LT521 – Bingally 400kV Substation

Flood Risk Assessment

BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0003

Scottish & Southern Electricity Networks
TRANSMISSION

SIEMENS energy bam

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CONTROL SHEET

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	P01	09/07/24	S5	ISSUE TO SSE	By	KO
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Appendices

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**.

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-0002, and the Drainage Strategy (DS) report, BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0001.

1.1.4 This report has been compiled to outline the Flood Risk associated with the substation platform to support the planning application for the proposed electrical substation at Bingally. A separate FRA has been produced for the proposed access track to the substation platform, BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0006.

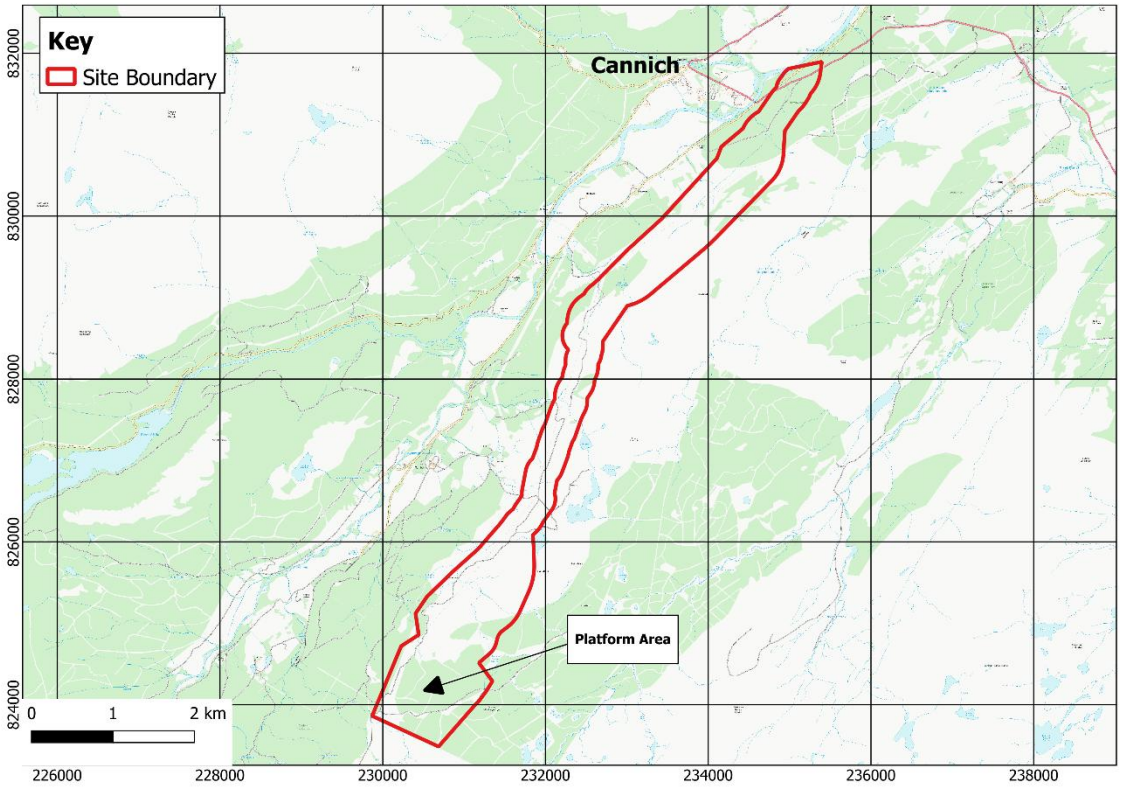


Figure 1: Site Location Plan

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.** The proposed substation platform area is approximately 11.5 hectares (ha) and that is the focus of this FRA.

