# LT459 – Fanellan 400kV Substation

**Flood Risk Assessment**

**FNLN-LT459-FAI-DRAI-XX-RPT-W-0001**

Scottish & Southern Electricity Networks TRANSMISSION

SIEMENS energy bam

FAIRHURST engineering solutions, delivering results

## CONTROL SHEET

| | |
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# Contents



# Figures



# 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 for the proposed Fanellan Substation and Converter Station ('Hub') development at Fanellan near Kilmorack 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 This assessment considers flood risk to the full site from a range of sources including coastal, fluvial, overland flows, infrastructure failure, sewer flooding and groundwater.

1.1.3 A previous Flood Risk Assessment was undertaken for the site (Reference: LT459-SWE-XX-XX-T-W-1002, Version 3, Sweco, 12 September 2024). The Flood Risk Assessment set out below supersedes the previous assessment. The new assessment takes account of consultation comments made by SEPA (Reference PCS-20005070, Dated 08/05/2025) and The Highland Council Flood Risk Management Team (Reference 25/00826/FUL, Dated 15/05/2025) in relation to the previous Flood Risk Assessment.

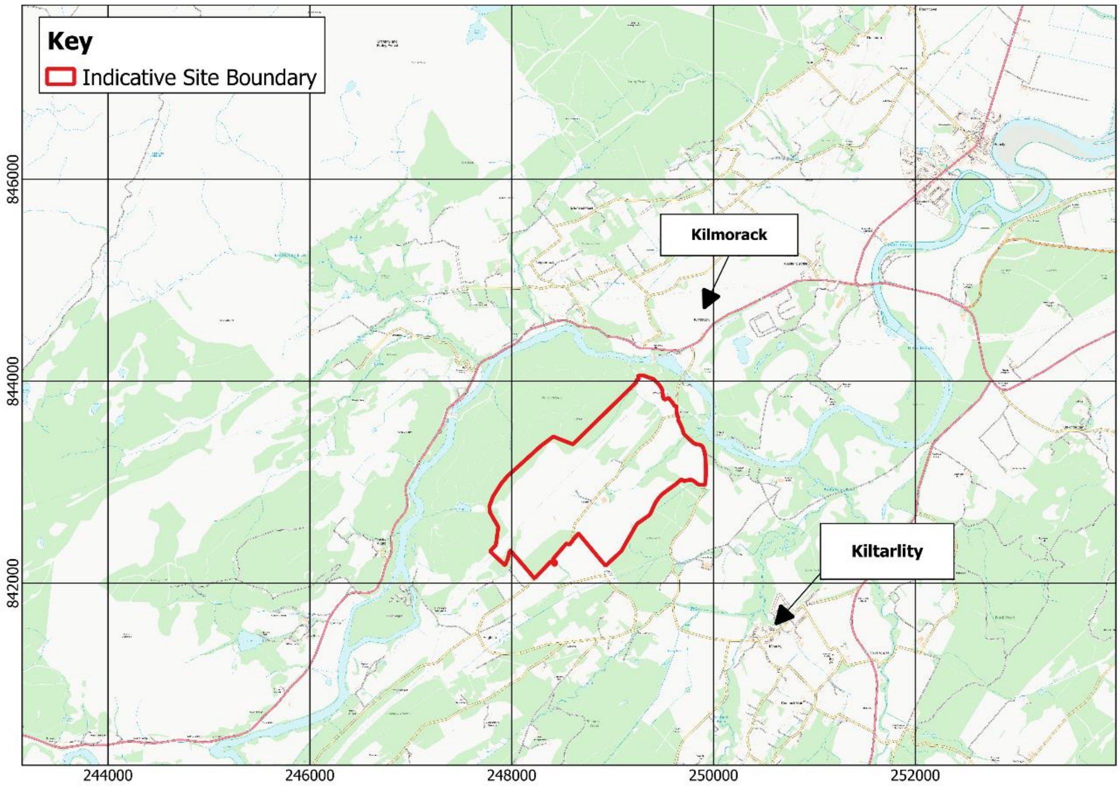




**Figure 1: Site Location Plan**

## 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."*

FAIRHURST

# 3.0 DEVELOPMENT SITE

## 3.1 Existing Conditions

3.1.1 The proposed development site covers a total area of approximately 223 hectares (ha), comprising mostly agricultural land, as illustrated in **Figure 2**.

3.1.2 The site is accessible from the east via an access road that branches off the A831 near Kilmorack. Alternatively, the site can be accessed from the south via an access road that branches off the A833 and passes through Kiltarlity.

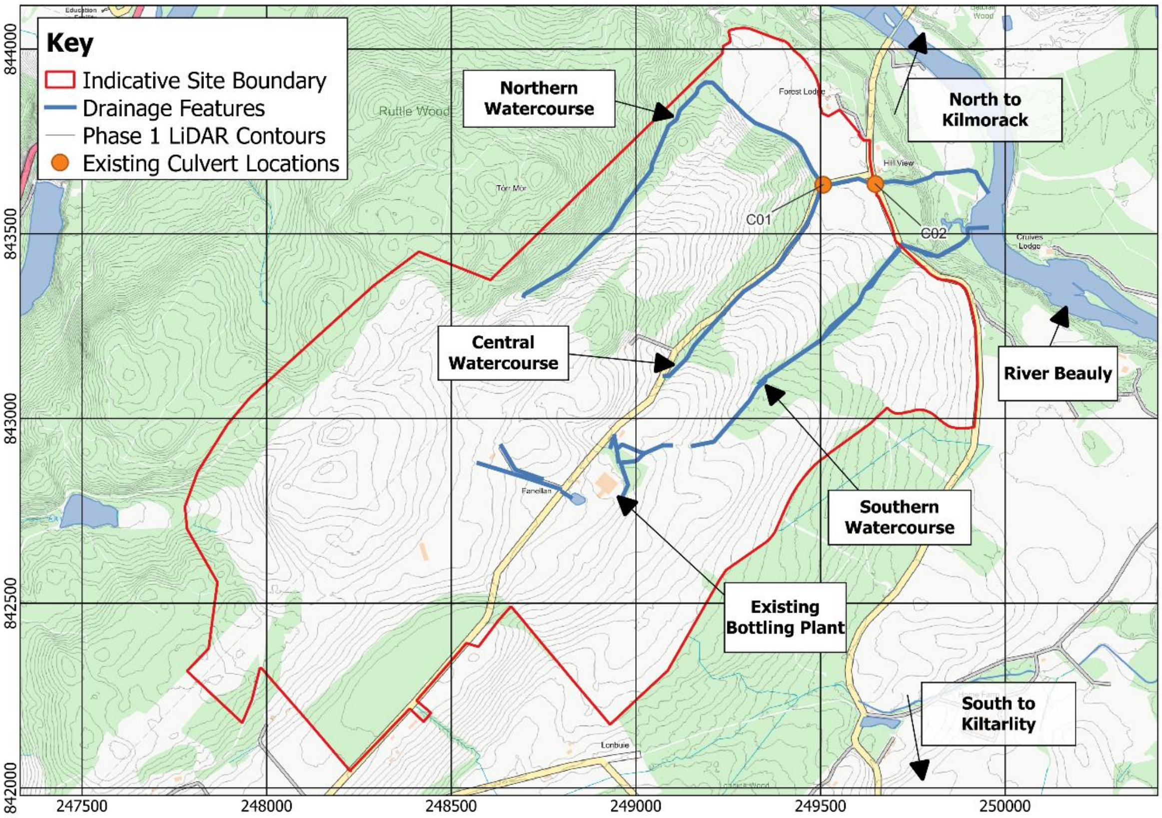


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**Figure 2: Existing Site Conditions**

3.1.3 The ground levels generally slope from the southwest to the northeast and range from approximately 34.0 metres (m) AOD at its lowest point in the northern end of the Site, rising to approximately 147.5 m in the southern area of the Site..

3.1.4 Three unnamed drainage features are located within the site. These are labelled in **Figure 2** and described below:

- Northern Watercourse: Flows in a north-easterly direction before turning south-east at the northern extent of the site. Within the site the Northern Watercourse has been historically heavily modified. The line and level and shape of the channel is not natural. The channel is culverted underneath the public road within the site and merges with the Central Watercourse at the culvert outlet. It then continues east flowing underneath the public road outwith the site and discharging into the River Beauly.

- Central Watercourse: Flows in a north easterly direction and merges with the Northern Watercourse at the culvert outlet. Water continues east and flows underneath the public road outwith the site before discharging into the River Beauly.
- Southern Watercourse: The watercourse originates from drains located north east of the existing bottling plant (see **Figure 2**). Flows are directed east through a culvert underneath a field crossing before turning north east and crossing the public road outwith the site. The channel discharges into the River Beauly.

## 3.2 Proposed Development

3.2.1 The proposed development includes the construction of the Fanellan Substation and Converter Station ('Hub')and associated infrastructure. Temporary access tracks and associated drainage features are required to facilitate the construction of the proposed development. The proposed layout of the site is illustrated in **Figure 3** below.

3.2.2 The proposed development being considered in this study consists of a substation platform of approximately 24.7 hectares (ha), permanent access tracks and SUDS and temporary access tracks and SUDS. The proposed substation platform is located on higher lying grounds at the south western extent of the site with the existing ground levels above 121 mAOD which is over 17m higher than the Northern Watercourse.

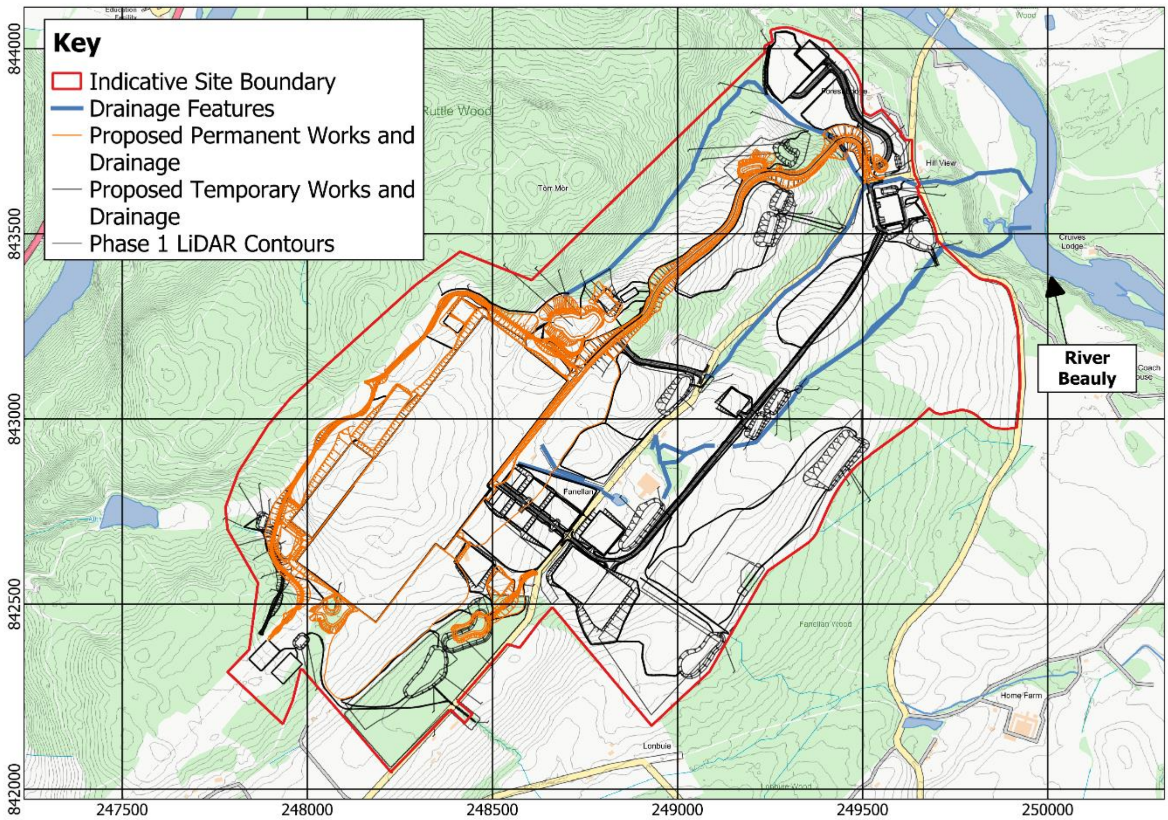


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**Figure 3: Proposed Development Layout**

3.2.1 This assessment considers flood risk to the full site from a range of sources including coastal, fluvial, overland flows, infrastructure failure, sewer flooding and groundwater and further detail on each aspect is provided in Section 5.0. The assessment considers the risk to the proposed development and the potential impact on existing nearby receptors.

## 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 watercourses within the site are too small to be included in the fluvial SEPA fluvial flood maps, however, they are included within the 'Surface water and small watercourses' flood maps. These flood maps indicate that in a 1 in 200 year + climate change event water within the Northern Watercourse could overtop the northern bank and flow onto the agricultural land, affecting areas proposed for temporary works and the permanent access track. Mapping also indicates that in a 1 in 200 year + climate change event the flows within the Central and Southern watercourses would be confined to the channels and the adjacent lower lying ground.* The SEPA surface water flood extents also indicate small isolated pockets of flooding at localised low points within the site.

3.3.4 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 existing nearby receptors and this is provided in **Section 5.0** of this report.

3.3.5 ***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.

3.3.6 The proposed substation site is not shown to be at risk from reservoir flooding.

# 4.0 POTENTIAL SOURCES OF FLOOD RISK

4.1.1 There are several potential sources of flooding that require consideration:

- **Coastal flooding**: 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.
- **Fluvial flows**: Extreme fluvial flood events 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.
- **Overland flow**: 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.
- **Infrastructure failure**: 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.
- **Sewer flooding**: 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.
- **Groundwater**: 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

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

## 5.2 Coastal Flooding

5.2.1 The proposed development is over 2 km from the nearest coast and ground levels are over 30mAOD. Its inland location and elevation mean it is not at risk from tidal inundation or coastal waves.

## 5.3 Fluvial Flows

5.3.1 Hydraulic modelling of the Northern Watercourse has been undertaken to establish the fluvial flood risk for the 1 in 200 year plus 42% climate change (+ CC). Details of the hydrology and model set-up are provided in **Appendix 3** and **Appendix 4**.

***Existing Conditions***

5.3.2 Hydraulic modelling suggests that under existing conditions, for the 1 in 200 year plus 42% climate change event, flows could overtop the northern and southern banks of the watercourse immediately upstream of the ditch's bend. A small proportion of these flows would be directed north east overland towards the River Beauly.

