5.6.4 Residual risk from this source of flooding can be mitigated by the installation of appropriate drainage measures, and by profiling ground levels to route flood water around and away from sensitive infrastructure. With these measures implemented, the risk of groundwater flooding is considered to be low.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1.1 Fairhurst was appointed by Siemens Energy BAM Joint Venture (SEBAM) to carry out a Flood Risk Assessment (FRA) for a proposed substation development at Bingally near Cannich in the Highlands. This FRA focuses on the access track to the substation platform.

6.1.2 Fluvial flood risk to the site from the small watercourses along the route of the proposed access track including an unnamed watercourse discharging into River Glass, Kerrow Burn, Allt a' Chlachain, Allt Baile na h-Aibhne, Allt Currachan, an unnamed tributary of Abhainn Deabhag, Allt an Fhaisaich Mhoir, Allt Bail a' Chladaich, and Allt a' Bhuachaille has been assessed. The topography of the land in the vicinity of the proposed access track is such that overland flows from these watercourses and their tributaries will be routed across the track and directed to the west and away from the site.

6.1.3 Watercourse crossings including bridges and culverts are to be installed as part of the proposed development. Bridges are to be installed across the Allt Bail a' Chladaich and its tributaries, Allt Currachan, an unnamed tributary of the Abhainn Deabhag, Allt an Fhaisaich Mhoir, Allt Bail a' Chladaich and Allt a' Bhuachaille and culverts are to be installed across the unnamed channel discharging into the River Glass and twice across the Kerrow Burn.

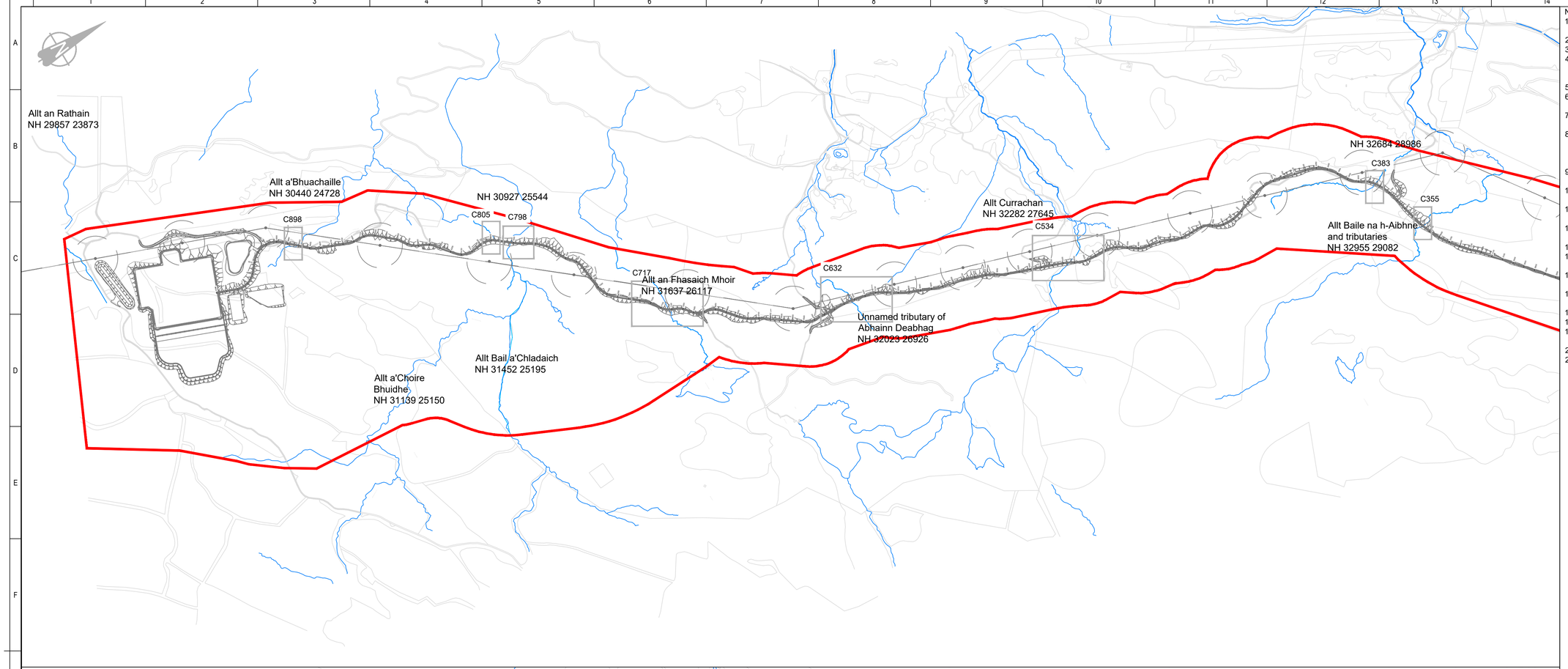
6.1.4 The installation of watercourse crossing structures has the potential to influence the river hydraulics and subsequently the conveyance of water within the channel. The proposed crossings will be designed to convey the 1 in 200 year return period flows with an appropriate freeboard included, as per the SSE guidelines for operational areas (SSEN, SP-NET-CIV-502). The crossings will also be designed to ensure no flood risk to the proposed access track in a 1 in 200 year + climate change event and no increase in flood risk elsewhere compared to existing.