3.1.2 The platform area can be accessed from a turn off on the A831 prior to reaching the village of Cannich and along an access road approximately 9.5km long. Alternatively, the platform can be reached more directly from an unnamed road just south of the village of Tomich

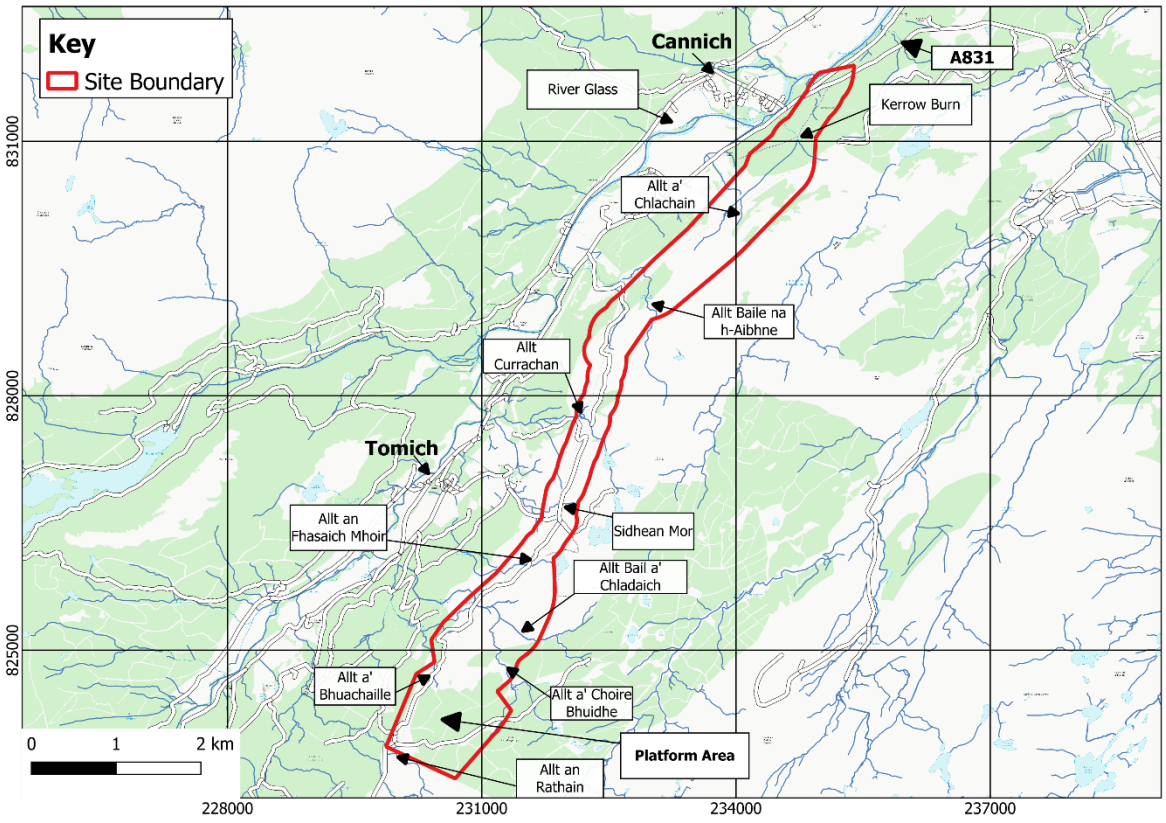


Figure 2: Existing Site Conditions

3.1.3 The ground levels at the substation platform and surrounding areas ranges from ~264mAOD to 333mAOD. The proposed substation platform ground levels are 324mAOD.

3.1.4 Numerous watercourses flow through the wider site although only 3 have the potential to influence the platform area, these are; Allt a' Bhuachaille, Allt an Rathain and Allt a' Choire Bhuidhe.

3.2 Proposed Development

3.2.1 The proposed development includes the construction of a 400kV substation and associated infrastructure. The proposed layout of the site is shown in Drawing BING-LT521-FAI-DRAI-XX-LAY-W-0501 P01.01 and BING-LT521-FAI-DRAI-XX-LAY-W-0502 P01.01 in **Appendix A**.

3.2.2 The proposed development being considered in this FRA consists of a substation platform of approximately 11.5ha at an elevation of 324mAOD.

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.

3.3.4 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.

3.3.5 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.

