LT521 Bingally 400kV Substation

Drainage Strategy Report: Access Track

BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0004

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1.0 INTRODUCTION

1.0 General

1.0.1 Fairhurst has been appointed by BAM to prepare a Drainage Strategy Report for the Bingally 400kV substation and access track in the Scottish Highlands. The site is part of Scottish and Southern Electricity Networks (SSEN) £7bn upgrade of their onshore electricity transmission infrastructure.

1.0.2 The development forms part of a proposed 400kV upgrade from the existing 275kV network between Beauly and Denny. The proposed substation and access track at Bingally forms part of this network route.

1.0.3 This report outlines the drainage strategy for the proposed access track to the Bingally substation, to support the planning application for the proposed electrical substation at Bingally.

1.0.4 This report also outlines the strategy associated with required crossings of existing water features and the required realignments along the track.

1.0.5 Please refer to BING4-LT521-SEBAM-DRAI-ZZ-RPT-C-0001 for the Bingally Drainage Strategy for the Substation.

1.1 Site Location

1.1.1 The proposed Bingally site is located to the east of the villages of Tomich and Cannich. The proposed access track is approximately 9.5 km long with the main access to the site from the A831, located approximately 1.5km northeast of Cannich. The site is situated within The Highland Council area. Refer to **Figure 1** for an indicative site location plan.

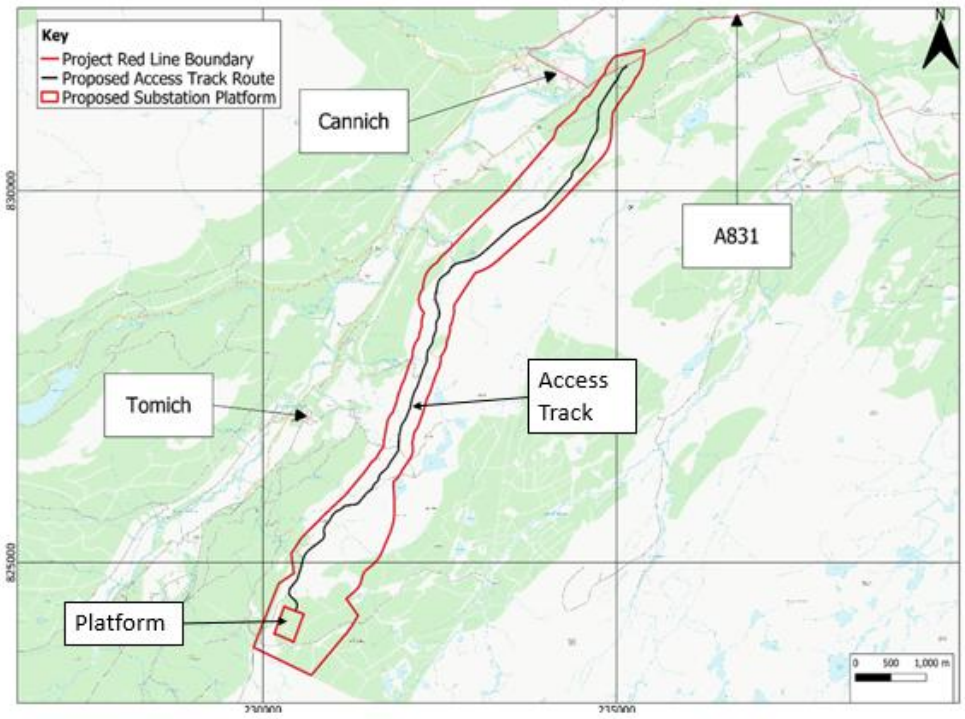


Figure 1: Indicative Site Location

1.1.2 The area within the red line boundary is approximately 619 Ha. The proposed access track will extend approximately 9.5km in length from the proposed entrance to the site (A831) to the proposed substation. The proposed substation will cover an area of approximately 11.5 Ha.

1.2 Design Considerations

1.2.1 This report will provide an outline strategy for the proposed surface water drainage design across the Bingally access track. In addition to this, proposals for any required drainage or water channel crossings and associated realignments of existing watercourse channels will be considered.

1.2.2 Refer to **Section 5** for the design strategy, philosophy, specification and requirements that the proposed Drainage Strategy adheres to.

1.3 Drainage Assumptions to the Access Tracks

1.3.1 The drainage design for the access track has been based on the earthwork extents of the proposed road model. Cut-off ditches are proposed where required, redirecting overland flows to natural channels. Swales have been designed to follow the natural topography of the area and convey the access track surface water run-off.

1.3.2 The design of the access track drainage has been carried out in accordance with the guidelines provided by Forestry and Land Scotland (FLS) for the purpose of adoption by the relevant authority.

2.0 EXISTING SITE DESCRIPTION

2.0 Existing Site Description

2.0.1 The current site is located in an area of moor and woodland with areas of boggy land and peat. In June 2023 a wildfire burned through an estimated 80km² of the surrounding area. This resulted in a large section of woodland being burned down or the charred remains being felled. The remnants of the fire can still be seen on site as scorched earth and burnt wooden embers.

2.0.2 The existing access to the proposed substation area is via forestry tracks originating from the village of Tomich. Several tracks lead to either the north or the south side of the proposed substation area.

2.0.3 Multiple unbound access tracks are situated throughout the site, extending in numerous different directions. However, there are currently no uninterrupted access provisions to the proposed substation site from the A831.

2.0.4 There are no existing residential dwellings or farm buildings within the site boundary.

2.0.5 For details on the proposed red line boundary and existing site, refer to **Appendix 1**.

2.1 Site Topography

2.1.1 The topography along the access track within the redline boundary varies in direction and gradient. The existing ground levels generally rises from north to south with a varying range of heights from the natural landscape over the approximate 9.5 km.

2.2 Ground Conditions

2.2.1 Ground investigation information has been taken from the *Fairhurst – Geo-environmental Desk Study Report (Doc no. BING4-LT521-SEBAM-EWKS-ZZ-RPT-G-0601).* The present site is a mixture of woodland area, boggy land, numerous watercourses, peat, and rock.