6.1.5 Fluvial flood risk to the access track is therefore considered to be low for a 1 in 200 year plus climate change return period. Residual risk of fluvial flooding can be mitigated by installing adequate track drainage, ensuring the road has sufficient camber to allow water to run off and by profiling ground levels to route flow around and away from sensitive infrastructure.

6.1.6 Under existing conditions, SEPA surface water maps indicate ponding within localised low points along the proposed access track route. This will be mitigated by the development proposals, which will profile ground levels accordingly to route runoff away from the track and provide appropriate drainage infrastructure. With these measures in place, the risk of surface water flooding within the site is considered to be low.

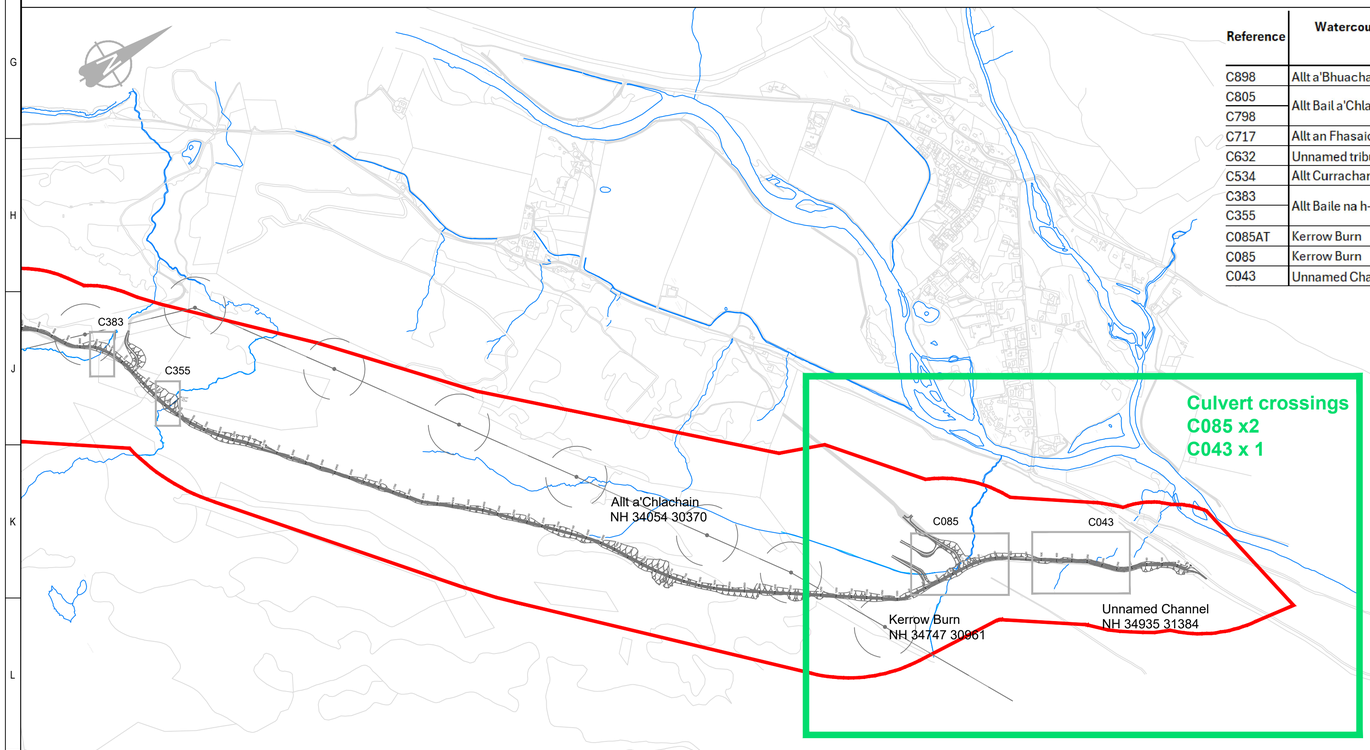
6.1.7 Flood risk from other sources including sewer flooding and groundwater flooding has also been assessed. Flood risk from these sources is considered to be low.