3.3.6 These maps show narrow corridors at risk of flooding along some of the watercourses within the platform area including; Allt a' Bhuachaille, Allt a' Choire Bhuidhe and Allt an Rathain, in both a 1 in 200 year plus climate change and a 1 in 1000 year flood event. Additionally, two overland flow routes directing flows from the south east to the north west into tributaries of the Allt a' Bhuachaille are indicated on the flood maps.

3.3.7 The SEPA surface water flood extents also indicate small isolated pockets of flooding at localised low points within the site.

3.3.8 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.

3.3.9 ***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.

3.3.10 The proposed substation platform site area which is located south of the site is not shown to be at risk from reservoir flooding.

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 40km from the nearest coast and at over ~324mAOD. 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 The SEPA surface water and small watercourses flood maps indicate narrow corridors at risk of flooding along the watercourses within the vicinity of the platform area, including the Allt a' Bhuachaille, Allt a' Choire Bhuidhe and Allt an Rathain, in both a 1 in 200 year plus climate change and a 1 in 1000 year flood event.

5.2.2 The topography in the vicinity of the substation is such that out-of-bank flows from these watercourses and their tributaries will be routed away from the proposed substation platform, as shown in **Figure 3**.

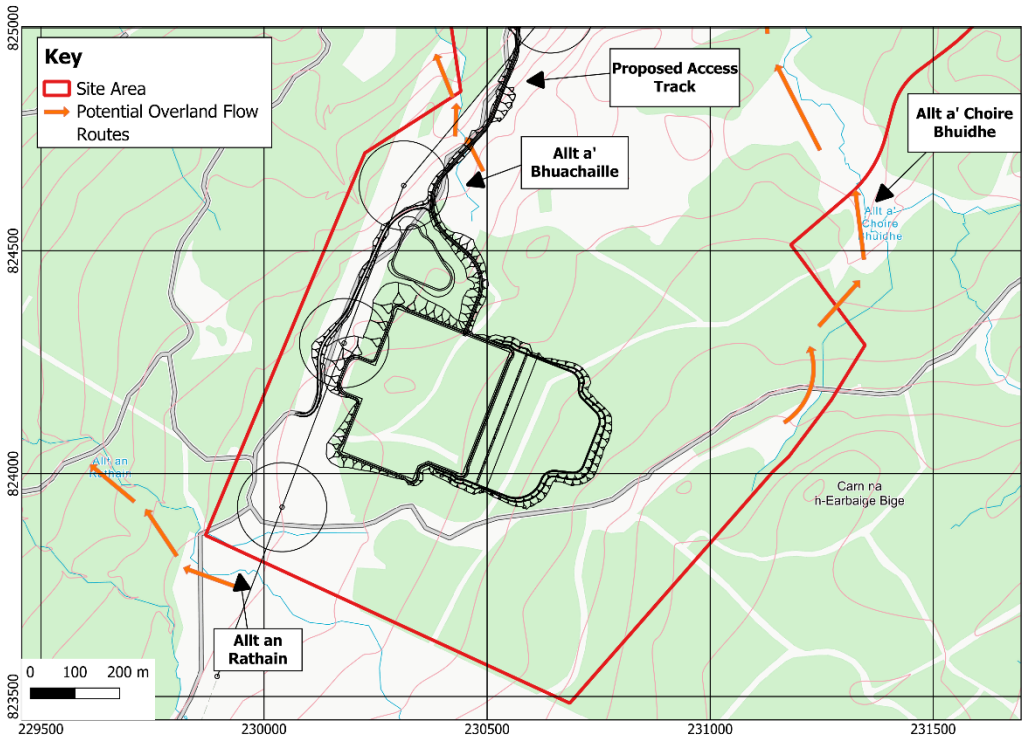


Figure 3: Watercourses Within the Platform Area

Proposed Scenario

5.2.3 The installation of new watercourse crossing structures has the potential to influence the river hydraulics and subsequently the conveyance of water within the channel. Therefore, proposed bridges and culverts have been 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).

5.2.4 A bridge structure will be installed across the Allt a' Bhuachaille, although this will be remote from the platform. The platform will not be affected by these activities.