2.2.2 It should be noted that ground investigations are ongoing for the proposed access track. Additional information will be available before detailed design, which will be reviewed when available.

Peat

2.2.3 Peat can be found over a large percentage of the proposed site. Recent ground investigations have shown that the peat reaches thicknesses of up to 7m. Further investigation is required but, it is likely that areas containing peat will require removal and replacement with suitable fill below proposed structures.

2.2.4 Areas where peat does not require removal should be left in-tact. Due to the possibility of removal leading to the release of carbon into the atmosphere, peat should only be removed if there are no suitable alternatives.

Groundwater

2.2.5 Groundwater is present at shallow levels on site. Due to the shallow depths of the groundwater, careful management will be required during the construction phase (particularly with any excavations) with long term management plans required for the post-construction phase.

2.3 Flood Risk

2.3.1 SEPA Flood Maps indicate that there is no risk of fluvial flooding at the proposed substation development location. However, there are some specific areas where minor surface water (pluvial) flooding may occur.

2.3.2 As part of the scheme, a Flood Risk Assessment (FRA) and Drainage Impact Assessment (DIA) will be conducted and provide comprehensive details on the flood risk across the site, and its impact.

2.4 Utilities

2.4.1 No private water supplies or foul water systems are recorded along the line of the access track and surrounding area, within the redline boundary. It is also assumed that any underground cables associated with the transmission line will run in parallel to the transmission overhead structures.

2.4.2 A proposed electrical and fibre optic cable will be buried below the planned access track from Fasnakyle Electricity Distribution Station. The construction of this utility will be overseen by the project manager and construction manager. **Figure 2** below illustrates the path of the transmission overhead line and its location within the proposed platform area.

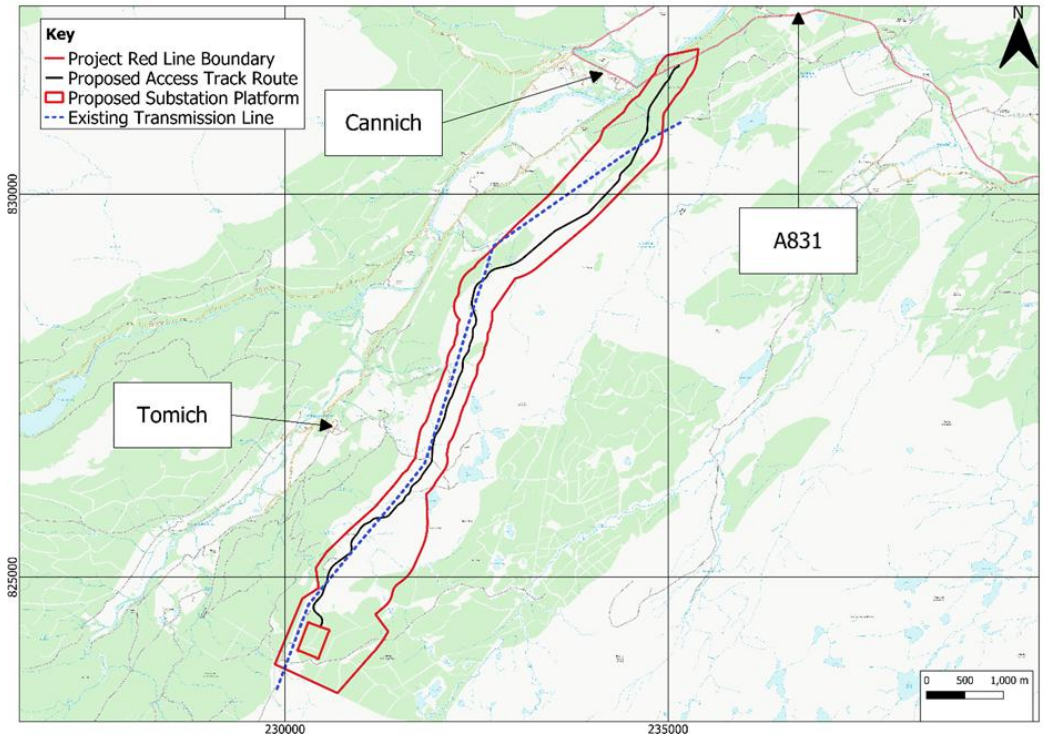


Figure 2: Plan of existing transmission line

2.4.3 During both the planning and construction phases, the proximity of the overhead lines to the platform must be taken into consideration. *Health and Safety Executive guidance note GS6: Avoiding danger from overhead power lines* must be followed during the planning and construction phases.

3.0 EXISTING WATERCOURSES AND DRAINAGE FEATURES

3.0 Watercourses

3.0.1 While numerous watercourses, small tributaries, and naturally formed ditches and channels exist within the site boundary, ten watercourse channels have been impacted. This necessitates the need for designed crossings for the proposed road design.

3.0.2 Due to the extensive area of the site and numerous informal surface water drainage channels in the region, there may be further drainage paths which may not have been identified using OS maps or visual inspection. It also should be noted that a range of tributaries are not visible on the 1:50,000 scale OS maps. A detailed investigation of the site is required before detailed design.

3.0.3 The nearest major watercourse is the northeast flowing River Glass which is 1.5km from the main site boundary and runs parallel to the proposed access track. It is fed by Abhain Deabhag which receives tributaries draining from the main site and the southern end of the access track.

3.0.4 The watercourses identified from the 1:50,000 scale OS mapping impacted by the proposed access track are included in Table 1.

Table 1: Existing Watercourses Crossing the Proposed Access Track

Approximate Chainage	Watercourse Name
0360	Unnamed channel
0850	Kerrow Burn
3580	Allt Baile na h-Aibhne
3870	Unnamed Tributary of Allt Baile na h-Aibhne
5370	Allt Currachan
6350	Unnamed Tributary of Abhainn Deabhag
7200	Allt an Fhasaich Mhoir
8000	Allt Bail a' Chladaich
8070	Allt a' Bhuachaille
9020	Unnamed Tributary of Allt a' Bhuachaille

3.0.5 A hydroelectric scheme and public water abstraction is located on Allt Currachan, downstream of the location of where the channel crosses the proposed access track. A further hydroelectric scheme can be found downstream of the track crossing point at the Allt Baile na h-Aibhne.