5.3.3 In this event the remainder of the overland flows would be routed south eastward and overtop the public road outwith the site. A percentage of this runoff would follow the lower lying grounds along the road and rejoin the channel upstream of culvert C02 (see **Figure 2**). The remaining water would flow over the public road in the vicinity of the existing residential property 'Hill View' before flowing into the channel downstream of C02 and discharge into the River Beauly.

5.3.4 Water contained in the channel would overtop the southern bank immediately downstream of culvert C01 and be directed east where it would rejoin the channel upstream of C02.

5.3.5 The 1 in 200 year plus climate change (+CC) flood extents under existing conditions are illustrated in **Figure 4**.

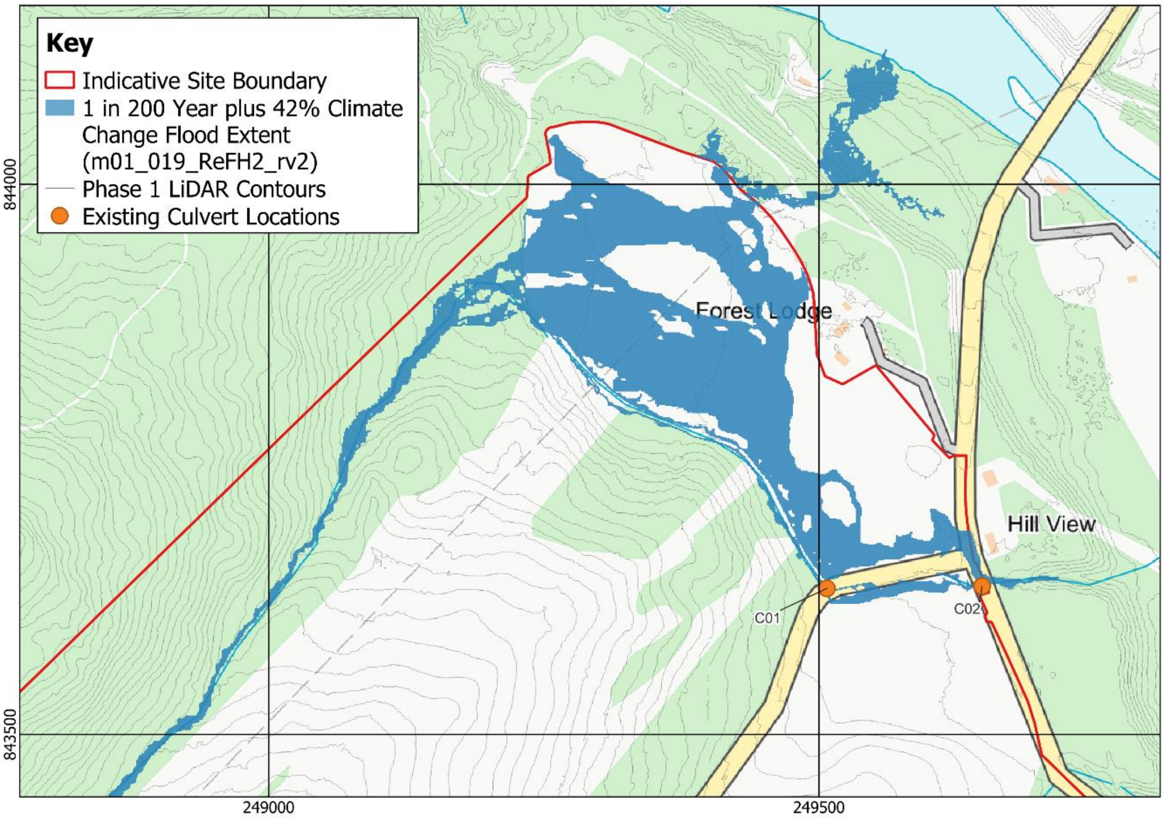




**Figure 4: 1 in 200 Year plus 42% Climate Change Flood Extents**

5.3.6 Under existing conditions, model results indicate that the proposed locations of the temporary and permanent works may be within the flood extents. Flood mitigation measures would therefore be required for the current development proposals within these areas. This is discussed below.

***Proposed Conditions***

5.3.7 The following mitigation measures are proposed for the development:

- Existing watercourse culverted underneath the proposed permanent access track
- Watercourse improvement works to create a new two stage channel with inset floodplains and improved geomorphological processes
- Upsizing the existing C01 culvert from 450mm diameter to 1200mm diameter

5.3.8 The proposed development, including earthworks and mitigation measures, has been represented in the hydraulic model. The results (**Figure 5**) indicate that the mitigation measures would retain flows within the proposed two stage channel during a 1 in 200 year plus 42% climate change event.

5.3.9 In the baseline scenario there is an overland flood flow route through the site where some water could flow north-east and into the River Beauly (**Figure 4**). The proposed mitigation measures would result in this flow being retained in channel with a marginal (0.17 $m^3/s$) increase in peak flow downstream of culvert C02. The water ultimately discharges to the River Beauly a short distance downstream of the baseline conditions, therefore there would be no overall impact on flood risk downstream of this.

5.3.10 There is one existing property which may be affected by the proposals – Hill View located immediately north of culvert C02. Although there will be a marginal increase in peak flow in the open channel downstream of C02 the results indicate that there should be an overall reduction in flood risk in the vicinity of the property. The baseline flood extents (**Figure 4**) indicate that overland flood flow routes through the site could currently inundate the public road immediately outside of the Hill View property, thereby posing a risk. The proposed scenario flood extents (**Figure 5**) indicate that this flood extent would be significantly reduced by the proposed watercourse improvements, thereby reducing the direct risk to the property.

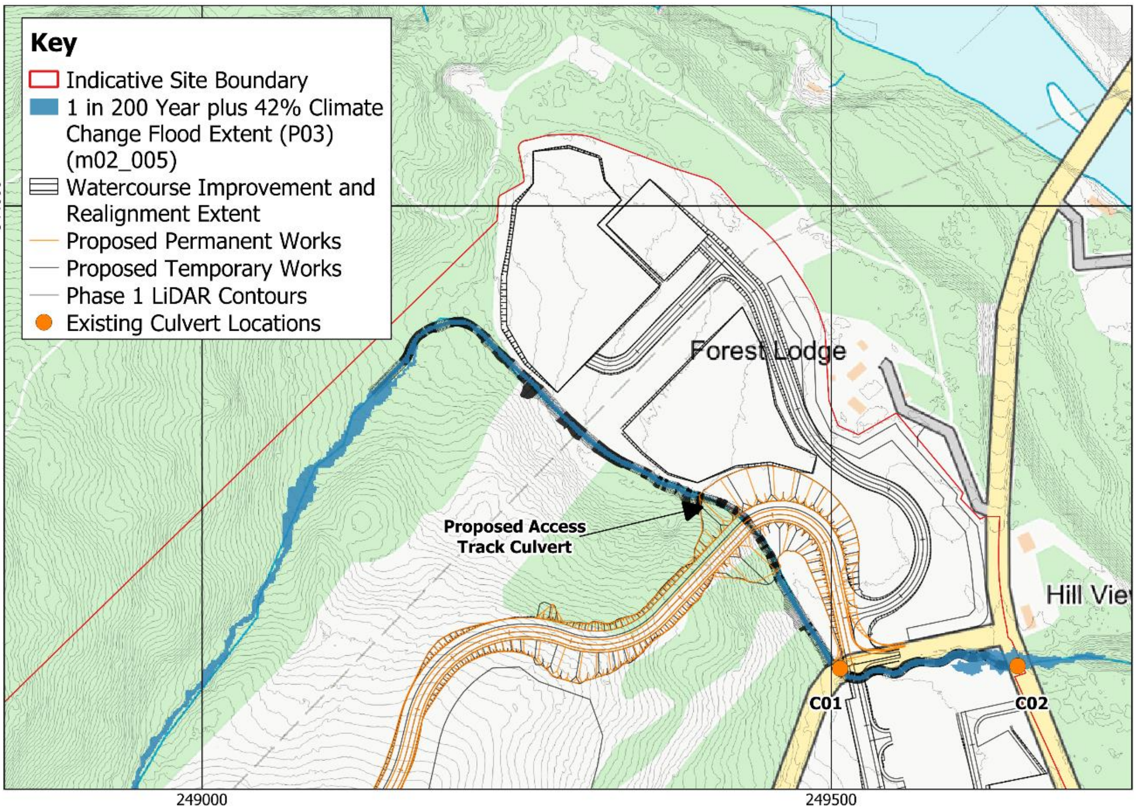


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**Figure 5: Proposed Mitigation 1 in 200 Year plus 42% Climate Change Flood Extents**

## 5.4 Overland Flow

5.4.1 The overland flow routes within and around the site have been assessed using Phase 1 LiDAR and the QGIS Watershed Analysis tool. The Phase 1 LiDAR has been reviewed against detailed topographic surface data for the site and found to be consistent, therefore the flow routes shown in **Figure 6** are deemed to be a reliable assessment of current conditions.

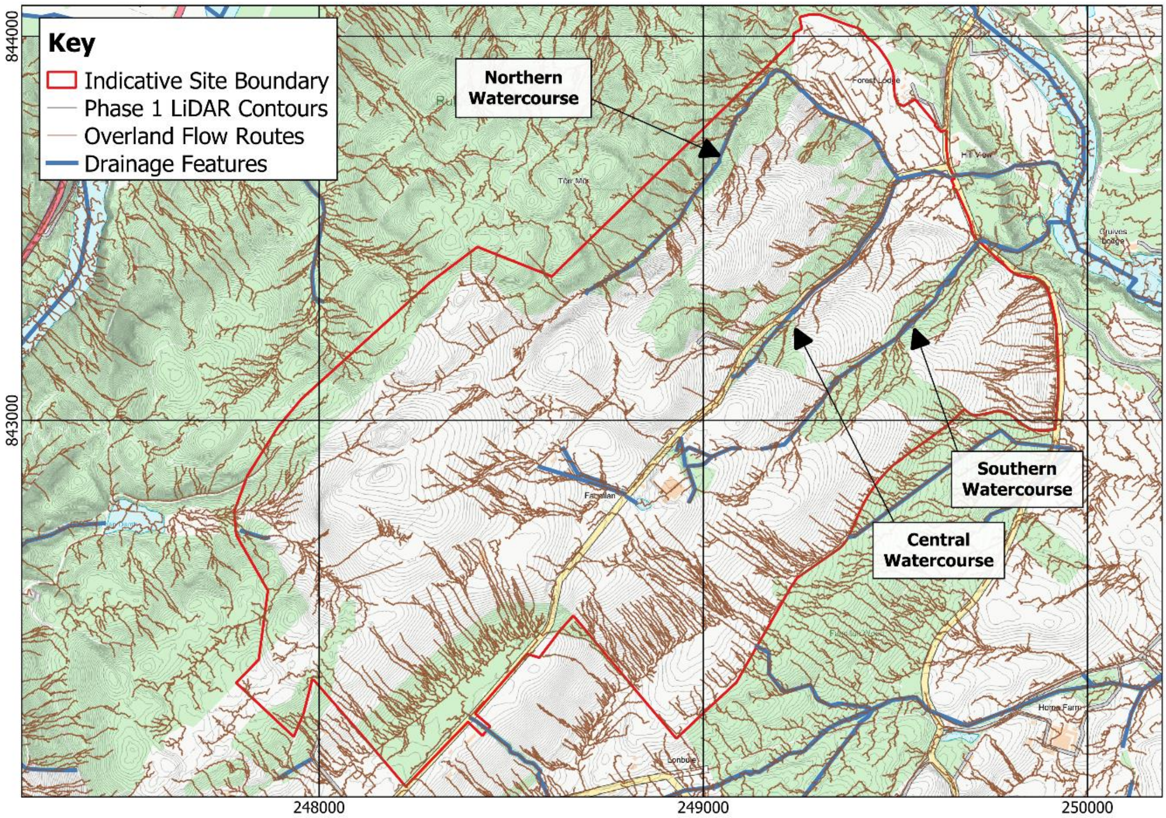


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**Figure 6: Overland Flow Routes**

5.4.2 A proportion of the flows originating from the south eastern and eastern extent of the site would be routed toward the east and away from the site. The remainder would continue north and be intercepted by the Southern Watercourse which would channel flows out of the site and into the River Beauly.

5.4.3 Runoff at the south west of the site would flow north along the lower lying ground at this extent before continuing west and away from the site.

5.4.4 Flows at the western extent of the site would be directed north and into the Northern Watercourse. Runoff generated at the north western extent of the site would be directed south eastwards and into the downstream extent of the Northern Watercourse. These flows would be channelled through the culvert underneath the public road outwith the site and rejoin the open channel downstream of the road discharging into the River Beauly.

5.4.5 Flows at the centre of the site would be directed north eastwards into the Central Watercourse.

5.4.6 The proposed development will include SuDS drainage and therefore the risk of flooding due to overland flow is considered to be low. Residual risk will be mitigated by profiling ground levels to route flow around and away from sensitive infrastructure.

### 5.5 Infrastructure Failure

5.5.1 SEPA reservoir inundation mapping does not show the site to be at risk in the event of an uncontrolled release of water from any reservoir covered by the Reservoirs (Scotland) Act 2011.

5.5.2 There are two culverts located within the vicinity of the site as illustrated in **Figure 2** and described in **Appendix 4**.There is potential for channel structures to become blocked with debris or sediment during extreme flood events, resulting in increased flood levels or changing out-of-bank flood patterns.

5.5.3 A 50% blockage of Structure C01 under existing and proposed conditions would result in similar flood extents to the existing conditions. The flood depths upstream of the culvert are indicated to marginally increase while the depths downstream are likely to marginally decrease. Flood risk to from this source is considered to be low.

5.5.4 A 50% blockage of Structure C02 would result in similar flood extents to the existing conditions. The flood depths upstream of the culvert are indicated to marginally increase while the depths downstream are likely to marginally decrease. Flood risk to from this source is considered to be low.

5.5.5 The design of the proposed access road culvert is for a bottomless structure which spans the watercourse channel, with a width of 11 m and a height of 3 m. The potential for blockage of this structure is considered to be low. The potential impact of a blockage has been assessed by modelling a 25% and 50% blockage of the structure. Model results indicate that in both scenarios, flood extents would be similar to the unblocked proposed scenario. The flood depths immediately upstream of the culvert are indicated to marginally increase while the depths immediately downstream are likely to marginally decrease. Flood risk from this source is considered to be low.