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 4**, 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 eastern 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 Under existing conditions, SEPA surface water and small watercourses maps indicate the presence of an overland flow route within the footprint of the proposed substation building with flows immediately south east of the existing access track flowing west through the building footprint and over the western access track before diverting north and joining a tributary of the Allt a' Bhuachaille. A second overland flow route is indicated within the northern extent of the proposed building footprint with flows being directed north into the Allt a' Bhuachaille.

5.3.4 Flood risk from this source will be mitigated by installing cut-off ditches along the entirety of the eastern extent of the platform which will intercept and re-direct runoff into the watercourse. Residual risk from this source will be mitigated by providing a levelled development platform and re-profiling ground levels to route flows away from the substation.

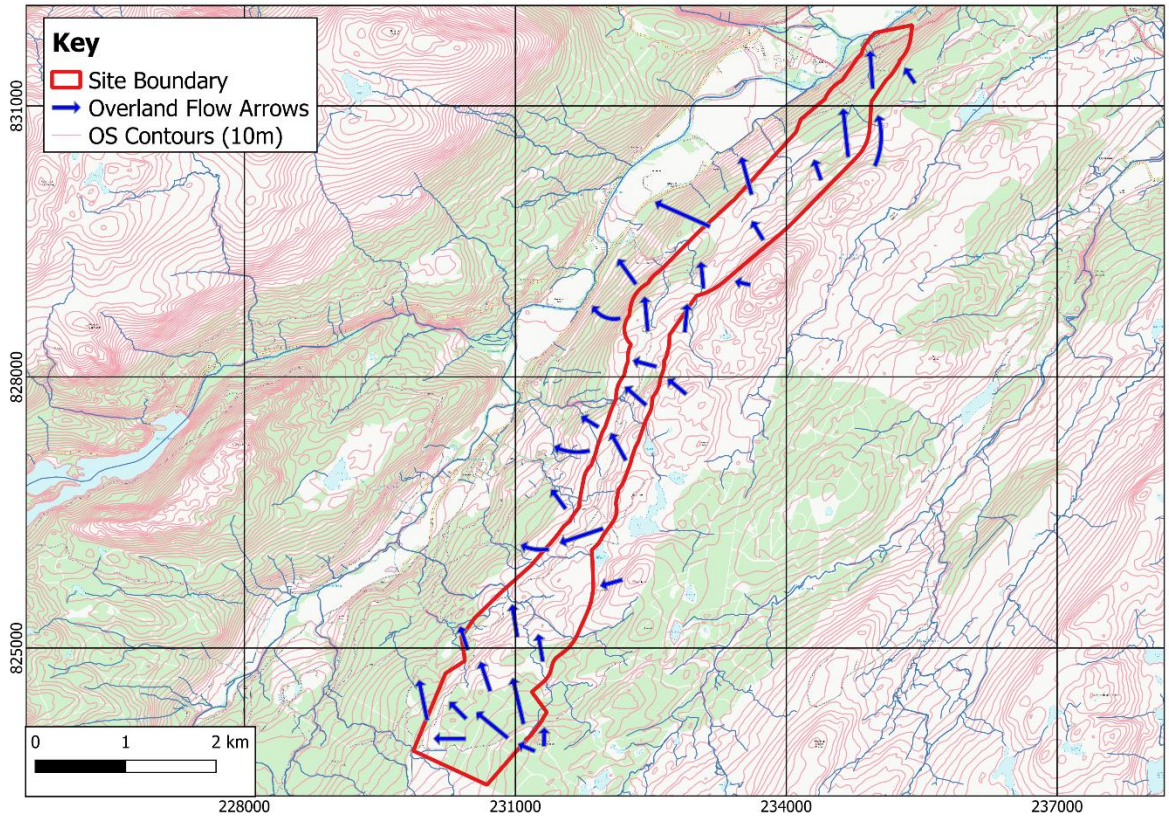


Figure 4: Overland Flow

5.3.5 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).

5.3.6 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 shows that there is no source of flood risk from reservoir failure.