3.0.6 Due to the extensive area and numerous informal surface water drainage channels in the region and surrounding the site, there may be further drainage paths within the access track area which have not been identified using OS maps or visual inspection. It should be noted that a range of tributaries are not visible on the 1:50,000 scale OS maps and some

which are noted at a 1:50,000 scale may be smaller than anticipated. A detailed investigation of the site is required prior to detailed design.

3.1 Drainage Features

3.1.1 Multiple land ditches can be seen throughout site, and are in mainly rectangular form. Outfalls from these ditches could not be located whilst on site.

3.1.2 Due to the extensiveness of the site, further investigation would be required to confirm the location and details of all culverts on site prior to detailed design.

4.0 PROPOSED DEVELOPMENT

4.0 Proposed Access Tracks

4.0.1 The site will be accessed from the A831 northeast of the village of Cannich. The proposed access track is approximately 9.5km in length from the proposed entrance (A831) to the proposed substation.

4.0.2 The proposed access track will incorporate new junctions along its length with existing intersecting tracks to provide access around the site.

4.0.3 It is assumed that where the gradient exceeds 8%, the access track will have a sealed surface in accordance with SSE Specification. Gradients < 8% will have an unsealed surface. SSEN specifications state that unbound material Type 2 sub-base is used. This will be confirmed by the contractor.

4.0.4 The proposed access track is proposed to be predominantly adoptable by Forestry and Land Scotland (FLS).

5.0 PROPOSED DRAINAGE: STRATEGY

5.0 Drainage Strategy

5.0.1 The principles of the drainage strategy for the new 400kV substation at Bingally in the Highlands will be to replicate the existing quality and quantities of run-off presently at the site wherever it is reasonable and practical to do so. All post development run-off shall also be dispersed in accordance with local authority guidelines (The Highland Council), SEPA guidelines, and SSEN Specifications (*SSEN Drainage Specifications: Document SP-NET-CIV-502*).

5.1 Drainage Strategy Contents

5.1.1 The drainage strategy will cover the following:

- Natural run-off collection and diversion (where required);
- Surface water run-off drainage collection and routing; and
- SuDS treatment and attenuation.

5.1.2 The permanent drainage for the access track has been designed for adoption by FLS. It is assumed all the road run-off will fall to swales via channels/ ditches discharging to the west of the road prior to discharging to the natural environment.

5.2 Design Philosophy

5.2.1 In addition to SSEN Drainage Specification and Local Authority guidelines, the proposed surface water design has been designed follow the philosophy detailed in *CIRIA: The SuDS Manual C753* wherever possible. The manual states:

- Wherever possible, runoff should be managed at source (i.e. close to where the rain falls) with residual flows then conveyed downstream to further storage or treatment components where required.
- The passage of water between individual components should be through the use of above ground conveyance systems (e.g. swales and rills).
- Pipework may be a more suitable option depending on the specific scheme, especially where space is limited.
- Pre-treatment (the removal of litter and sediment) and maintenance are vital to ensure the long-term and sustained effectiveness of all SuDS components.
- Overland flow routes may also be required to convey and control floodwater safely during extreme events.

5.3 Design Specifications and Requirements

5.3.1 The design shall adhere to the relevant SSEN specifications to meet the client's requirements. These specifications are listed below:

- SP-NET-CIV-502 – Drainage Specification
- SP-NET-CIV-503 – Pavements and Roadways

5.3.2 The following publications have also been considered in design decisions in accordance to SSEN SP-NET-CIV-005 – Drainage Specification:

- CIRIA: The SuDS Manual C753
- The Highland Council: Flood Risk & Drainage Impact, Supplementary Guidance
- SEPA: Scottish Flood Hazard and Risk Information
- Forestry and Land Scotland Civil Engineering Handbook 3rd Edition
- SUDSWP: Water Assessment and Drainage Assessment Guide

5.3.3 The SSEN Drainage Specification, document number SP-NET-CIV-502, states the following with regards to design requirements:

5.3.4 "The strategy shall identify the levels of flood protection for the site. As a minimum these shall include:

- *1 in 200 year rainfall period protection for operational areas*
- *1 in 1000 year rainfall return period protection for critical equipment*
- *1 in 200 year rainfall return period for off-site flooding"*

5.3.5 SSEN specifications state that both the platform and access road should be considered operational areas.

5.3.6 Highland Council flood risk guidance states that "in line with SPP, all new developments need to be free from unacceptable flood risk for all flood events up to the 1 in 200-year return period (including an allowance for climate change). And that the post-development runoff rates do not exceed the pre-development runoff rate and volume for a previously undeveloped site."

5.3.7 The Highland Council flood risk and drainage guidance states that "formal on-site storage should be provided up to the 1 in 30-year return period event and attenuation measures should be designed such that SuDS features will not surcharge during a 30-year return period rainfall event." However, the drainage design has accommodated on-site storage of up to and including the 1 in 200-year return period storm with a discharge rate equivalent to the 1 in 2-year return period, to accommodate SSE Specifications.

5.3.8 Climate change allowances have been added when considering the proposed surface water drainage design within the development site. The *SEPA climate change allowances for flood risk assessment in land use planning, version 4, Table 2* recommends a 42% uplift for rainfall data at Bingally, which falls within the North Highland basin region. This climate change allowance shall be considered during surface water drainage design as required by SEPA guidelines.

5.4 Outfall Options

5.4.1 The options available for discharging surface water are recommended by *CIRIA: The SuDS Manual C753* hierarchy. The hierarchy with relevant site considerations are summarised in **Table 2**:

Table 2: CIRIA: The SuDS Manual C753 Outfall Hierarchy

Outfall Method	Suitability	Comments
Infiltrate run-off back into the ground.	Suitability is not known at this time as no infiltration test have been completed.	Conclusive infiltration tests are required prior to confirming if this option is available at the Bingally development site.
Discharge run-off to watercourse	There are a number of watercourses located across the site. Based on the proposed surface water design and development levels, outfalls can be achieved to nearby watercourses following suitable approvals.	A number of outfalls may be required to allow for this option, along with confirmation of levels detailed design stages.
Discharge run-off to surface or combined sewers.	There are no known Scottish Water sewers at the site location so there could be no discharge to a sewer network.	Not feasible.
Discharge run-off into existing water features such as ponds.	Further investigations and agreements would be required to consider this outfall option.	Not feasible.