5.5.6 To mitigate the residual risk of potential blockage SSEN operations department will undertake the maintenance of all culverts inclusive of post storm inspections.

### 5.6 Sewer Flooding

5.6.1 The Scottish Water sewer records do not indicate the presence of any significant sewer infrastructure within the vicinity of the site. The risk of sewer flooding is therefore considered to be low.

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

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

### 5.7 Groundwater Flooding

5.7.1 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 site is situated outwith groundwater influenced flood extents shown on these maps.

5.7.2 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. Residual risk from this source of flooding can be mitigated by profiling ground levels to route flood water around and away from sensitive infrastructure. With this mitigation implemented, the risk of flooding from groundwater 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 for the proposed Fanellan Substation and Converter Station ('Hub')development at Fanellan near Kilmorack in the Highlands.

6.1.2 Existing fluvial flood risk to the site from the northern watercourse within the site has been assessed using a hydraulic model. The model shows that in a 1 in 200 year + climate change event, under existing (pre-development) topographical conditions, out of bank flows from the northern drainage ditch would be directed north onto the agricultural land along the channel's northern bank. A proportion of these flows would be directed north towards the River Beauly while the remainder would be routed south eastwards and flow onto the access road outwith the site boundary.

6.1.3 The model results indicate that the proposed locations for temporary and permanent works may be within the flood extents based on existing conditions. The following mitigation measures are proposed for the development and existing sensitive receptors:

- Existing watercourse culverted underneath the proposed permanent access track
- Watercourse improvement works to create a new two stage channel with inset floodplains and improved geomorphological processes
- Upsizing the existing C01 culvert from 450mm diameter to 1200mm diameter

6.1.4 Hydraulic model results indicate that the mitigation measures would retain flows within the proposed two stage channel during a 1 in 200 year plus climate change event. There would be a marginal impact on flows but there would be no overall impact on flood risk downstream of the discharge to the River Beauly. The proposed mitigation measures would reduce the flood extents on the public road in the vicinity of the existing Hill View property in a 1 in 200 year plus climate change event compared to the baseline scenario.

6.1.5 Flood risk from other sources including coastal flooding, overland flow, infrastructure failure, sewer flooding and groundwater flooding has also been assessed and is considered to be low.

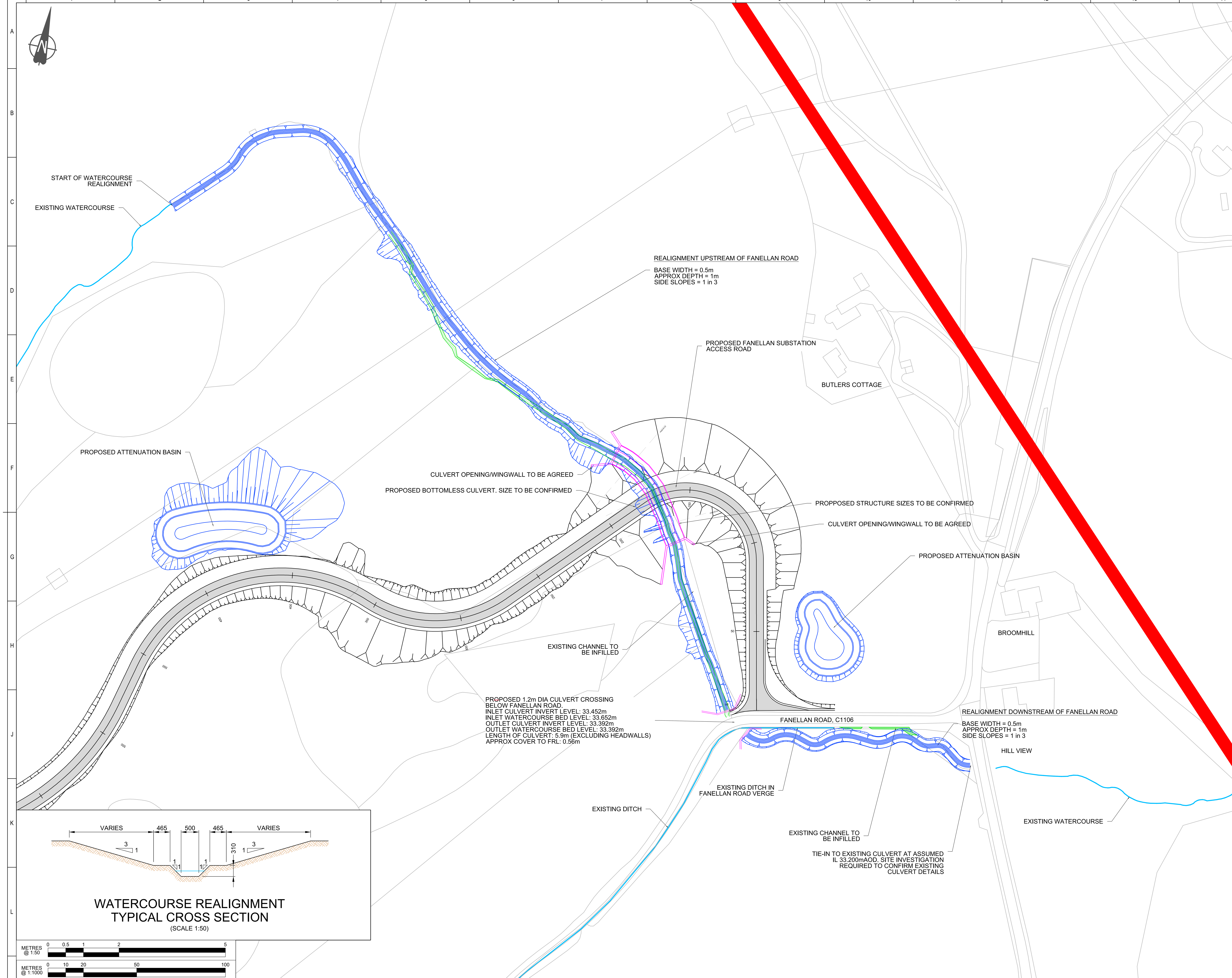
# Appendix 1 Glossary

**Definitions of FEH Catchment Descriptors[1]**

| | |
|---|---|
| **BFIHOST** | This base flow index is a measure of catchment responsiveness derived using the 29-class Hydrology Of Soil Types (HOST) classification. The HOST dataset is available as a 1km grid which records, for each grid square, the percentage associated with each HOST class present. Using boundaries for each gauged catchment, the soil characteristics of the catchment can be indexed and by exploiting the relationship between soil typologies and runoff response an aggregated assessment of BFIHOST for the catchment can be derived.<br><br>Note: there is a strong general association between BFIHOST and the Baseflow Index derived using the hydrograph separation approach, but no close equivalence can be expected where the natural flow regime is substantially disturbed e.g. by compensation flows or major augmentation from sewage effluent. |
| **BFIHOST19** | The estimate of the base flow index (BFI) based on the Hydrology of Soil Types (HOST) classification, BFIHOST, provides a measure of catchment responsiveness. The new BFIHOST19 descriptor addresses a number of issues in the original BFIHOST developed in 1995, including:<br><br>• the BFI calculated through base flow separation tended to be underestimated in clay-dominated catchments,<br><br>• the calculation technique performed poorly in ephemeral catchments or those with missing data, and<br><br>• the pragmatic bounding of BFI coefficients for permeable soils overlying aquifer outcrops was also problematic for small catchments. |
| **DPLBAR** | Mean Drainage Path Length. Mean of distances between each node on the catchment grid and the catchment outlet, in kilometres. Used to characterise catchment size and configuration. |
| **DPSBAR** | Mean Drainage Path Slope. This landform descriptor provides an index of overall catchment steepness. It was developed for the Flood Estimation Handbook and is calculated as the mean of all inter-nodal slopes for the catchment. The index is expressed in metres per kilometre with values ranging from >300 in mountainous terrain to <25 in the flattest parts of the country. |
| **PROPWET** | This catchment wetness index (PROPortion of time soils are WET), developed for the Flood Estimation Handbook, provides a measure of the proportion of time that catchment soils are defined as wet (in this context, when soil moisture deficits are less than 6mm). PROPWET values range from over 80% in the wettest catchments to less than 20% in the driest parts of the country. |
| **SAAR** | Average annual rainfall in the standard period (1961-1990) in millimetres. (SAAR4170 is from 1941 to 1970). |
| **SPRHOST** | Standard percentage runoff (%) associated with each HOST soil class. This can be used to derive SPRHOST over a catchment. SPRHOST can be derived from flow data where available. |
| **URBEXT1990** | Index of urban and suburban land cover in 1990 expressed as a fraction. |

[1] NRFA (2025). *FEH catchment descriptors* [online] Available at: https://nrfa.ceh.ac.uk/data/about-data/catchment-information/feh-catchment-descriptors

# Appendix 2 Drawings




PLAN
(SCALE 1:500)



NOTES:

1. This drawing shall only be used for the design element sated 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. The proposals shown on this drawing have been determined from topographical survey information provided by others
6. Site layout based on drawing FNLN4-LT459-SEBAM-ROAD-EXT-D-C-0127.
7. Design proposals are preliminary only and subject to detailed design and coordination.
8. Site constraints from existing services and proposed OHL to be confirmed
9. Refer to design decision log for assumptions associated with proposed drainage design and watercourse realignment designs.
10. Tie-in locations of existing channels and culvert to be confirmed.
11. The contractor shall check all dimensions on site and report any difference to the designer.
12. All levels are in metres (m) above ordnance datum unless stated otherwise.
13. Flood modelling required to confirm design impact.
14. Temporary laydown and access proposals not considered.

LEGEND:

- RED LINE BOUNDARY
- PROPOSED CHANNEL REALIGNMENT
- PROPOSED CULVERT
- EXISTING CHANNEL TO BE INFILLED
- EXISTING CULVERT AND HEADWALL
- EXISTING WATERCOURSE / DITCH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
(REFER TO CDM REGISTER GRNS4-LT379-SEBAM-ZZ-EXT-REG-OS-0001)

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

MAINTENANCE / CLEANING RISK

DECOMMISSIONING / DEMOLITION RISK

| REV: | DATE: | DRWN: | CHKD: | APPVD: | DESCRIPTION: |
|---|---|---|---|---|---|
| P01.01 | 18/11/2024 | CMcL | RD | RJM | WATERCOURSE MODEL UPDATED |

STATUS: S2 - ISSUED FOR INFORMATION

CONTRACTOR:

Joint Venture
Substation Delivery Framework

CLIENT:

PROJECT:
LT459 - FANELLAN 400kV SUBSTATION

PROJECT NUMBER: FNLN4-LT459 | LOCATION: FANELLAN

TITLE: FANELLAN ACCESS ROAD
PERMANENT WATERCOURSE REALIGNMENT
INCLUDING CULVERT

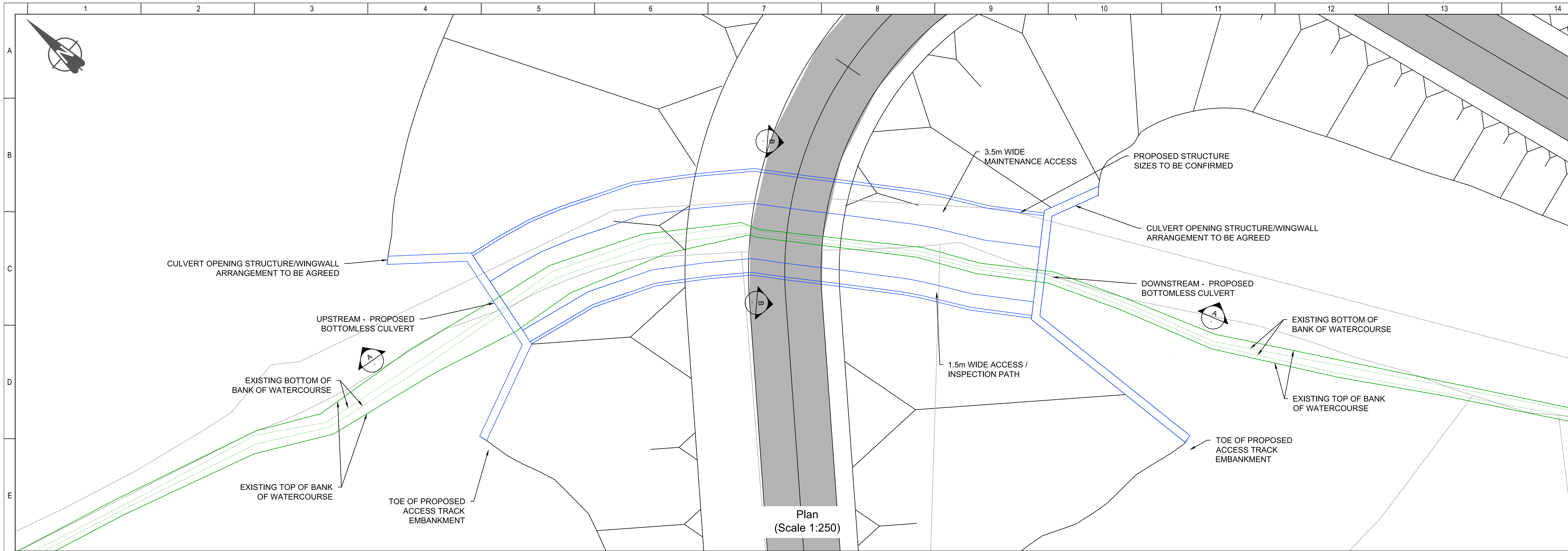
| | | | |
|---|---|---|---|
| DRAWN: | CMcL | ENG CHECK: | RD |
| DESIGNER: | AP | COORDINATION: | AP |
| SCALE : | 1:1000 | APPROVED: | RJM |
| DATE OF FIRST ISSUE: | 13/11/2024 | SECURITY: | |