Appendix 1 Drawings



NOTES:-

1. This drawing shall only be used for the design element stated in the drawing title.
2. Only written dimensions shall be used.
3. All dimensions are in metres unless noted otherwise.
4. This drawing shall only be used for construction of the works when certified as acknowledged by Scottish and Southern Electricity Networks and upon relevant third party consultation certification.
5. All levels in metres (m) above ordnance datum unless stated otherwise
6. Refer to design decision log for assumptions associated with proposed design.
7. Tie-in locations to existing watercourse on hold until topographical survey is received.
8. Proposed channel realignments are designed to coordinate with available topographical contours. This information in some instances is inconsistent with OS information for the existing watercourse. Additional surveys are ongoing and will be reviewed against the design when available.
9. Proposed crossing design to be finalised upon receipt of detailed topographical survey and completed site and ground investigations
10. The contractor shall check all dimensions on site and report and inconsistencies to the designer prior to construction.
11. Refer to BING4-LT521-SEBAM-DRAI-EXT-D-C-0501 - 0514 for proposed access track drainage design.
12. Final setting out of watercourse crossing designs are on hold and will be updated to local grid upon receipt of topographical survey.
13. Channel hydrology details on hold until topographical survey is received.
14. Watercourse crossing culverts and headwalls greater than 1.2m on hold until structural check complete.
15. Watercourse realignments on hold until geotechnical stability assessment complete.
16. Watercourse realignment on hold until scour assessment and erosion protection can be determined.
17. Baffles required in culverts with a gradient greater than 1:67.
18. Baffles are to be included on the headwall apron section on the channel.
19. Refer to drawings BING4-LT521-SEBAM-DRAI-EXT-D-C-0585 - 0586 for watercourse realignment channel bed type details.
20. Culvert bed material to match sediment sizing table.
21. Refer to BING4-LT521-SEBAM-DRAI-ZZ-SCH-C-0002 for proposed Bingally access track watercourse crossings culvert schedule.



Reference	Watercourse on 1:50,000 hydrological map (direction: SW to NE)	Crossing point Easting (X), Northing (Y)	Crossing type	Crossing type	Bridge span length (m)
C898	Allt a'Bhuachaille	230443, 824717	Bridge	Bridge	18
C805	Allt Bail a'Chladaich and tributaries	230884, 825492	Bridge	Bridge	18
C798		230927, 825547	Bridge	Bridge	15
C717	Allt an Fhasaich Mhoir	231548, 826001	Bridge	Bridge	15
C632	Unnamed tributary of Abhainn Deabhag	231931, 826719	Bridge	Bridge	9
C534	Allt Currachan	232284, 827636	Bridge	Bridge	18
C383	Allt Baile na h-Aibhne and tributaries	232682, 828988	Bridge	Bridge	15
C355		232957, 829077	Bridge	Bridge	12
C085AT	Kerrow Burn	234720, 831036	Culvert	Culvert	
C085	Kerrow Burn	234736, 830966	Culvert	Culvert	
C043	Unnamed Channel	234902, 831353	Culvert	Culvert	

METRES @ 1:10000 0 100 200 500 1000

REV:	DATE:	DRWN:	CHKD:	APPVD:	DESCRIPTION:
P04	27/10/25	JM	RG	SC	UPDATED WITH LATEST DESIGN
P03	07/10/25	JM	RG	SC	UPDATED WITH LATEST DESIGN
P02	12/09/25	JM	RG	SC	BRIDGE SPANS ADDED
P01	14/03/25	CMcL	RD	RJM	FIRST ISSUE

STATUS: S5 ISSUED FOR FINAL REVIEW

CONTRACTOR: SIEMENS energy + bam

Joint Venture
Substation Delivery
Framework

CLIENT: Scottish & Southern Electricity Networks TRANSMISSION

PROJECT: LT521-BINGALLY 400kV SUBSTATION

PROJECT NUMBER: BING4-LT521 | LOCATION: BINGALLY

TITLE: PROPOSED WATERCOURSE CROSSING REALIGNMENT LOCATION PLAN

DRAWN:	C.McLAUGHLIN	ENG CHECK:	R.DUNCAN
DESIGNER:	A.PETERS	COORDINATION:	R.DUNCAN
SCALE :	1:10000	APPROVED:	R.MINTO
DATE OF FIRST ISSUE:	24/01/2025	SECURITY:	

ORIGINATOR DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-EXT-D-C-0584 | SHEET No: 1 of 1

CLIENT DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-EXT-D-C-0584 | REV. No: P04