6.0 DRAINAGE STRATEGY: PERMANENT DRAINAGE DESIGN

6.0 Specifications

6.0.1 The SuDS and attenuation system on site had been designed in accordance with:

- SSEN Drainage Specification document SP-NET-CIV-502.
- CIRIA: The SuDS Manual C753
- Highlands & Argyll Local Flood Risk Management Plan

6.1 Simple Index Analysis (SIA) Tool

6.1.1 All proposed SuDS schemes are designed in compliance with *CIRIA: The SuDS Manual C753*. The Simple Index Analysis (SIA) Tool has been developed by SEPA to assess the suitability of proposed SuDS components at a development and to minimise any risks to the water quality of any receiving waterbodies.

6.1.2 Outputs from the SIA study for the proposed access track are summarised below.

Table 3: SIA Tool Summary Table – Access track

Run-off area land-use description	**Platform: Low Trafficked Roads**			
Pollution hazard indices:	Hazard Level	Suspended Solids	Metals	Hydrocarbons
	Low	0.5	0.4	0.4
Pollution mitigation indices (Swale):		0.5	0.6	0.6
Total mitigation Index:		0.5	0.6	0.6
Sufficiency:		Sufficient	Sufficient	Sufficient

6.1.3 **Table 3** above shows that sufficient treatment has been proposed for the substation access track.

6.2 SuDS

6.2.1 Overland flow and excess surface water flow from the proposed access track will be collected by swales and ditches at the extents of the earthworks, and discharged to the natural surroundings, before discharging to the nearby watercourses.

6.2.2 In accordance with the guidelines, the SuDS have been designed for surface water run-off for up to a 1:200-year return period with the inclusion of an additional 42% climate change allowance in line with SEPA recommendations.

6.2.3 The proposed access track drainage incorporates collection ditches along sections in cutting that direct surface water runoff to swales at the toe of the embankment where treatment and attenuation shall be provided.

6.2.4 See **Appendix 2** for the Proposed Drainage Layout.

6.3 Discharge of Surface Water

6.3.1 Where possible, surface water runoff is collected and discharged to nearby watercourses.

6.3.2 Where required, the discharge of the surface water will be directed to a natural low point, where it will disperse naturally overland, away from the proposed access track.

7.0 DRAINAGE STRATEGY: TEMPORARY DRAINAGE DESIGN

7.0 Temporary Drainage

7.0.1 The temporary drainage of the proposed access track will utilise the permanent drainage design for treatment during the track construction.

7.0.2 The Contractor as part of their construction surface water runoff strategy will put additional measures into place to remove sediment and pollution from the surface water runoff.

7.0.3 Refer to **Appendix 2** for proposed temporary drainage details.

8.0 DRAINAGE STRATEGY: CHANNEL CROSSINGS AND REALIGNMENTS

8.0 Channel Crossings

8.0.1 In 10 no. locations along the extent of the proposed access track, watercourses visible on the OS 1:50,000 scale map will be impacted by the proposed access track design. In these locations, suitably designed crossings will be required.

8.0.2 Where possible, bridge crossings will be provided to provide a clear span over the existing watercourse channel. Where this is not possible, culvert crossings and watercourse realignments will be proposed, whilst still aiming to provide the least impactful solution to the existing site and water environment by minimising culvert length and maximising open channel length.

8.0.3 The modelling of watercourse crossing capacities has been assessed using the following software, methods and data:

- Flood Estimation Handbook (FEH) method to determine the rainfall data for the region.
- ReFH2 software to model flows in the region to the appropriate storm events.
- LIDAR data to determine rainfall flow paths (where available).
- QGIS software to determine the catchment area size in km² for each crossing.
- HY8 culvert analysis software to determine capacities of crossings with freeboard limits applied.

8.0.4 Where culverts crossings and realignments are considered as required under the Bingally access track, the channel crossings have been sized to convey the 1 in 200-year return period peak flow with an allowance for freeboard through the culvert in accordance with *CIRIA Report C786: Culvert, screen and outfall manual*. A sensitivity check has been undertaken to assess the culvert against the 1 in 200-year flow peak flow plus an allowance for climate change to check the freeboard of the inlet headwater level to the finished access track level to make sure that the access track is not overtopped and remains accessible as an ‘operational’ area.

8.0.5 In accordance with *CIRIA Report C786: Culvert, screen and outfall manual* watercourse crossings will include an allowable bed material depth and freeboard allowance. The depths of both vary depending on the diameter/height of the proposed crossing.

8.1 Channel Realignments

8.1.1 The realignment of existing watercourses have been designed to allow for the proposed substation access track realignment, where required.

8.1.2 During the design considerations for channel realignments, any activities proposed within the site that may affect the natural environment, including channels, may require a *Water Environment (Controlled Activities) (Scotland) Regulations (CAR)* application to SEPA.

8.1.3 Channels that require realignment have been designed to accommodate a 1 in 200-year flow. The channel's calculations are based on the Manning's equation for a trapezoidal cross-section:

$$Q = v*A = (1/n)*A*R^(2/3)*S^(1/2)$$

8.1.4 Where:

- Manning's 'n' = 0.05 for a natural stream/stony channel for diverted channels
- S = Average channel slope based on the gradient between the channel tie-in level and the channel bed level
- R = Hydraulic radius (m), which is equal to the Flow Area / Wetted Perimeter
- A = Flow area (m^2)

8.1.5 Channel side slope gradients have been proposed as 1 in 3, but geotechnical advice will be needed to confirm this at detailed design stage. The bed widths of the channel have been proposed as 0.6m and will be confirmed at detailed design stage. With confirmation of additional details, the channel can be adjusted to complement the natural settings.

8.1.6 The typology of the channels has been taken into consideration during the design, providing sinuosity to the channels to allow for naturalisation of the channels.