ORIGINATOR DRAWING NUMBER: FNLN4-LT459-SEBAM-ZZ-EXT-D-W-9002 | SHEET No: 1 of 1

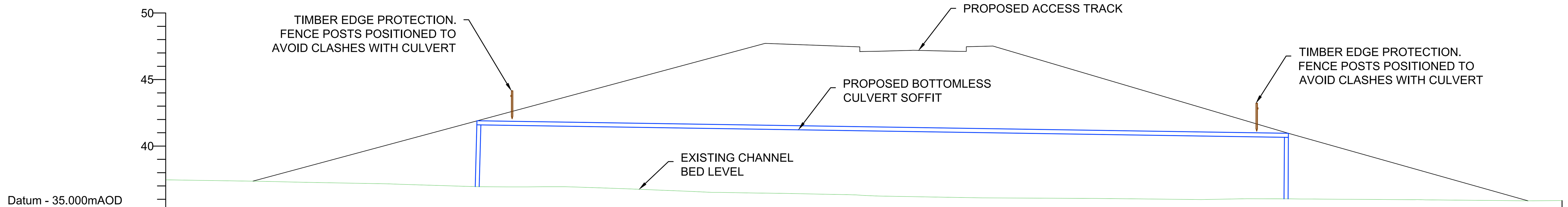
CLIENT DRAWING NUMBER: FNLN4-LT459-SEBAM-ZZ-EXT-D-W-9002 | REV. No: P01.01

File Name: C:\Users\smillar\Documents\FNLN-LT459-SEBAM-ZZ-EXT-D-W-9001-P01.04\FNLN-LT459-SEBAM-ZZ-E

Date Plotted: 01.07.2025

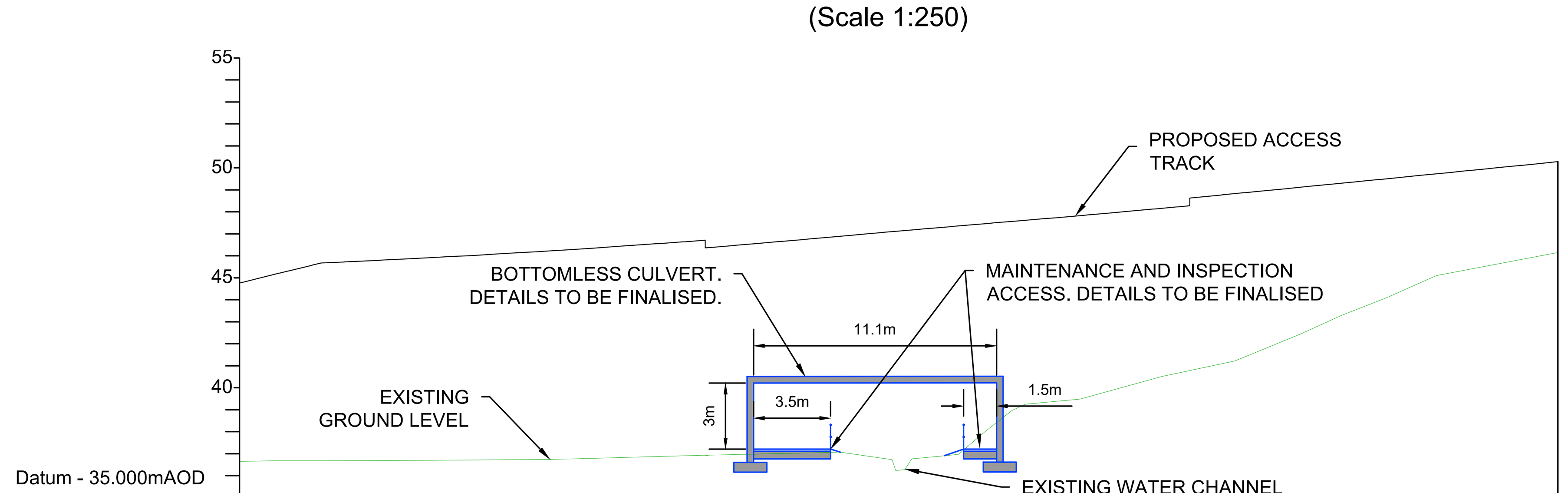



Plan
(Scale 1:250)




| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Existing Ground Levels (m AOD) | 37.288 | 37.048 | 36.941 | 36.570 | 36.373 | 36.127 | 35.973 | 36.043 | 36.028 | 35.993 | 35.970 | 35.904 | |
| Proposed AccessTrack Levels (m AOD) | 37.415 | 47.724 | 47.450 | 47.180 | 47.446 | 47.522 | 35.877 | | | | | | |
| Existing Channel Gradient | -1:64 | -1:42 | -1:71 | -1:34 | -1:60 | -1:90 | -1:189 | | | | | | |
| Length (m) | 0+000 | 0+010 | 0+020 | 0+030 | 0+040 | 0+050 | 0+060 | 0+070 | 0+080 | 0+090 | 0+100 | 0+105.029 | |

Proposed Channel Long
Section A-A
(Scale 1:250)




| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Existing Ground Levels (mAOD) | 36.650 | 36.683 | 36.698 | 36.766 | 36.951 | 36.248 | 38.954 | 40.511 | 42.454 | 45.105 | 46.153 |
| Proposed Access Track Levels (mAOD) | 44.765 | 45.597 | 45.918 | 46.291 | 46.455 | 47.123 | 47.564 | 48.161 | 49.121 | 49.729 | 50.282 |
| Offset from Channel Centre Line (m) | -30.000 | -26.600 | -21.204 | -14.798 | -7.675 | 0.000 | 5.140 | 11.968 | 18.312 | 24.395 | 29.839 |

Cross Section at B-B
(Scale 1:250)

METRES @ 1:250 0 2 5 10 25



NOTES:

1. All dimensions are in millimetres (mm) unless noted otherwise.
2. All levels are in metres (m) above ordnance datum unless stated otherwise.
3. This drawing shall only be used for the design element stated in the drawing title.
4. Refer to the Design Decision Log for assumptions associated with the proposed design.
5. Design on hold until full topographical survey is received.
6. The details for the existing watercourse shown are shown as per the received topographical survey.
7. The proposed crossing design remains on hold until receipt of full G.I. received.
8. The proposed crossing design remains on hold until structural and geotechnical assessments are complete.
9. The existing watercourse geometry is to remain unaltered through the crossing.
10. Proposed maintenance and inspection access details within the crossing to be finalised.
11. Earthworks and design at culvert opening to be agreed/finalised upon structural and geotechnical assessments.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
(REFER TO CDM REGISTER GRNS4-LT379-SEBAM-ZZ-EXT-REG-OS-0001)

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

MAINTENANCE / CLEANING RISK

DECOMMISSIONING / DEMOLITION RISK

| REV: | DATE: | DRWN: | CHKD: | APPVD: | DESCRIPTION: |
|---|---|---|---|---|---|
| P02.01 | 01/09/2025 | CMcL | RD | CG | SECOND ISSUE INCORPORATING SSEN COMMENTS |
| P01 | 26/03/2025 | AEP | RD | RJM | FIRST ISSUE |

STATUS: S5 - FINAL REVIEW

CONTRACTOR:

Joint Venture
Substation Delivery Framework

CLIENT:

PROJECT: LT459 - FANELLAN 400kV SUBSTATION

PROJECT NUMBER: FNLN4-LT459 | LOCATION: FANELLAN

TITLE: WATERCOURSE CROSSING

| | | | |
|---|---|---|---|
| DRAWN: | AEP | ENG CHECK: | RD |
| DESIGNER: | AEP | COORDINATION: | RD |
| SCALE : | AS SHOWN | APPROVED: | RJM |
| DATE OF FIRST ISSUE: | 06/03/2025 | SECURITY: | |

ORIGINATOR DRAWING NUMBER: FNLN4-LT459-SEBAM-DRAI-EXT-D-W-0507
SHEET No: 1 of 1
CLIENT DRAWING NUMBER: FNLN4-LT459-SEBAM-DRAI-EXT-D-W-0507
REV. No: P02.01

# Appendix 3 Hydrology

## 3-1 Introduction

Hydraulic modelling has been undertaken to quantify existing fluvial flood risk from the Northern Watercourse. Derivations of flows for this watercourse are detailed in this section.

## 3-2 Catchment

At the downstream extent, the Northern Watercourse drains an area of roughly 0.50km$^2$. The catchment area has been derived based on Phase 1 LiDAR data and is illustrated in **Figure 3-1:**. The Phase 1 LiDAR has been reviewed against detailed topographic surface data for the site and found to be consistent, therefore the catchment area shown in **Figure 3-1:** is deemed to be a reliable assessment of current conditions.

There is no gauging station available on the channel and given the small catchment area, catchment descriptors for the watercourse are unavailable on the Flood Estimation Handbook (FEH) Web Service. Therefore, catchment characteristics from a similar donor catchment have been adopted at the site and utilised to estimate runoff volumes. The donor catchment and adopted descriptors are detailed in **Figure 3-1:** and **Table 3-1**.

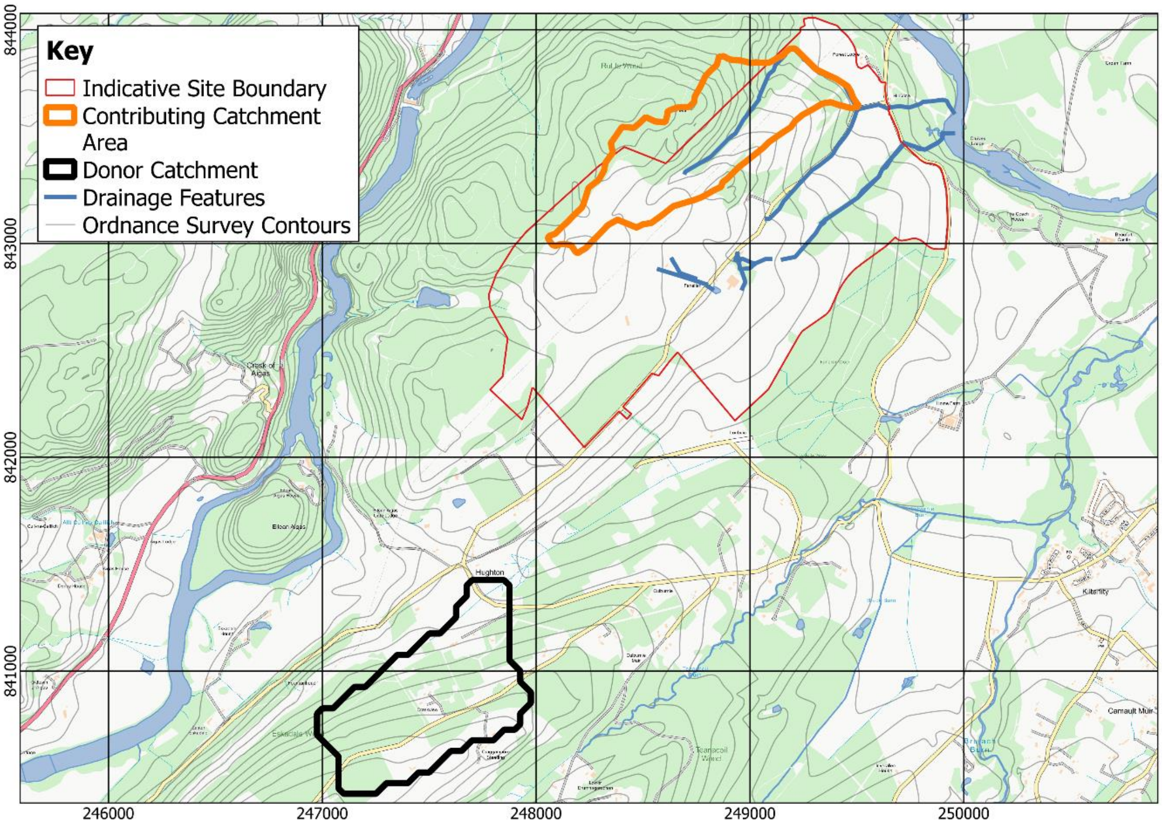



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**Figure 3-1: Contributing Catchment Area**

**Table 3-1: FEH Catchment Descriptors**

| Descriptor* | Value |
|---|---|
| **Area (km$^2$)** | 0.50 |
| **BFIHOST** | 0.793 |
| **BFIHOST19** | 0.765 |
| **DPLBAR** | 0.78 |
| **DPSPAR** | 114.4 |
| **PROPWET** | 0.74 |
| **SAAR** | 936 |
| **SPRHOST** | 20.58 |
| **URBEXT1990** | 0 |

* See Glossary in Appendix 1

## 3-3 Peak Flow Estimation

NPF4 requires that new developments be assessed against a 1 in 200 year flood, with allowances for climate change.

The catchment area of the channel is 0.5km$^2$, therefore, catchment descriptors are unavailable at the site. Catchment descriptors from a donor catchment (**Figure 3-1:**) have been adopted and used to estimate the 1 in 200 year plus 42% climate change flows.

The BFIHOST values are in excess of 0.65 indicating that the catchment is classified as highly permeable. The Flood Estimation Handbook Volume 4 states that the FEH rainfall-runoff method may not adequately represent permeable catchments. The Environment Agency Flood Estimation Guidelines state that ReFH2 is suitable for estimating design flood hydrographs on highly permeable catchments. The ReFH2 method has therefore been adopted for the assessment. The FEH rainfall runoff (RR) method has been used as a sensitivity test.

Current SEPA guidance on applying climate change allowances in FRAs for land use planning recommends that climate change be accounted for in small catchments (less than 30 km$^2$) by applying a defined increase in peak rainfall intensity, which varies depending on the location of the catchment (SEPA, 2023). The site is situated in the North Highland River Basin Region and as such a 42% increase in rainfall has been applied to the derived flows to provide an estimate of the plus climate change (+ CC) flood flows, as detailed in *Table* **3-2**.

**Table 3-2: Comparison of Peak Flow Estimates**

| Return Period | Derived Peak Flows (m$^3$/s) | |
|---|---|---|
| | FEH Method | ReFH2 Method |
| **200 year + 42% CC** | 1.50 | 0.50 |

FAIRHURST

# Appendix 4 Hydraulic Modelling

## 4-1 Introduction

Hydraulic modelling was undertaken to provide a quantitative assessment of the fluvial flood risk from the northern watercourse using a 2D only model.

## 4-2 Model Construction

A 2D hydraulic model of the northern drainage ditch has been constructed using the industry standard TUFLOW software package. The set-up of the model is shown in **Figure 4-1:**.

