



TECHNICAL APPENDIX 12.2: FLOOD RISK ASSESSMENT



Netherton Hub, Aberdeenshire

Flood Risk Assessment

Prepared on behalf of **SSEN Transmission**



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1 Introduction

1.1 Scope of Report

- 1.1.1 This Flood Risk Assessment (FRA) has been produced by Stantec UK ('Stantec') on behalf of our client, Scottish and Southern Electricity Networks ('SSEN'), to support an outline planning application for the Netherton Hub ('the proposed development') on land at Flushing, Peterhead, Aberdeenshire ('the site').
- 1.1.2 The main objectives of this report are to assess the risk of flooding from all possible sources, including fluvial, surface water, coastal, groundwater and the public sewer system.
- 1.1.3 The report is based on the available flood risk information for the site as detailed in Section 1.2 and prepared in accordance with the planning policy requirements set out in Section 1.3.
- 1.1.4 Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The authors and reviewers of the document are experienced engineers and members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).

1.2 Sources of Information

- 1.2.1 This FRA has been prepared based on the following sources of information:
- Scottish Environment Protection Agency (SEPA) Online Flood Maps¹
 - SEPA National Flood Risk Assessment 2018
 - British Geological Survey (BGS) Mapping²
 - National Soil Map of Scotland³

1.3 Relevant Planning Policy

National Planning Framework 4

- 1.3.1 Scottish Government planning policy on flooding is provided by the recently updated National Planning Framework 4 (NPF4) which now incorporates updated Policy 22 on Flood Risk and water management. This policy is based on the following principles:
- Developers and planning authorities must give consideration to the possibility of flooding from all sources;
 - New development should be free from significant flood risk from any sources;
 - In areas characterised as "medium to high" flood risk for watercourses and coastal flooding, new development should be focused on built up areas and all development must be safeguarded from the risk of flooding;

¹ SEPA Online Flood Maps [ArcGIS Web Application](#)

² BGS Geological Survey Mapping [BGS Geology Viewer - British Geological Survey](#)

³ National Soil Map of Scotland [Scotland's Soils - soil maps \(environment.gov.scot\)](#)

- The storage capacity of functional flood plains should be safeguarded from further critical equipment. The functional floodplains comprise areas generally subject to an annual probability of flooding greater than 0.1% (1 in 1000 year return period event).
- 1.3.2 Drainage is a material consideration and the means of draining a development should be assessed. Any drainage measures proposed should have a neutral or better effect on the risk of flooding both on and off the site.
- 1.3.3 The Risk Framework approach identifies flood risk in three main categories:
- Little or no risk area (annual probability of flooding less than 0.1%): No constraints to development due to flood risk.
 - Low to medium risk area (annual probability of flooding between 0.1% and 0.5%): Usually suitable for most developments but not essential civil infrastructure such as hospitals, fire stations, emergency depots, etc., schools, care homes and ground-based electrical telecommunications equipment unless subject to an appropriate long term flood risk management strategy.
 - Medium to high risk area (annual probability of flooding greater than 0.5%): Generally not suitable for essential civil infrastructure, commercial and residential developments. If development is permitted, appropriate measures to manage flood risk will be required which may include existing formal flood defences or those in construction.

SEPA Guidance

- 1.3.4 SEPA has issued guidance in relation to preparing FRAs (SEPA, 2022). Technical requirements for FRAs depend on the complexity of the site with more complex or high-risk sites requiring detailed assessments. In summary, FRAs must include the following:
- Background site data, including suitable plans and/or photographs;
 - Historic flood information;
 - Description of methodologies used;
 - Identification of relevant flood sources;
 - In the case of river flooding: assessment of river flows, flood levels, depths, extents, displaced flood storage volumes, etc;
 - Assessment of culverts, sewers or other structures affecting flood risk;
 - Consideration of climate change impacts;
 - Details of required flood mitigation measures; and
 - Conclusions on flood risk related to relevant national and local policies.
- 1.3.5 In addition to reporting requirements, the document also provides technical guidance on Flood Estimation Handbook (FEH) (CEH, 2022) methodologies and on land raising and compensatory storage.

Aberdeenshire Council Guidance & Policies

- 1.3.6 Aberdeenshire Council's 'Local Development Plan', released in 2023, provides guidance with regards to flooding in Policy C4: Flooding.

- 1.3.7 This guidance states that development should not increase flood risk vulnerability and should avoid areas of medium to high risk, functional floodplain or other areas where the risks are otherwise assessed as heightened or unacceptable except where:
- It is a development to alleviate flooding or erosion of riverbanks or the coast;
 - It is consistent with the flood storage and conveyance function of a floodplain;
 - It would otherwise be less affected by flooding (such as a play area or car park);
 - It is essential infrastructure. The location is essential for operational reasons for example for water-based navigation, agriculture, transport or utilities infrastructure and an alternative lower risk location is not available.
- 1.3.8 Further to this guidance, Aberdeenshire Council's 'North East Local Flood Risk Management Plan 2022-2028', released in 2022. The Plan supplements SEPA's North East Flood Risk Management Strategy and presents actions to avoid and reduce the risk of flooding and prepare and protect communities within the Potentially Vulnerable Areas (PVAs) and across the Local Plan District (LPD).