8.1.7 The design has implemented the typology for the catchment setting and channel average bed slope based on the table provided in *Buffington and Montgomery (2013) - Geomorphic Classification of rivers in Scroder J., Wohl E. (eds) Treatise on Geomorphology, Vol9, Academic Press, San Diego CA, pages 730-767*. See extract of the table below.

Table 4: Extract from Buffington and Montgomery (2013)

Type	Slope (%)	Slope (1:X)
Cascade	>7.5%	>1:13
Step pool	3% – 7.5% Or 2% – 3% (>150W/m^2 in 1:2 year event)	1:33 – 1:13 Or 1:50 - 1:33 (>150W/m^2 in 1:2 year event)
Plane bed	1% – 2% Or 2% – 3% (<150W/m^2 in 1:2 year event)	1:100 – 1:50 Or 1:50 – 1:33(<150W/m^2 in 1:2 year event)
Plane riffle	0.5% - 1%	1:200 – 1:100
Pool riffle	0.2% - 0.5%	1:500 – 1:200
Low gradient passive meandering (dune-ripple bed)	<0.2%	<1:500

8.1.8 Channel realignments have been designed to accommodate a 1 in 200-year return period.

8.1.9 Sustainable and ecological material choices shall be specified at detailed design stages where possible, once further investigations of the existing watercourse are carried out.

8.1.10 Please refer to BING4-LT451-SEBAM-DRAI-ZZ-RPT-C-0005 *Drainage Impact Assessment: Access Track* for further details on the proposed channel crossings.

9.0 DRAINAGE STRATEGY: GROUNDWATER

9.0.1 *SEPA Flood Maps* indicate areas where groundwater could influence the duration and extent of flooding from other sources. The proposed site is situated outwith the groundwater influenced flood extent shown on these maps with the exception of the northern end of the proposed track where it approaches the A831.

9.0.2 The 1:50,000 British Geological Society (BGS) digital mapping shows that the site is underlain by sedimentary bedrock, comprising the Tarvie Psammite Formation. The BGS 1:625,000 hydrogeology map classifies this as a low productivity aquifer with small amounts of flow occurring predominantly through near surface fractures and discontinuities.

9.0.3 The BGS identifies that superficial deposits across the site, where present, are predominantly Glacial Till. Glacial Till is more prevalent in the southern half of the site. Overlying both bedrock and Glacial Till are pockets and areas of Peat.

9.0.4 It should be noted that ground investigations are ongoing for the proposed access track. Additional information will be available to inform the detailed design, and reviewed when available.

9.0.5 Considerations for groundwater as part of the surface water drainage design are to be finalised upon completion of ground investigations on site. When available, any significant ground water seepage rates from earthworks cut slopes shall be considered as part of the Drainage Strategy if required.

9.0.6 Please refer to Geo-Environmental Report No. BING4-LT521-SEBAM-ZZ-ZZ-RPT-G-0001 for details on potential for groundwater flooding.

9.1 Design Considerations

9.1.1 Groundwater has been observed to be shallow at the proposed substation site and throughout the site. Due to the shallow groundwater depths, careful management will be required to ensure excavation stability during construction and also in the long-term, e.g. culvert operation, slope stability and any groundwater changes which may cause flooding or dewatering of localised peat.

9.1.2 Ongoing ground investigation results will be reviewed once available against the proposed design.

10.0 MAINTENANCE SCHEDULE

10.0.1 All surface water drainage features will require regular maintenance to ensure the features can maintain their drainage capabilities. The frequency of a maintenance schedule varies depending on the feature and can become less regular over time again, depending on the feature type. *CIRIA: The SuDS Manual C753* provides recommended maintenance requirements, which is summarised below.

10.1 Swales/Ditches

Table 5: Maintenance Schedule, Swales/ Ditches, CIRIA: The SuDS Manual C753

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect inlets/outlets and overflows for blockages and clear if required	Monthly
	Litter and debris removal	Monthly/as required
	Grass cutting – to retain grass height within specified design range.	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants	Monthly at start then as required
	Inspect infiltration surfaces for ponding, compaction & silt accumulation. Record areas where ponding occurs for >48 hours.	Monthly/as required
	Inspect vegetation coverage	Monthly for 6 months then quarterly for 2 years then half yearly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Bi-annually
Occasional Maintenance	Reseed areas of poor vegetation growth and alter plant types to better suit conditions if required	As required of if bare soil is exposed over 10% or more of swale treatment area.
Remedial Maintenance	Repair erosion or other damage by re-turfing or re-seeding.	As required
	Re-level uneven surfaces and reinstate design levels.	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required
	Remove and dispose of oil or petrol residues using safe standard practices	As required

11.0 CONCLUSION

11.0.1 This drainage strategy report shows the proposed drainage infrastructure and the methodology behind the designs for the proposed access track to the proposed Bingally 400kV Substation. Design parameters have also been included in this report and appropriate guidelines have been observed in order to influence the design process.