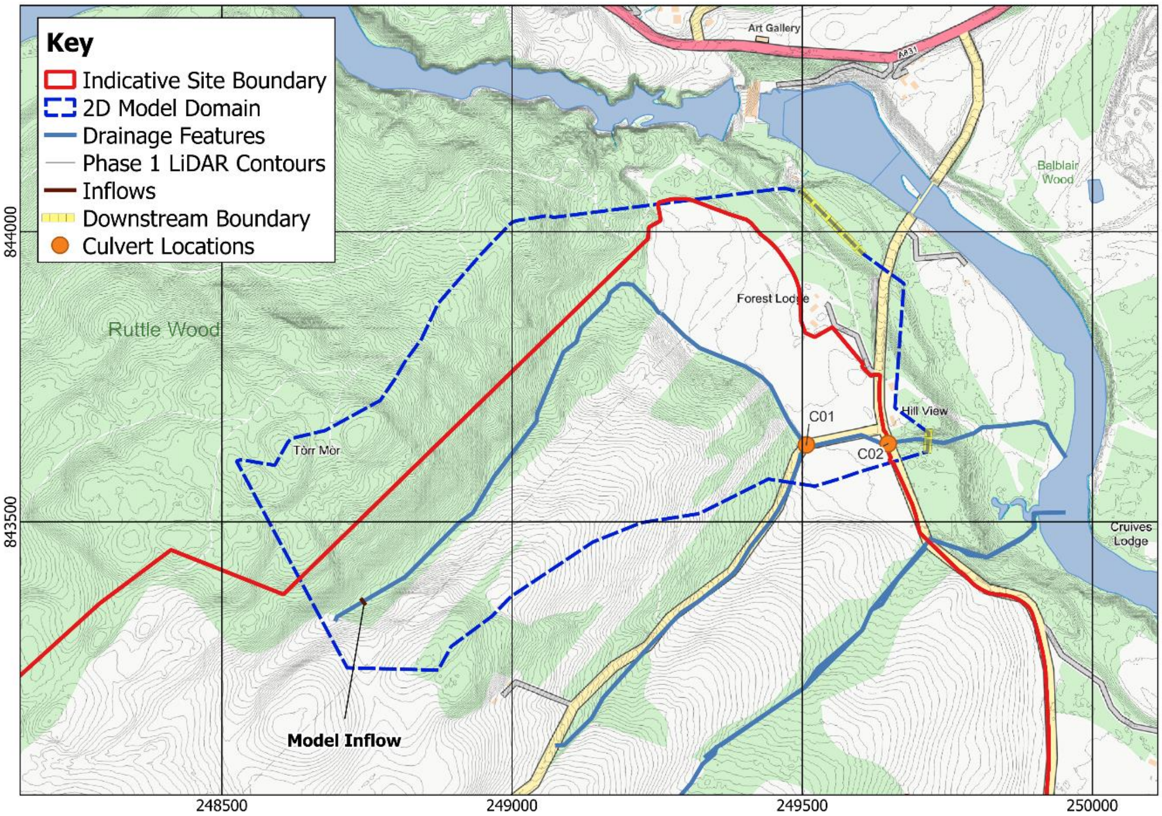


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**Figure 4-1: Model Set-up**

The 2D domain covers an area of 0.55km$^2$ (Figure 4-1:) and has been constructed using a combination of Phase 1 LiDAR, supplemented by detailed topographic survey data within the site area. The topographic survey data includes detailed information on the watercourse channel, including bed and bank levels. A stone wall is in place along the eastern bank of the watercourse, however this has been omitted from hydraulic model to provide a conservative approach to the modelling assessment.

The model includes two structures along the watercourse including the crossing at the access road within the site boundary and the crossing outwith the site boundary (**Table 4-1**).

**Table 4-1: Watercourse Crossing Structures**

| Structure Ref | Description & Dimensions |
|---|---|
| **C01**<br>Public road within the site | Concrete Pipe<br>450mm diameter |
| **C02**<br>Public road outwith the site | Concrete Pipe<br>450mm diameter |

A fixed grid of 1m cell size was applied to the model, which was found sufficient to resolve flow pathways.

## 4-3 Model Roughness

Manning's roughness values within the 2D domain were set to a global value of 0.05 to represent high grass. A higher value of 0.1 was applied to areas with medium to dense brush, while a lower value of 0.013 was adopted along the roads and culvert structures. Sensitivity testing has been undertaken on these roughness values as described in **Section 4-6**.

## 4-4 Boundary Conditions

The inflows to the model are "QT" (flow-time) type boundary conditions. These inflows are based on the ReFH2 hydrograph profile derived in **Appendix 3**. Sensitivity testing has been undertaken on the inflows as described in **Section 4-6**.

The downstream boundaries are "HQ" (head-flow) type boundaries, with the slope set indicative of the respective average slopes. Sensitivity testing has been undertaken on the downstream boundary, as described in **Section 4-6**.

## 4-5 Model Runs and Results

Hydraulic modelling has been undertaken to quantify the flood risk associated with the northern drainage ditch under the existing conditions. The baseline assessment has utilised the ReFH2 hydrograph profile derived in **Appendix 3**.

**Existing Conditions**

The associated 1 in 200 year plus 42% climate change event flood extents are illustrated in **Figure 4-2:**.

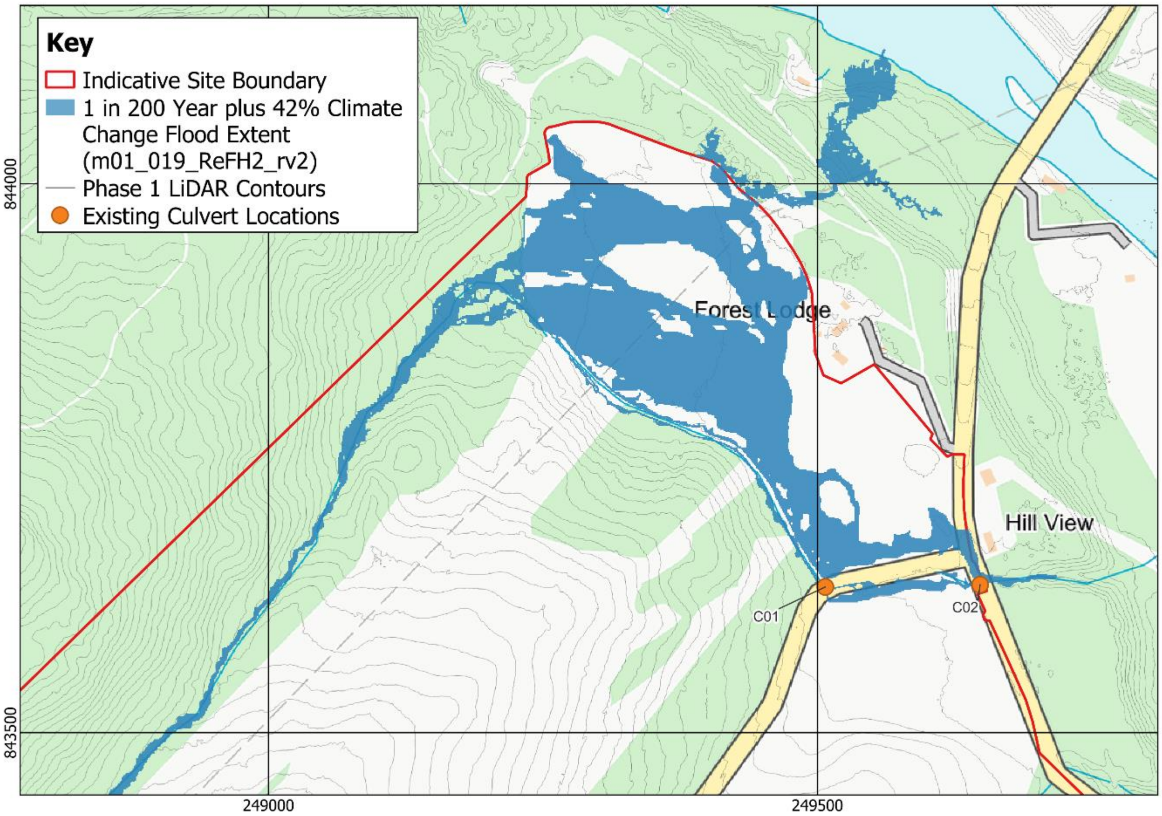


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**Figure 4-2: Figure 7: 1 in 200 Year plus 42% Climate Change Flood Extents – Baseline Scenario**

Model results indicate that for the 1 in 200 year plus 42% climate change event, flows would overtop the northern and southern banks of the watercourse immediately upstream of the ditch's bend. A proportion of these flows would be directed north east towards the River Beauly.

The remainder of the overland flows would be routed south eastward and overtop the access road outwith the site. A percentage of this runoff would follow the lower lying grounds along the road and rejoin the channel upstream of culvert C02 while the rest would flow into the channel downstream of C02 and discharge into the River Beauly.

Water contained in the channel would overtop the southern bank immediately downstream of culvert C01 and be directed east where it would rejoin the channel upstream of C02.

Under existing conditions model results indicate that the proposed locations for temporary and permanent works may be within the flood extents. Flood mitigation measures would therefore be required for the current development proposals within these areas.

### Proposed Mitigation Measures

To mitigate potential flood risk to the proposed development and existing sensitive receptors, the potential mitigation measures listed in **Table 4-2** below were assessed and the derived 1 in 200 year plus 42% climate change flood extents are shown in **Figure 4-3:**.

**Table 4-2: Proposed Mitigation Measures**

| Mitigation Measures |
| --- |
| • **Existing watercourse culverted underneath the proposed permanent access track**<br>• **Watercourse improvement works required upstream of the proposed permanent access track's culvert implemented**<br>• **Upsizing the channel downstream of the proposed permanent access track**<br>• **Upsizing of the existing 450mm culvert underneath the access track within the site (Structure Ref. C01) to a 1200mm culvert** |

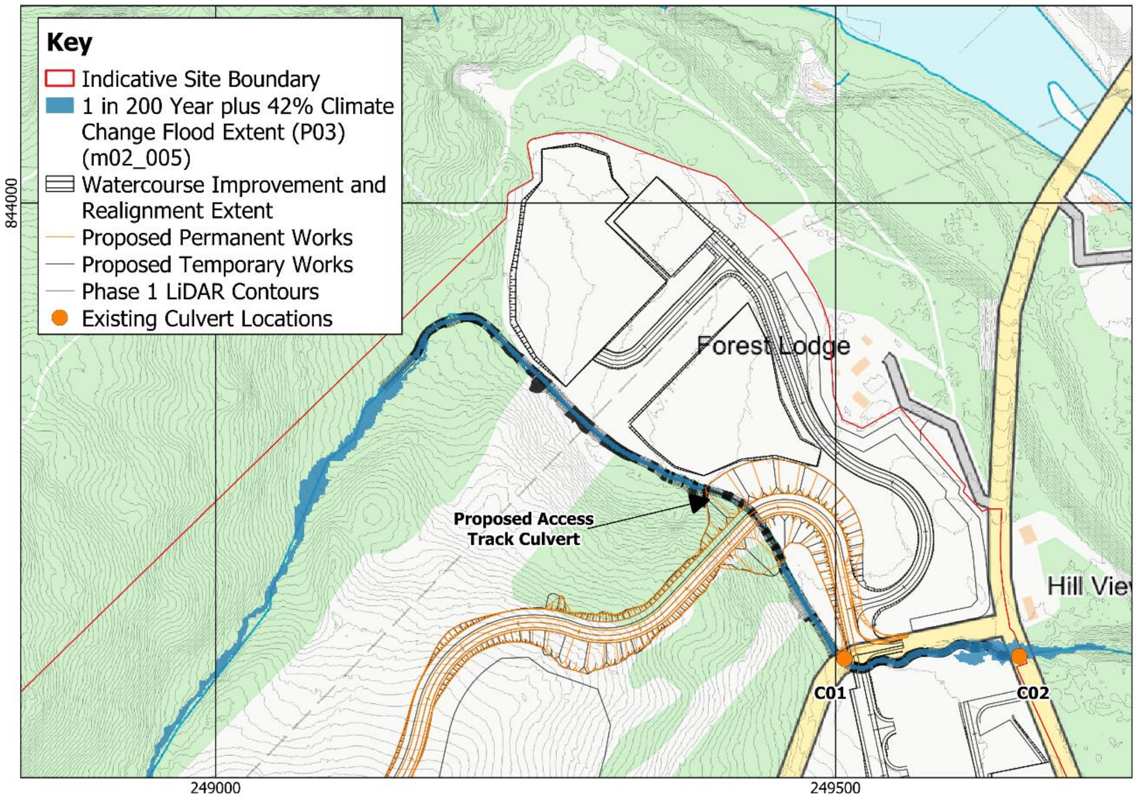


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**Figure 4-3: Proposed Mitigation 1 in 200 Year plus 42% Climate Change Flood Extents**

## 4-6 Sensitivity Testing

All hydraulic modelling carries a degree of uncertainty resulting from a variety of factors including inflows, roughness and downstream boundary slope. Sensitivity testing has therefore been carried out on the baseline model to assess how the model responds to variations in these parameters and in doing so better understand the risks.

The parameters tested include:

- Inflows – FEH RR peak flows adopted for the assessment
- Manning's Roughness – baseline Manning's n increased by 20%
- Downstream Boundary – baseline average slope decreased by 50%
- Culvert blockage – culverts assumed 50% blocked

Adopting the FEH RR peak flows results in similar flow routes to the baseline scenario with a slight increase in the flood extents. The impact on flood depth varies with location, with a maximum flood depth increase of 0.3 m in some areas. A comparison of the flood extents is shown in **Figure 4-4:**.