5.4.2 Watercourse Crossing Blockage

Some of the watercourses flowing through the site have existing crossing structures. These include Allt a' Choire Bhuidhe, Allt a' Bhuachaille and Allt an Rathain.

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

5.5 Sewer Flooding

5.5.1 Presently, there is no drainage infrastructure within the site area, 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).

5.5.2 Residual flood risk should be mitigated by profiling ground levels to route flow around and away from the substation platform and other sensitive infrastructure. With this mitigation implemented, the risk of flooding from sewer surcharging is considered to be low.

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. The proposed substation platform is outwith the areas shown to be at risk on this map.

5.6.2 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.

6.1.2 Fluvial flood risk to the site from the small watercourses including Allt a' Bhuachaille, Allt an Rathain and Allt a' Choire Bhuidhe have been assessed. Within the proposed substation platform area, narrow corridors of flooding are shown on the SEPA surface water and small watercourses flood maps along Allt a' Bhuachaille, Allt an Rathain and Allt a' Choire Bhuidhe. The topography in the vicinity of the substation is such that out-of-bank flows from these watercourses and their tributaries will be routed away from the proposed substation platform.

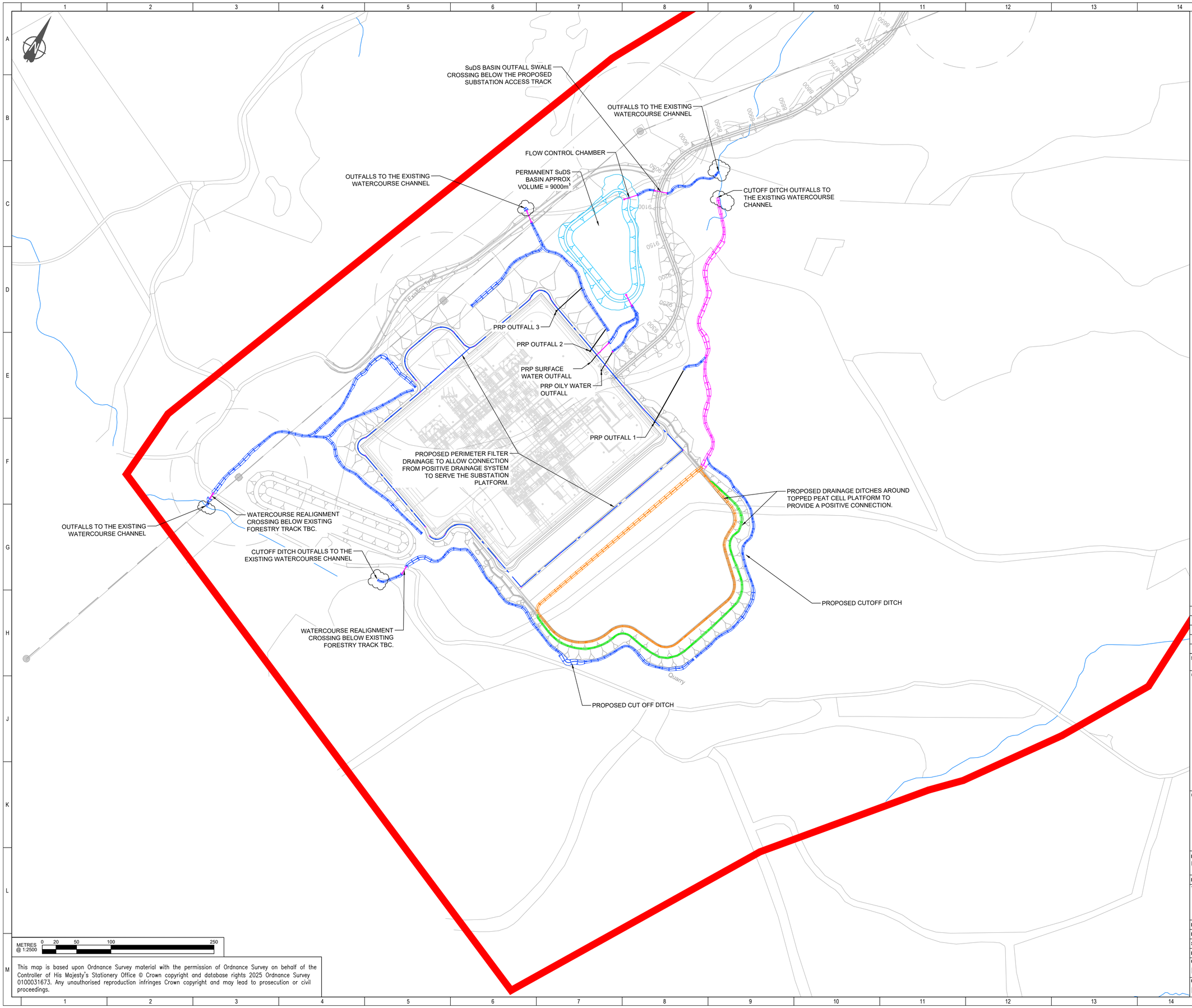
6.1.3 Under existing conditions, SEPA's surface water and small watercourses map indicates the presence of overland flow routes within the northern and southern extents of the proposed platform with flows at the south originating from the higher lying grounds to the south east and flowing west through the building footprint before discharging into an unnamed tributary of the Allt a' Bhuachaille and flows at the northern extent flowing north and over the proposed access track before discharging into the Allt a' Bhuachaille . This will be mitigated by the development proposals which will provide cut-off drainage along the entirety of the eastern extent of the platform, and the proposed substation platform will be levelled.