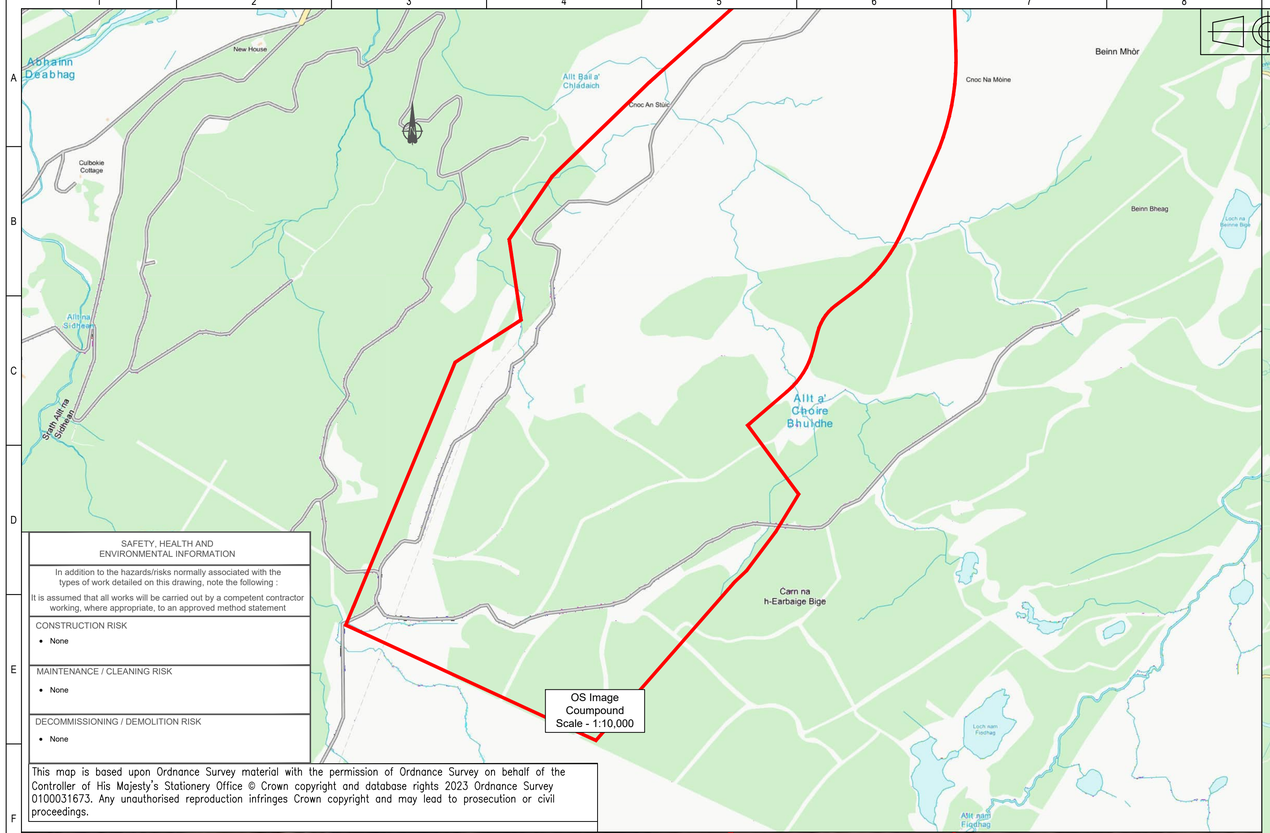
11.0.2 Fairhurst are responsible for all surface water drainage proposals to the proposed access track.

11.0.3 The proposed permanent surface water drainage has been designed in accordance with The Highland Council, SEPA, CIRIA and SSE guidance. Greenfield runoff rates and attenuation volumes are to be stored up to and including the 1 in 200-year return event storm. This has contributed to the SuDS design throughout the scheme. Swales/ ditches shall convey surface water, and discharge treated surface water run-off into the existing channels / drainage ditches across the site.

11.0.4 The temporary surface water design has also been considered. It is proposed that the temporary drainage during construction will utilise the swales and ditches prior to discharging to the natural environment.

11.0.5 The upgraded forestry track has been designed connecting the A831 to the proposed new substation platform. Along the proposed route of the access track, several channel realignments to the existing channels have been designed to accommodate the realigned forestry track. This has been designed with current best practice, and shall include sinuosity where possible, and aim to keep natural gradients as close to the existing channel.

Appendix 1 Existing Site Layout



OS Image
Coumpound
Scale - 1:10,000

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

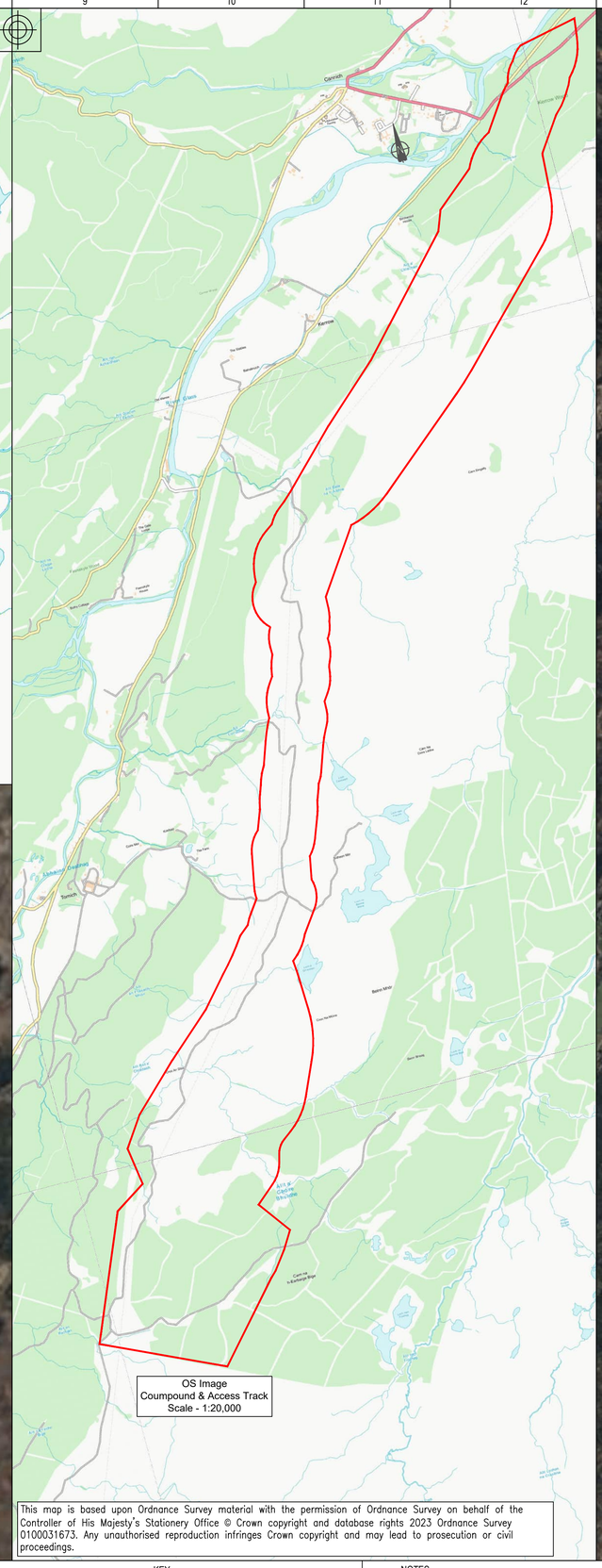
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