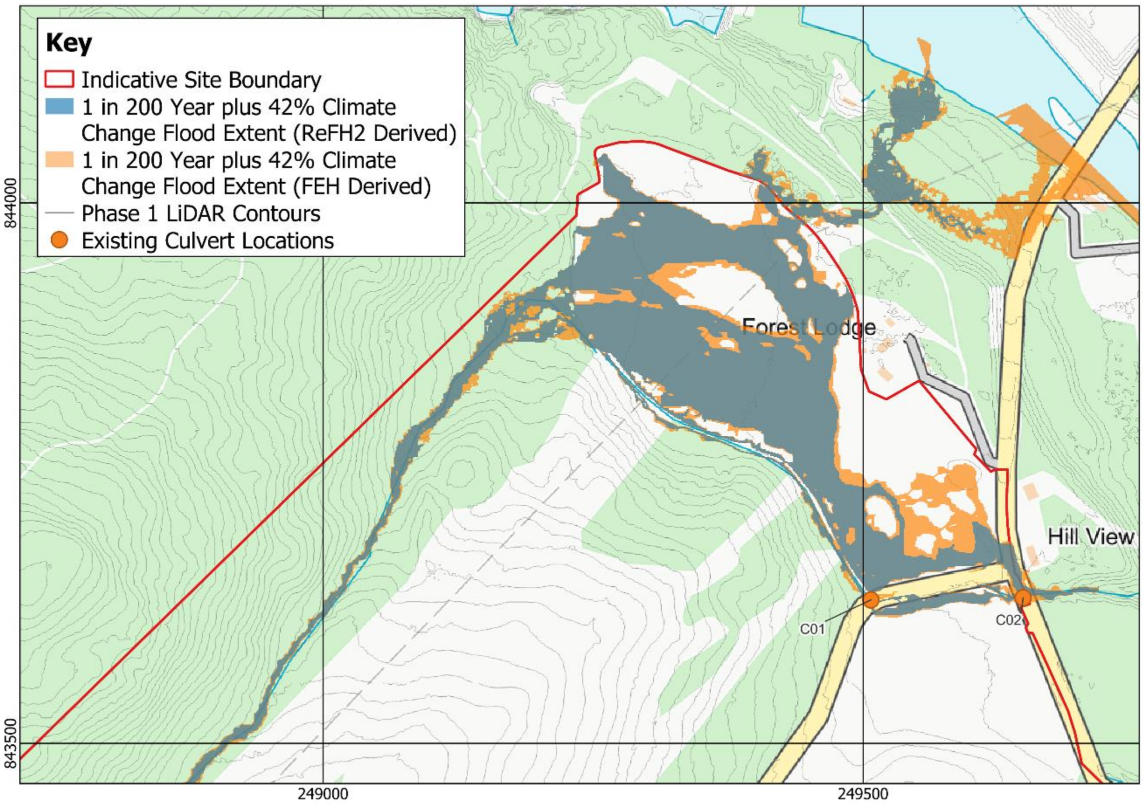


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**Figure 4-4: Comparison of the FEH Derived Flood Extents to the ReFH2 Derived Flood Extents for the Baseline Scenario (1 in 200 Year plus 42% Climate Change Scenario)**

The FEH RR peak flows were also tested for the proposed mitigation measures. The resulting flood extents predict similar flow routes to those derived using ReFH2 peak flows with a slight increase in the flood extents. The impact on flood depth varies with location, with a maximum flood depth increase of 0.3 m in some areas for both scenarios. All flows would be contained within the proposed two stage watercourse channel. A comparison of the flood extents is shown in **Figure 4-5:**.

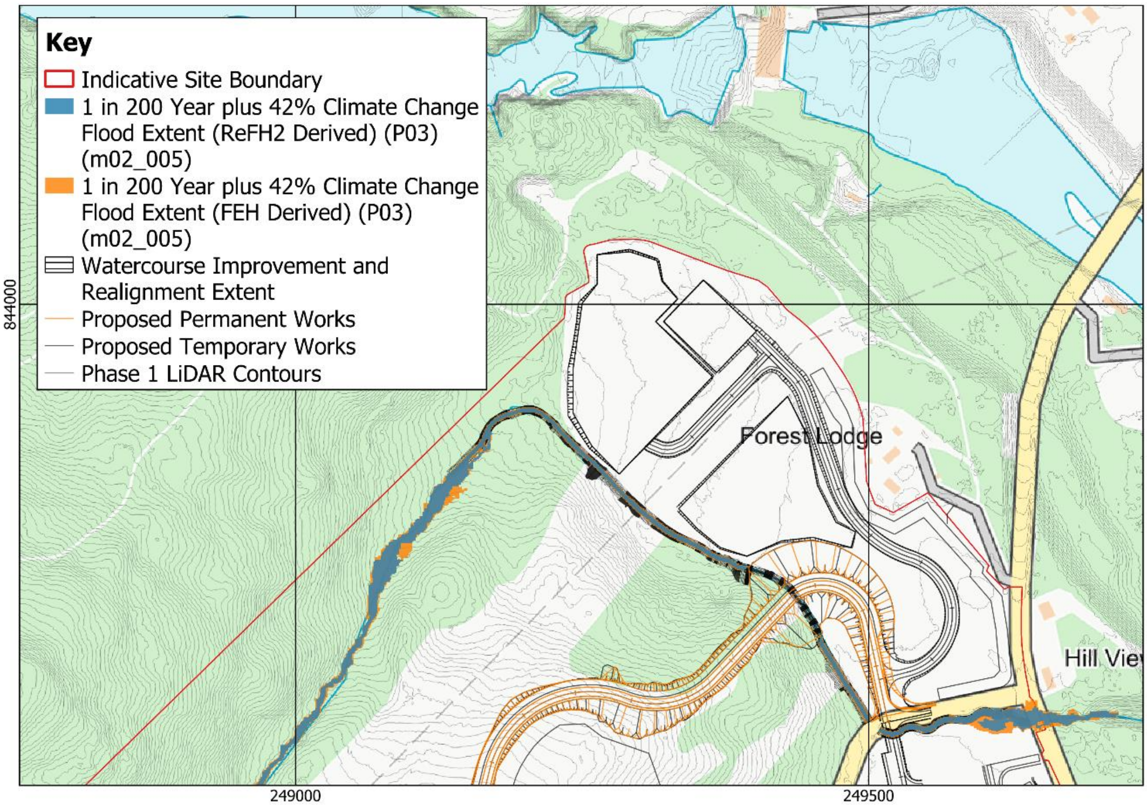




**Figure 4-5: Comparison of the FEH Derived Flood Extents to the ReFH2 Derived Flood Extents for Proposed Mitigation (1 in 200 Year plus 42% Climate Change Scenario)**

A 20% increase in the Manning's roughness results in similar flood extents to the baseline scenario with the flood depth increases within the model limited to a maximum of 0.05m. Therefore, the model is considered to have a low sensitivity to the Manning's roughness.

A 50% decrease in the average slope at the downstream boundary causes only localised flood depth increases at the downstream extent of the model. The average slope at the downstream boundary is relatively steep, therefore, flood depths throughout majority of the model remain unchanged.

A 50% blockage of Structure C01 under existing and proposed conditions would result in similar flood extents to the existing conditions. The flood depths upstream of the culvert are indicated to marginally increase (7 mm) while the depths downstream are likely to marginally decrease. Flood risk to from this source is considered to be low.

A 50% blockage of Structure C02 would result in similar flood extents to the existing conditions. The flood depths upstream of the culvert are indicated to marginally increase (5 mm) while the depths downstream are likely to marginally decrease. Flood risk to from this source is considered to be low.

The design of the proposed access road culvert is for a bottomless structure which spans the watercourse channel, with a width of 11 m and a height of 3 m.  The potential for blockage of this structure is considered to be low.  The potential impact of a blockage has been assessed by modelling a 50% blockage of the structure. Model results indicate that flood extents would be similar to the unblocked proposed scenario. The flood depths immediately upstream of the culvert are indicated to marginally increase (5 mm) while the depths immediately downstream are likely to marginally decrease. Flood risk from this source is considered to be low.

# Appendix 5 Additional Assessments

## 5-1 Introduction

Following the submission of the Flood Risk Assessment FNLN-LT459-FAI-DRAI-XX-RPT-W-001 Revision 02 SEPA provided correspondence (Reference: PCS-20006696, 19th September 2025) requesting additional information. The requested information is set out below.

## 5-2 Additional Information

### 5.2.1 SEPA Letter, Paragraph 1.4, a

**SEPA Comment**

*The previous FRA performed by SWECO for this application calculated the 1:200 year + climate change flow to be 0.93m$^3$/s, which we checked as being suitable for this assessment. This flow value should be used in further assessment unless otherwise suitably justified.*

**Fairhurst Response**

Fairhurst has undertaken an independent hydrological assessment using appropriate methods, which is documented in **Appendix 3**. A peak flow of 0.5 m$^3$/s based on the ReFH method was determined to be the most suitable and was therefore used as the basis of the analysis. However sensitivity tests were also undertaken using a peak flow of 1.5 m$^3$/s based on the FEH rainfall-runoff method. As set out in **Appendix 4** the results of the sensitivity test demonstrate that the proposed flood risk mitigation measures would be effective even when the higher 1.5 m$^3$/s flow is utilised.

The SWECO hydrological assessment using the ReFH2 method referred to in the SEPA correspondence resulted in a 1 in 200 year + climate change peak of 0.93 m$^3$/s. The SWECO assessment used a different 'donor catchment' to the Fairhurst assessment, however this is considered to be less suitable based on catchment characteristics, as exemplified by the proportional difference in catchment area compared to the study catchment. The differences are set out in **Table 5-1** and illustrated in **Figure 5-1:** below.

**Table 5-1: Hydrological Assessment Donor Catchment Comparison**

| Catchment | Catchment Area (km$^2$) |
|---|---|
| Study Catchment | 0.50 |
| Fairhurst Donor Catchment | 0.53 |
| SWECO Donor Catchment | 3.58 |

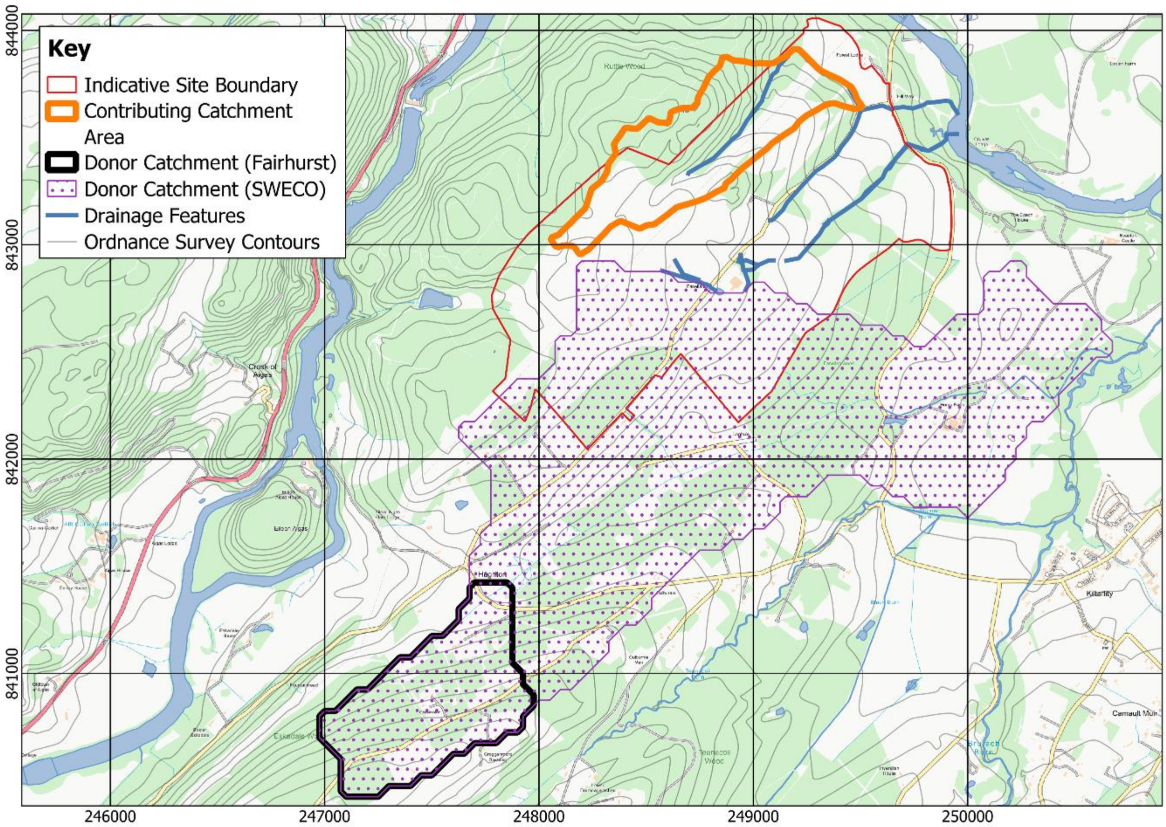




**Figure 5-1: Comparison of Donor Catchments**

Fairhurst has attempted to replicate the analysis undertaken by SWECO using the equivalent donor catchment and adjusting parameters in line with the values set out in Appendix B of the SWECO FRA. However the results indicate that the resultant 1 in 200 year + climate change peak flow was 0.73 $m^3$/s using FEH22 rainfall data, or 0.83 $m^3$/s using FEH 13 rainfall data, which differ from the 0.93 $m^3$/s stated in the SWECO FRA and in SEPA's recent correspondence.

The Fairhurst assessment of peak flows is considered to be robust and justifiable for use within this Flood Risk Assessment.

The above information notwithstanding, additional hydraulic modelling assessment has been undertaken utilising the 0.93$m^3$/s peak flow as requested by SEPA for both the existing and proposed mitigation scenarios. The associated flood extents are illustrated in **Figure 5-2:** and **Figure 5-3:**.