6.1.4 The proposed development will include a dedicated drainage system designed to appropriate standards and Sustainable Drainage Systems (SuDS). Additionally, ground levels will be profiled to route runoff around and away from the substation platform. With

these measures in place, the risk of surface water flooding within the site is considered to be low.

6.1.5 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. The proposals shown on this drawing have been determined from topographical survey information provided by others
2. Site layout based on drawing Fasnakyle - Site D alternative Siemens BAM layout
3. Substation layout based on S345-SEL-V00-XX-M3-C-5001.rvt.
4. Design proposals shown are preliminary and subject to detailed design.
5. All dimensions in mm unless stated otherwise.
6. Refer to design decision log for assumptions associated with proposed design.
7. Tie-in locations to existing watercourse channels to be confirmed.
8. The contractor shall check all dimensions on site and report any difference to the designer.
9. All levels are in metres (m) above ordnance datum unless stated otherwise.
10. Services to be confirmed to allow for co-ordination.
11. Existing drainage unknown and to be confirmed.
12. Site constraints from underground HV cables and access to OHL to be confirmed
13. Refer to drawings - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0151, BING4-LT521-SEBAM-DRAI-ZZ-D-C-0152 & BING4-LT521-SEBAM-DRAI-ZZ-D-C-0153 for access track drainage design
14. Temporary drainage not shown for clarity. Please refer to drawing - BING4-LT521-SEBAM-DRAI-ZZ-D-C-0195

LEGEND:

- Proposed Ditch - Type A
- Proposed Ditch - Type B
- Proposed Swale - Type C (700x700 min)
- Proposed Swale Type D (500x500 min)
- Filter Drain
- Pipe/Culvert
- Suds Basin
- Chamber
- Headwall
- Existing ditch / watercourse

METRES @ 1:2500 0 20 50 100 250

REV:	DATE:	DRWN:	CHKD:	APPVD:	DESCRIPTION:
P02	28/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING
P01	23/10/25	CMcL	RD	RJM	ISSUED FOR PLANNING

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 PERMANENT DRAINAGE LAYOUT - SUBSTATION

DRAWN:	C.McLaughlin	ENG CHECK:	R.Duncan
DESIGNER:	A.Peters	COORDINATION:	R.Duncan
SCALE :	1:2500	APPROVED:	R.Minto
DATE OF FIRST ISSUE:	04/02/2025	SECURITY:	

ORIGINATOR DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0190 | SHEET No: 1 of 1

CLIENT DRAWING NUMBER: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0190 | REV. No: P02