CONSTRUCTION RISK
- None

MAINTENANCE / CLEANING RISK
- None

DECOMMISSIONING / DEMOLITION RISK
- None

Aerial View
Coumpound
Scale - 1:10,000



OS Image
Coumpound & Access Track
Scale - 1:20,000

Aerial View
Coumpound & Access Track
Scale - 1:20,000

KEY
PROPOSED RED LINE BOUNDARY

NOTES
1. THE PROPOSALS SHOWN ON THIS DRAWING HAVE BEEN DETERMINED FROM TOPOGRAPHICAL SURVEY INFORMATION PROVIDED BY OTHERS
2. SITE LAYOUT BASED ON DRAWING 231204 SB Layout with additional land take
3. DESIGN PROPOSALS SHOWN ARE PRELIMINARY AND SUBJECT TO DETAILED DESIGN.

DRAWING STATUS: ISSUED	REVISION:	P02
	DRAWN: RG	23/02/24
	CHECKED: GI	23/02/24
	APPROVED: CG	23/02/24

PROJECT REF:
FIRST ISSUE
P02 - 23/02/2024 BOUNDARY AMENDED

Customer: Scottish & Southern Electricity Networks TRANSMISSION

Contractor: SIEMENS energy + bam
Joint Venture
Substation Delivery Framework

Subcon. Drawing No.: LT521-SEBAM-ZZ-ZZ-D-C-0102

Project: BINGALLY 400kv SUBSTATION

Title: LT521 - BINGALLY 400kv SUBSTATION
REFERENCE LOCATION PLAN

Contractor Drawing No.: BING4-LT521-SEBAM-ZZ-ZZ-D-C-0102

Customer Drawing No.: BING4-LT521-SEBAM-ZZ-ZZ-D-C-0102

Designed	Drawn	Checked	Approved	Date	Scale	Size	Sheet	Revision
RG	AC	FF	CG	08/01/2024	AS SHOWN	A1	1 of 1	P02

Appendix 2 Proposed Drainage Drawings

OUTFALL TO OVERLAND FLOW DISPERSAL
OUTFALL TO WATERCOURSE
DRAINAGE CULVERT
WATERCOURSE BRIDGE
TRACK SIDE DRAINAGE DITCH OUTFALL
TRACKSIDE DRAINAGE DITCH OUTFALL

NOTES
1. DITCH DIMENSIONS ARE PRELIMINARY ONLY AND TO BE FINALISED AT DETAILED DESIGN UPON COORDINATION WITH EARTHWORKS AND CULVERT DESIGNS
2. DITCH SIZES REFER TO CAPACITY REQUIREMENTS ONLY. ADDITIONAL CUT AND FILL MAY BE REQUIRED TO GRADE EXISTING GROUND.
3. SETTLEMENT LAGOONS SHOWN TO NOT INCLUDE EARTHWORKS EXTENTS.
4. DURING CONSTRUCTION PARTICULAR CARE IS TO BE TAKEN BY THE CONTRACTOR TO ENSURE THAT THE MINIMUM AMOUNT OF DAMAGE AND DISTURBANCE TO LAND DRAINS AND DITCHES ARE CAUSED. THE CONTRACTOR WILL INVESTIGATE, DESIGN, INSTALL, REPAIR AND MAINTAIN ALL LAND DRAINS THAT ARE AFFECTED BY THE WORKS AS PER THE CIVIL SCOPE OF WORKS.
5. COORDINATION OF DRAINAGE DESIGN AND CABLE COORDINATES TO BE CONFIRMED.

LEGEND:
- TYPE A OR TYPE B HIGHSIDE DITCH
- SWALE
- DRAINAGE DITCH (PERMANENT TRACK)
- DRAINAGE CULVERT
- WATERCOURSE BRIDGE
- WATERCOURSE CULVERT

METRES @ 1:2500 — 0 20 50 100 250

DRAWING STATUS: S5											
ISSUED FOR FINAL REVIEW	REVISION:	P01		PROJECT REF: BING4-LT521	ISSUED FOR FINAL REVIEW	P02		PROJECT REF: BING4-LT521	ISSUED FOR FINAL REVIEW	P03		PROJECT REF: BING4-LT521	ISSUED FOR FINAL REVIEW
	DRAWN:	J.PETRIE	08/11/2024			J.PETRIE	23/10/2025			J.PETRIE	28/10/2025		
	CHECKED:	R.DUNCAN	08/11/2024			R.DUNCAN	23/10/2025			R.DUNCAN	28/10/2025		
	APPROVED:	R.MINTO	08/11/2024			R.MINTO	23/10/2025			R.MINTO	28/10/2025		

Customer: Scottish & Southern Electricity Networks TRANSMISSION

Contractor: SIEMENS energy + bam — Joint Venture Substation Delivery Framework

Subcon. Drawing No.: FAIRHURST — BING4-LT521-SEBAM-DRAI-ZZ-D-C-0191

Project: BINGALLY 400kV SUBSTATION

Title: LT521 - BINGALLY
ENGINEERING DRAWINGS
PROPOSED TRACK DRAINAGE LAYOUT SHEET 1

Contractor Drawing No.: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0191

Customer Drawing No.: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0191

Designed	Drawn	Checked	Approved	Date	Scale	Size	Sheet	Revision
J.PETRIE	S.MITCHELL	J.PETRIE	R.MINTO	03/09/2024	1:2500	A1	1 of 3	P03

OUTFALL TO OVERLAND FLOW DISPERSAL
OUTFALL TO WATERCOURSE
TRACK SIDE DRAINAGE DITCH OUTFALL
DRAINAGE CULVERT
WATERCOURSE BRIDGE

NOTES
1. DITCH DIMENSIONS ARE PRELIMINARY ONLY AND TO BE FINALISED AT DETAILED DESIGN UPON COORDINATION WITH EARTHWORKS AND CULVERT DESIGNS
2. DITCH SIZES REFER TO CAPACITY REQUIREMENTS ONLY. ADDITIONAL CUT AND FILL MAY BE REQUIRED TO GRADE EXISTING GROUND.
3. SETTLEMENT LAGOONS SHOWN TO NOT INCLUDE EARTHWORKS EXTENTS.
4. DURING CONSTRUCTION PARTICULAR CARE IS TO BE TAKEN BY THE CONTRACTOR TO ENSURE THAT THE MINIMUM AMOUNT OF DAMAGE AND DISTURBANCE TO LAND DRAINS AND DITCHES ARE CAUSED. THE CONTRACTOR WILL INVESTIGATE, DESIGN, INSTALL, REPAIR AND MAINTAIN ALL LAND DRAINS THAT ARE AFFECTED BY THE WORKS AS PER THE CIVIL SCOPE OF WORKS.
5. COORDINATION OF DRAINAGE DESIGN AND CABLE COORDINATES TO BE CONFIRMED.