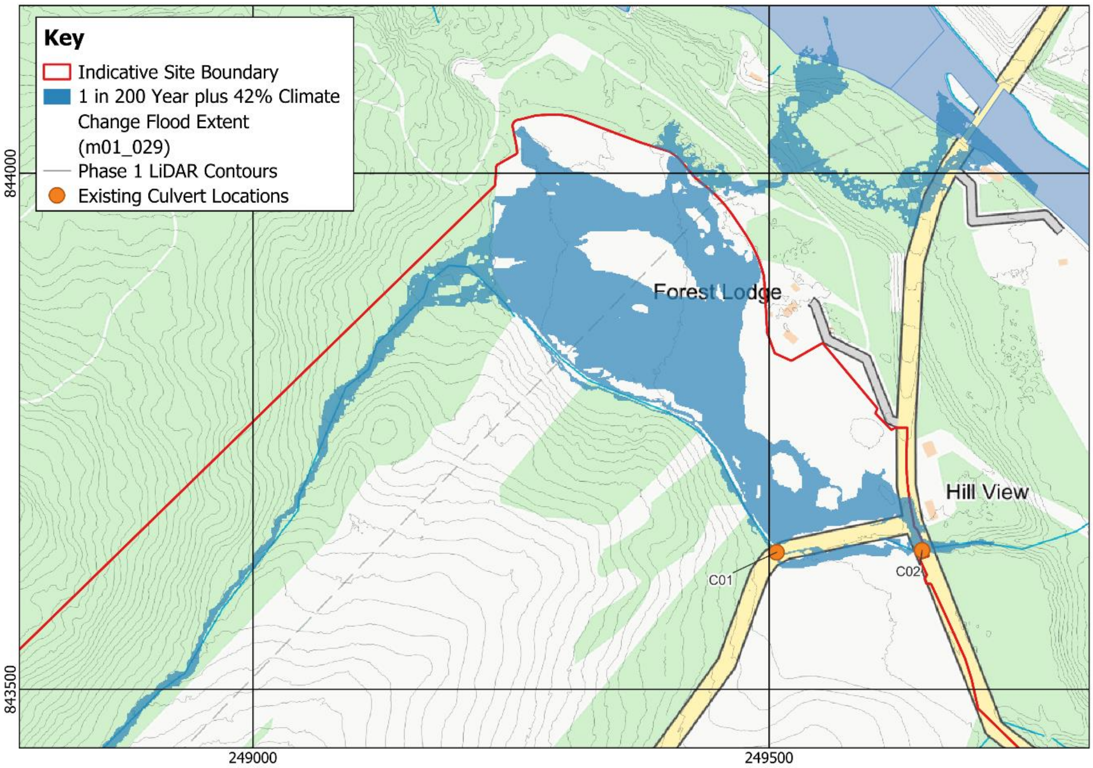


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**Figure 5-2: 1 in 200 Year plus 42% Climate Change Flood Extents – Baseline Scenario**

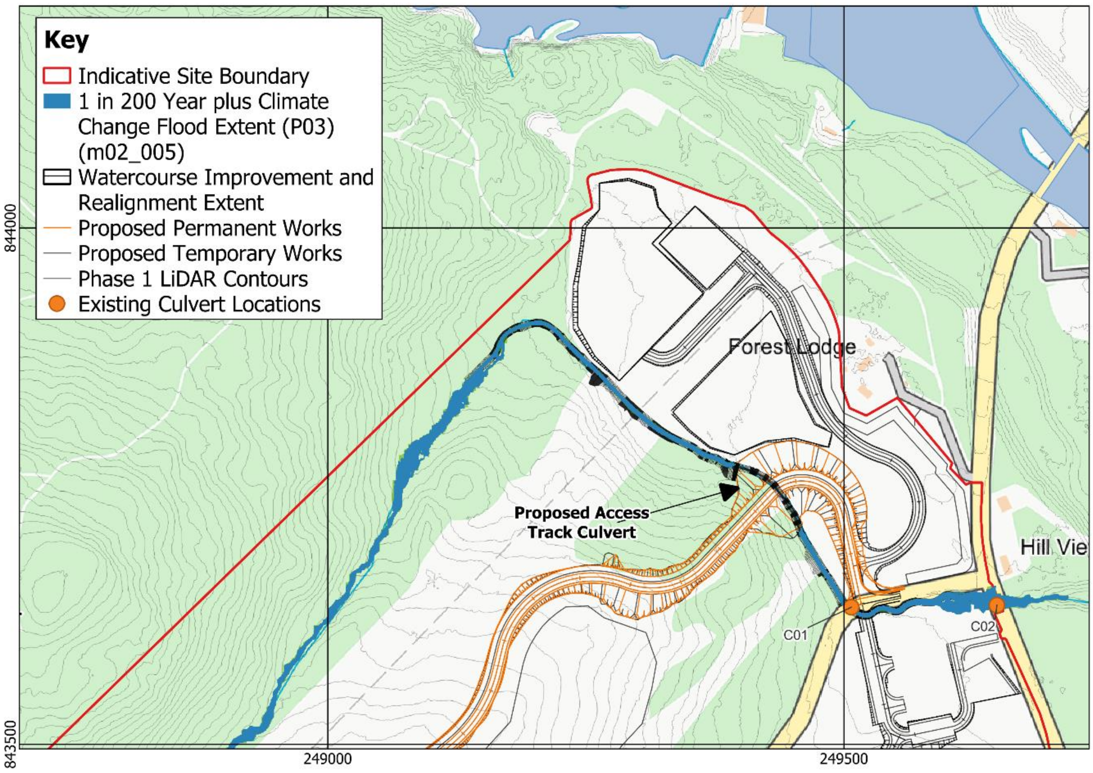


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**Figure 5-3: Proposed Mitigation 1 in 200 Year plus 42% Climate Change Flood Extents**

#### 5.2.2 SEPA Letter, Paragraph 1.4, b

**SEPA Comment**

*Discussion on the suitability of the topographical data and modelling methods used around the Hill View property for representing overland flowpaths.*

**Fairhurst Response**

Detailed topographic data is available which covers the majority of the hydraulic model domain, as shown in Drawing No. FNLN-LT459-FAI-ZZ-ZZ-SUR-C-0001 included at the end of this appendix. Beyond the extent of the detailed topographic survey Scottish Government Phase 1 LiDAR data is available and has been used within the hydraulic model. Checks have been undertaken which demonstrate that the LiDAR ground levels are consistent with the detailed topographic survey levels and are therefore reliable for use within the model. Furthermore there are no 'steps' between the two datasets at the data boundaries which could cause erroneous hydraulic outputs.

**Figure 5-4:** below provides a comparison of topographic survey and LiDAR levels in the vicinity of the Hill View property which demonstrates the close correlation. This also demonstrates that there is a slight rise from the road up to the boundary of the Hill View property. As the predicted overland flow in this area is shallow the level difference is sufficient to constrain flood extents in a 1 in 200 year + climate change event to the roadway without inundating the Hill View property. Additional information on flood risk in relation to the Hill View property is provided in subsequent sections.

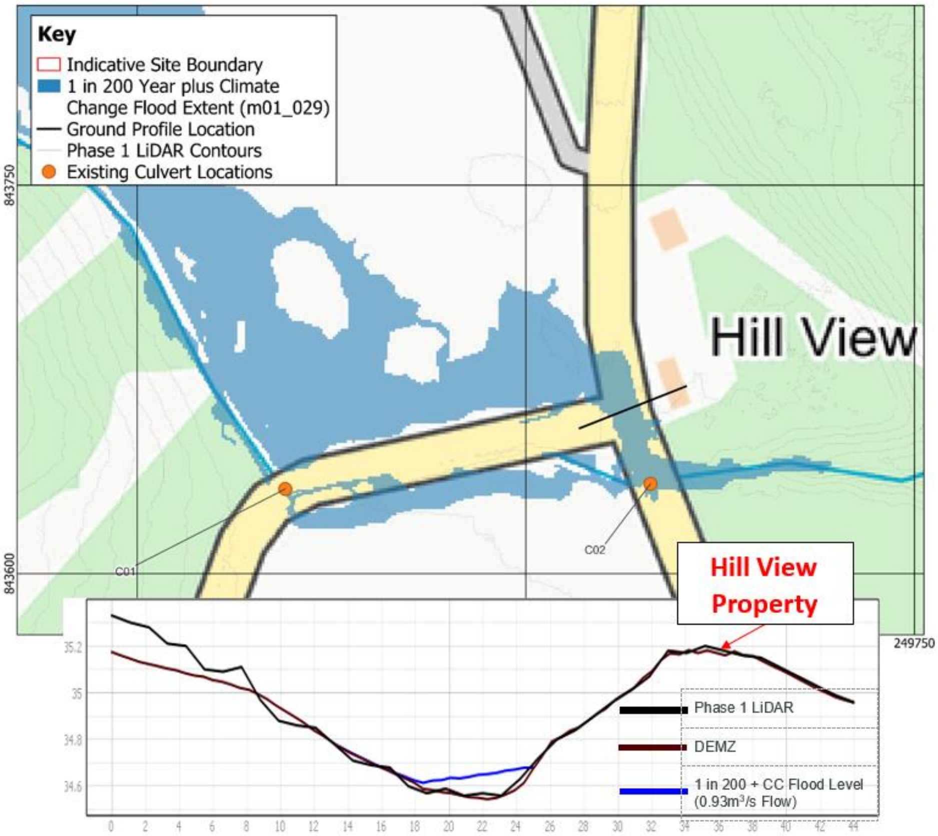




**Figure 5-4: Comparison of Existing Flood Levels to the Hill View Property Elevation**

## SEPA Comment

*Has cell size convergence testing been undertaken for the 2D model?*

## Fairhurst Response

Cell size convergence testing has been undertaken for the existing and proposed mitigation scenario by comparing a 1m cell size to a 0.5m cell size. For both scenarios there are marginal differences in flood levels (±0.002m in the baseline scenario and ±0.050m in the proposed mitigation scenario). This results in negligible differences in flood extents, as shown in the figures below. The choice of cell size used in the model is therefore considered to be robust.

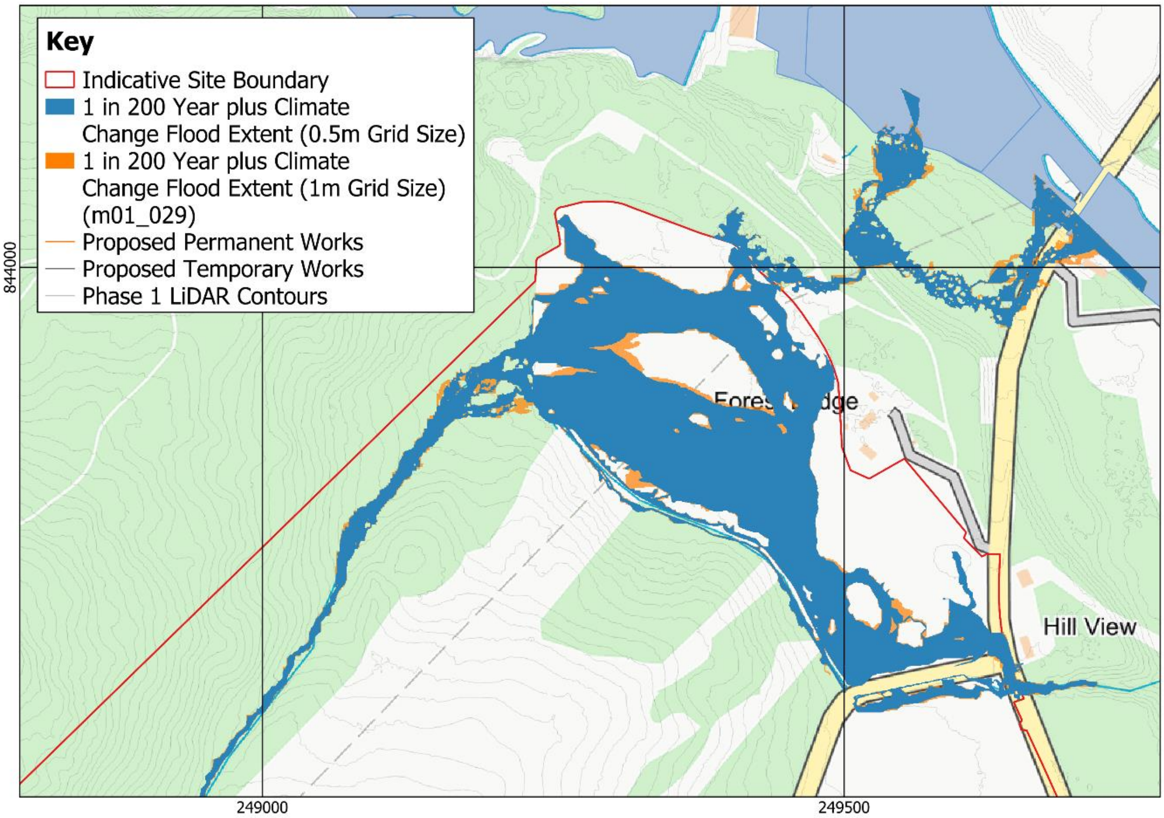


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**Figure 5-5: Comparison of the 1m Cell Size Flood Extents to the 0.5m Grid Size Flood Extents for the Baseline Scenario (1 in 200 Year plus 42% Climate Change Scenario)**

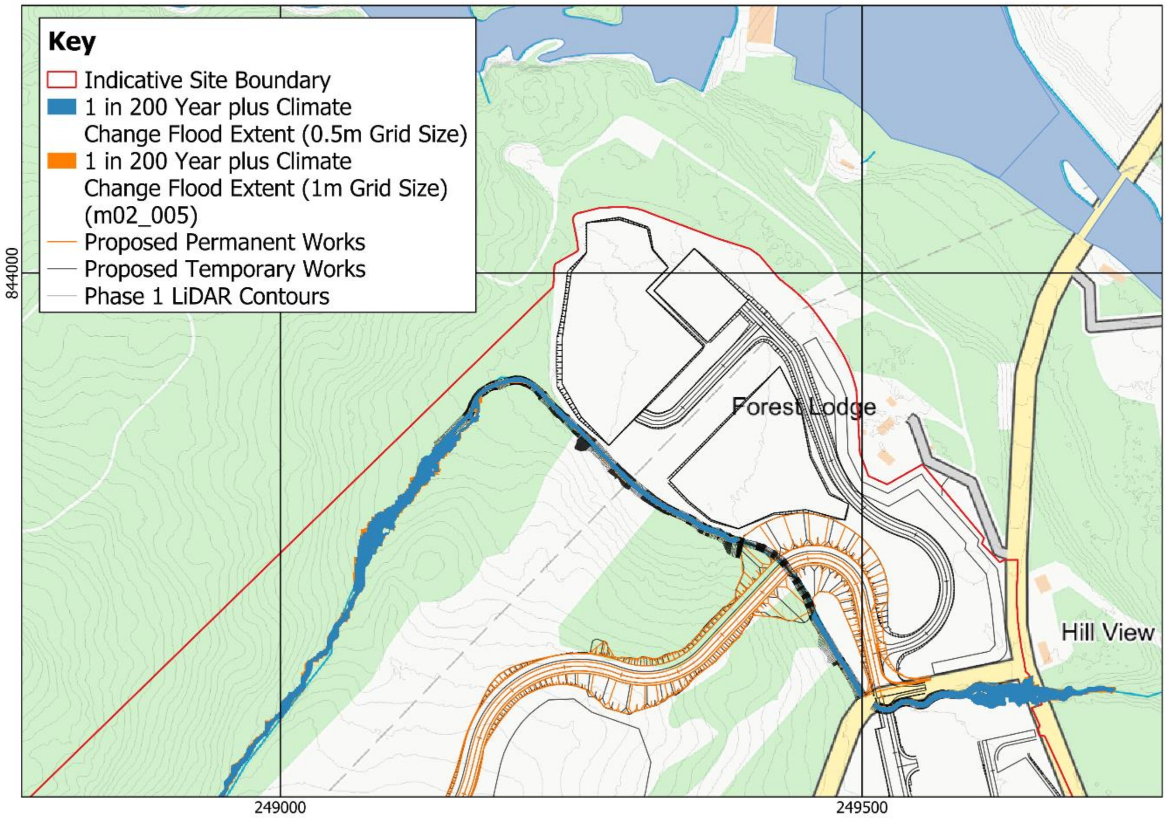


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**Figure 5-6: Comparison of the 1m Cell Size Flood Extents to the 0.5m Grid Size Flood Extents for the Proposed Mitigation (1 in 200 Year plus 42% Climate Change Scenario)**

### 5.2.3 SEPA Letter, Paragraph 1.4, c

**SEPA Comment**

*Presentation of the topographic survey data used within the model.*

**Fairhurst Response**

Details of the topographical survey data used within the model is provided in Drawing No. FNLN-LT459-FAI-ZZ-ZZ-SUR-C-0001 at the end of this appendix.