LEGEND:
- TYPE A OR TYPE B HIGHSIDE DITCH
- SWALE
- DRAINAGE DITCH (PERMANENT TRACK)
- DRAINAGE CULVERT
- WATERCOURSE BRIDGE
- WATERCOURSE CULVERT

METRES @ 1:2500 — 0 20 50 100 250

DRAWING STATUS: S5

	P01		P02		P03	
REVISION:	P01		P02		P03	
DRAWN:	J.PETRIE	08/11/2024	J.PETRIE	23/10/2025	J.PETRIE	28/10/2025
CHECKED:	R.DUNCAN	08/11/2024	R.DUNCAN	23/10/2025	R.DUNCAN	28/10/2025
APPROVED:	R.MINTO	08/11/2024	R.MINTO	23/10/2025	R.MINTO	28/10/2025

ISSUED FOR FINAL REVIEW | PROJECT REF: BING4-LT521

Customer: Scottish & Southern Electricity Networks TRANSMISSION
Contractor: SIEMENS energy + bam — Joint Venture Substation Delivery Framework
Subcon. Drawing No.: FAIRHURST — BING4-LT521-SEBAM-DRAI-ZZ-D-C-0192

Project: BINGALLY 400kV SUBSTATION
Title: LT521 - BINGALLY ENGINEERING DRAWINGS PROPOSED TRACK DRAINAGE LAYOUT SHEET 2
Contractor Drawing No.: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0192
Customer Drawing No.: BING4-LT521-SEBAM-DRAI-ZZ-D-C-0192

Designed	Drawn	Checked	Approved	Date	Scale	Size	Sheet	Revision
J.PETRIE	S.MITCHELL	R.DUNCAN	R.MINTO	03/09/2024	1:2500	A1	2 of 3	P03

OUTFALL TO OVERLAND FLOW DISPERSAL
OUTFALL TO WATERCOURSE
TIE INTO EXISTING ROAD SIDE DITCH
OUTFALL TO TRACK SIDE DITCH
TRACK SIDE DRAINAGE DITCH OUTFALL
WATERCOURSE CULVERT
DRAINAGE CULVERT
TEMP DRAINAGE CULVERT (TBC)
TRACK SIDE DRAINAGE DITCH OUTFALL

NOTES
1. DITCH DIMENSIONS ARE PRELIMINARY ONLY AND TO BE FINALISED AT DETAILED DESIGN UPON COORDINATION WITH EARTHWORKS AND CULVERT DESIGNS
2. DITCH SIZES REFER TO CAPACITY REQUIREMENTS ONLY. ADDITIONAL CUT AND FILL MAY BE REQUIRED TO GRADE EXISTING GROUND.
3. SETTLEMENT LAGOONS SHOWN TO NOT INCLUDE EARTHWORKS EXTENTS.
4. DURING CONSTRUCTION PARTICULAR CARE IS TO BE TAKEN BY THE CONTRACTOR TO ENSURE THAT THE MINIMUM AMOUNT OF DAMAGE AND DISTURBANCE TO LAND DRAINS AND DITCHES ARE CAUSED. THE CONTRACTOR WILL INVESTIGATE, DESIGN, INSTALL, REPAIR AND MAINTAIN ALL LAND DRAINS THAT ARE AFFECTED BY THE WORKS AS PER THE CIVIL SCOPE OF WORKS.
5. COORDINATION OF DRAINAGE DESIGN AND CABLE COORDINATES TO BE CONFIRMED.

LEGEND:
- TYPE A OR TYPE B HIGHSIDE DITCH
- SWALE
- DRAINAGE DITCH (PERMANENT TRACK)
- DRAINAGE CULVERT
- WATERCOURSE BRIDGE
- WATERCOURSE CULVERT

METRES @ 1:2500 — 0 20 50 100 250

DRAWING STATUS: S5									
ISSUED FOR FINAL REVIEW	REVISION:	P01		P02		P03			
	DRAWN:	J.PETRIE	08/11/2024	J.PETRIE	23/10/2025	J.PETRIE	28/10/2025		
	CHECKED:	R.DUNCAN	08/11/2024	R.DUNCAN	23/10/2025	R.DUNCAN	28/10/2025		
	APPROVED:	R.MINTO	08/11/2024	R.MINTO	23/10/2025	R.MINTO	28/10/2025		
PROJECT REF:	BING4-LT521								

Customer	Scottish & Southern Electricity Networks TRANSMISSION
Contractor	SIEMENS energy + bam Joint Venture Substation Delivery Framework
Subcon. Drawing No.	FAIRHURST BING4-LT521-SEBAM-DRAI-ZZ-D-C-0193
Project	BINGALLY 400kV SUBSTATION
Title	LT521 - BINGALLY ENGINEERING DRAWINGS PROPOSED TRACK DRAINAGE LAYOUT SHEET 3
Contractor Drawing No.	BING4-LT521-SEBAM-DRAI-ZZ-D-C-0193
Customer Drawing No.	BING4-LT521-SEBAM-DRAI-ZZ-D-C-0193

Designed	Drawn	Checked	Approved	Date	Scale	Size	Sheet	Revision
J.PETRIE	S.MITCHELL	J.PETRIE	R.MINTO	03/09/2024	1:2500	A1	3 of 3	P03