### 5.2.4 SEPA Letter, Paragraph 1.4, d

**SEPA Comment**

*Pre and Post development modelled extents for 100% blockage at culvert C02.*

**Fairhurst Response**

A 100% blockage of the culvert C02 has been assessed for both the existing and proposed mitigation scenarios using a peak flow of 0.93$m^3$/s. In both instances, results indicate a marginal increase in the flood extents immediately upstream of the structure and along the access track compared to a 0% blockage scenario. The resulting flood extents are indicated in **Figure 5-7:** and **Figure 5-8:**.

The results demonstrate that the Hill View property is not at risk of flooding in a 1 in 200 year + climate change event with 100% blockage of culvert C02 and that the proposed mitigation measures would reduce flood extents in the vicinity of the property compared to existing.




**Figure 5-7: Comparison of the 100% blockage of culvert C02 Flood Extents to the unblocked culvert Flood Extents for the Baseline Scenario (1 in 200 Year plus 42% Climate Change Scenario)**

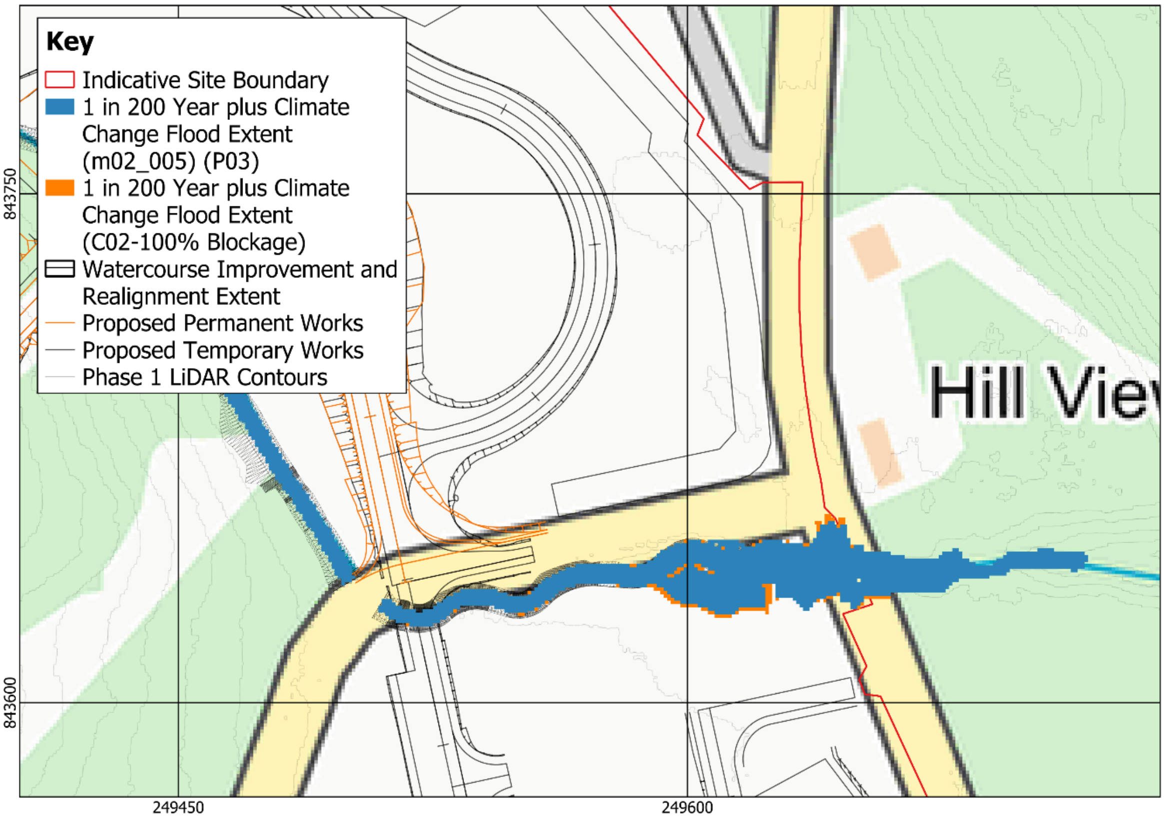





**Figure 5-8: Comparison of the 100% blockage of culvert C02 Flood Extents to the unblocked culvert Flood Extents for the Proposed Mitigation (1 in 200 Year plus 42% Climate Change Scenario)**

### 5.2.5 SEPA Letter, Paragraph 1.4, e

**SEPA Comment**

*Flood level information should also be presented for 0% blockage, 50% blockage and the 100% blockage pre and post development scenarios. Ideally these could also be compared to the minimum elevation of the Hill View property.*

**Fairhurst Response**

**Based on the LiDAR data the minimum elevation of the existing property at Hill view is 35.05 mAOD.** The topographical survey extends up to boundary of the property at Hill View and does not include levels within the property; however, as noted previously checks have been undertaken which demonstrate that the LiDAR ground levels are consistent with the detailed topographic survey levels where there is an overlap, indicating that LiDAR in the vicinity of the property is reliable.

The flood levels for the 0%, 50% and 100% have been extracted from the model results at the locations shown in **Figure 5-9**:, and these are provided in **Table 5-1**.

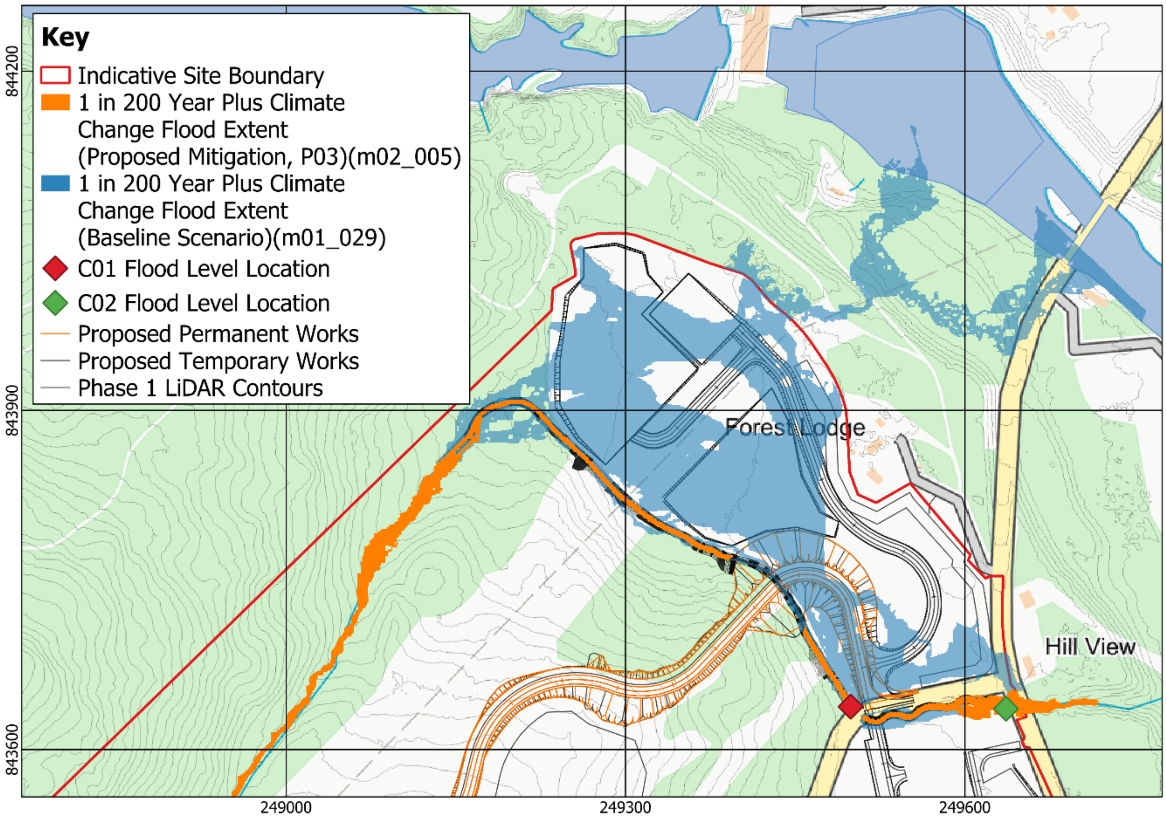





**Figure 5-9: Location of Flood Level Blockage Results Sampling Points for the Existing and Proposed Mitigation Scenarios**

**Table 5-1: Flood Levels Upstream of the Modelled Structures for a Range Of Blockage Scenarios (0.93 m$^3$/s flow)**

| Blockage Percentage (%) | Baseline Scenario | | Proposed Mitigation | |
|---|---|---|---|---|
| | Flood Levels upstream of C01 (mAOD) | Flood Level upstream of C02 (mAOD) | Flood Levels upstream of C01 (mAOD) | Flood Level upstream of C02 (mAOD) |
| **0** | 35.90 | 34.22 | 34.99 | 34.58 |
| **50** | 36.03 | 34.18 | 35.10 | 34.60 |
| **100** | 36.12 | 34.51 | 36.12 | 34.61 |

#### 5.2.6 SEPA Letter, Paragraph 1.4, f

**<u>SEPA Comment</u>**

*Confirmation of whether any of the modelling parameters and advanced parameters been changed from the default. If so, has it been justified?*

**<u>Fairhurst Response</u>**

The assessment has been carried out using the default modelling parameters and advanced parameters.

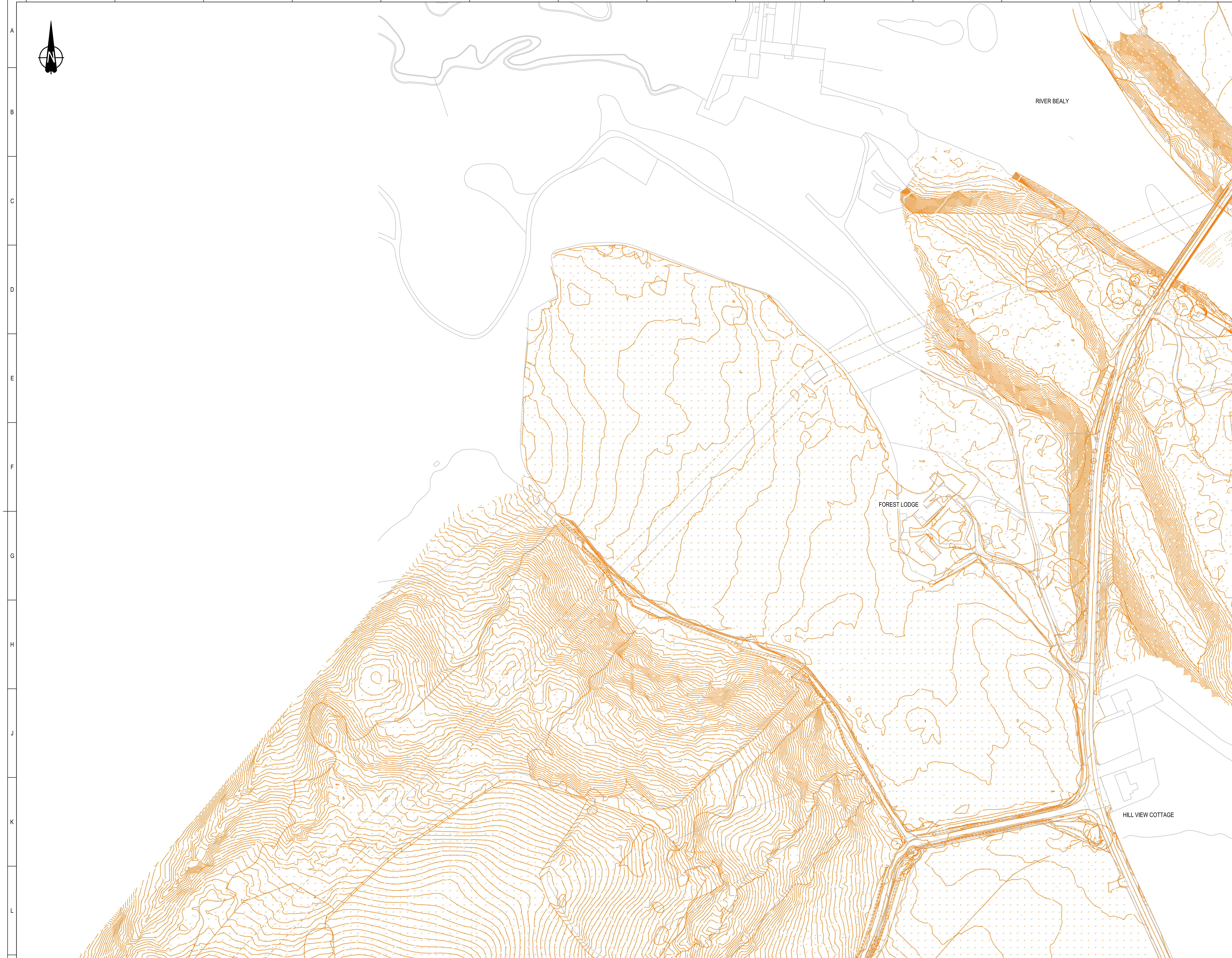
#### 5.2.7 SEPA Letter, Paragraph 1.4, g

**<u>SEPA Comment</u>**

*How have hydraulic structures been modelled? Of particular interest is culvert C02.*

**<u>Fairhurst Response</u>**

All hydraulic structures have been modelled as ESTRY culvert units and are based on surveyed or designed dimensions and levels.






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

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
(REFER TO CDM REGISTER GRNS4-LT379-SEBAM-ZZ-EXT-REG-OS-0001)

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
N/A

MAINTENANCE / CLEANING RISK
N/A

DECOMMISSIONING / DEMOLITION RISK
N/A

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| P01.01 | 01/10/25 | SM | CG | CG | FIRST ISSUE |

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Substation Delivery Framework

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Scottish & Southern Electricity Networks
TRANSMISSION

PROJECT:
LT459-FANELLAN 400kV SUBSTATION

PROJECT NUMBER: FNLN-LT459 | LOCATION: FANELLAN

TITLE:
EXTENT OF TOPOGRAPHICAL INFORMATION

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