1.4 Caveats & Exclusions

- 1.4.1 This report has been prepared solely for this development. Therefore, no responsibility is accepted to any third party for all or any part of this report in connection with any other development.
- 1.4.2 No hydraulic modelling has been undertaken as part of this flood risk assessment, with results of previous assessments and analyses being used to inform the risk.
- 1.4.3 The areas stated in this document are indicative only and should not be considered as binding maxima and minima.

2 Site Setting

2.1 Site Description

2.1.1 The site of interest is a broadly square parcel of land approximately 222ha in area, located west to Peterhead to the southern edge of Flushing, Aberdeenshire in Scotland (**Figure 2-1**).



Figure 2-1 Netherton SSEN Proposed Development Site Boundary

2.1.2 The site is located approximately 7.5 km west of Peterhead. The northern boundary of the site is the A950 Longside Road which also borders the village of Flushing. The Burn of Faichfield is located approximately 500m to the East and the Burn of Ludquharn is located circa 450m to the West of the site.

2.1.3 A track cuts across the site boundary from west to east.

Topography

2.1.4 The topography of the site increases as you move from the north to the south. Ground levels as high as c.70m AOD can be found towards the south of the site, falling to c.30m AOD in the north.

2.2 Hydrological Setting

- 2.2.1 The closest waterbodies are the Burn of Faichfield, which borders the eastern edge of the site and the Burn of Ludquharn, bordering the western edge of the site. Both burns are approximately 500m from the boundaries of the site.
- 2.2.2 Another watercourse, the South Ugie Water, is located north of the A950 road, approximately 2km from the site's northern most point.

2.3 Geology & Hydrogeology

Bedrock Geology

- 2.3.1 The BGS Geology of Britain viewer indicates that the bedrock geology of the site is predominantly igneous formed during the Ordovician Period. The Forest of Deer Pluton (formed between 485.4 and 443.8 million years ago) dominates the whole area of the site.

Drift Deposits

- 2.3.2 The superficial geology of the site is varied.
- 2.3.3 On the majority of the site, the superficial geology is predominantly till (diamicton) of the Quaternary period, formed between 116 and 11.8 thousand years ago.
- 2.3.4 The northern portion of the site Glaciofluvial sheet deposits (gravel, sand and silt) formed between 2.588 million years ago and present.

Soils

- 2.3.5 The National Soil Map of Scotland shows that the site is underlain by gleys, which have been derived from intermediate rocks or mixed acid and basic rocks, both metamorphic and igneous. Gley soils do not drain well.

Hydrogeology

- 2.3.6 Hydrogeological mapping provided by the BGS shows that the site is underlain by the intrusive rock unit, which allows some groundwater to near surface in shallow cracks and joints opened by weathering.

2.4 Land Use

- 2.4.1 At present, the site consists of agricultural land. It is classified by Aberdeenshire Council as private farmland.

3 Proposed Development

- 3.1.1 As previously mentioned, the current land use of the site is agricultural.
- 3.1.2 It has been proposed that the site become a new strategic transmission hub.
- 3.1.3 At the stage of conducting this flood risk assessment, the development proposal is high level, and the exact site hectares remains to be determined.

4 Overview Of Flood Risk

- 4.1.1 A flood risk framework to guide development outlines three categories for coastal and river/watercourse flooding. These categories are:
- **Little or no risk:** annual probability of coastal or watercourse flooding is less than 0.1% (1 in 1000 years)
 - **Low to medium risk:** annual probability of coastal or watercourse flooding is between 0.1% and 0.55 (1 in 1000 years to 1 in 200 years)
 - **Medium to high risk:** annual probability of coastal or watercourse flooding is greater than 0.5% (1 in 200 years)
- 4.1.2 The SEPA online flood risk maps have been developed to illustrate flood risk from fluvial, pluvial, and coastal sources in Scotland, with land areas categorised based on the criteria above. The extents shown on the SEPA flood maps are indicative only and therefore should not be considered as binding maxima or minima.
- 4.1.3 It should be noted that the SEPA flood maps do not consider fluvial flood risk for small watercourses that have a catchment area of less than 3km². However, pluvial flood risk is often a good indicator of fluvial flood risk for these smaller catchment watercourses.

4.2 Sources of Flooding

River & Watercourse (Fluvial) Flooding

- 4.2.1 River flooding, also referred to as fluvial flooding, occurs when a watercourse becomes overwhelmed or obstructed and bursts its banks.
- 4.2.2 The Burn of Faichfield flows in a generally northern and occasionally easterly direction 500m to the eastern boundary of the site as shown in **Figure 4-1** below. The SEPA flood map shows that with low, medium and high likelihood, the extent of flooding does not reach the eastern part of the site. Therefore, it has been considered that the site is to be at very low risk of flooding from Burn of Faichfield.
- 4.2.3 The Burn of Ludquharn flows in a generally northern direction until it reaches the South Ugie Water and sits approximately 500m from the western boundary of the site as can be seen in **Figure 4-1**. The SEPA flood map shows that for all flooding likelihoods (from low to high), the extent of flooding does not reach the western part of the site. Consequently, it has been considered that the site is to be at very low risk of flooding from Ludquharn Burn.
- 4.2.4 The South Ugie Water, located on the other side of the A950 road to the north of the site, approximately 2km away from its northern most point. The SEPA flood maps show the extent of flooding for all flooding likelihoods does not reach the northern part of the site. There is therefore very low risk of flooding from South Ugie Water.
- 4.2.5 The southern boundary of the site south of the track is not considered to be at risk of fluvial flooding due to the rising topography.

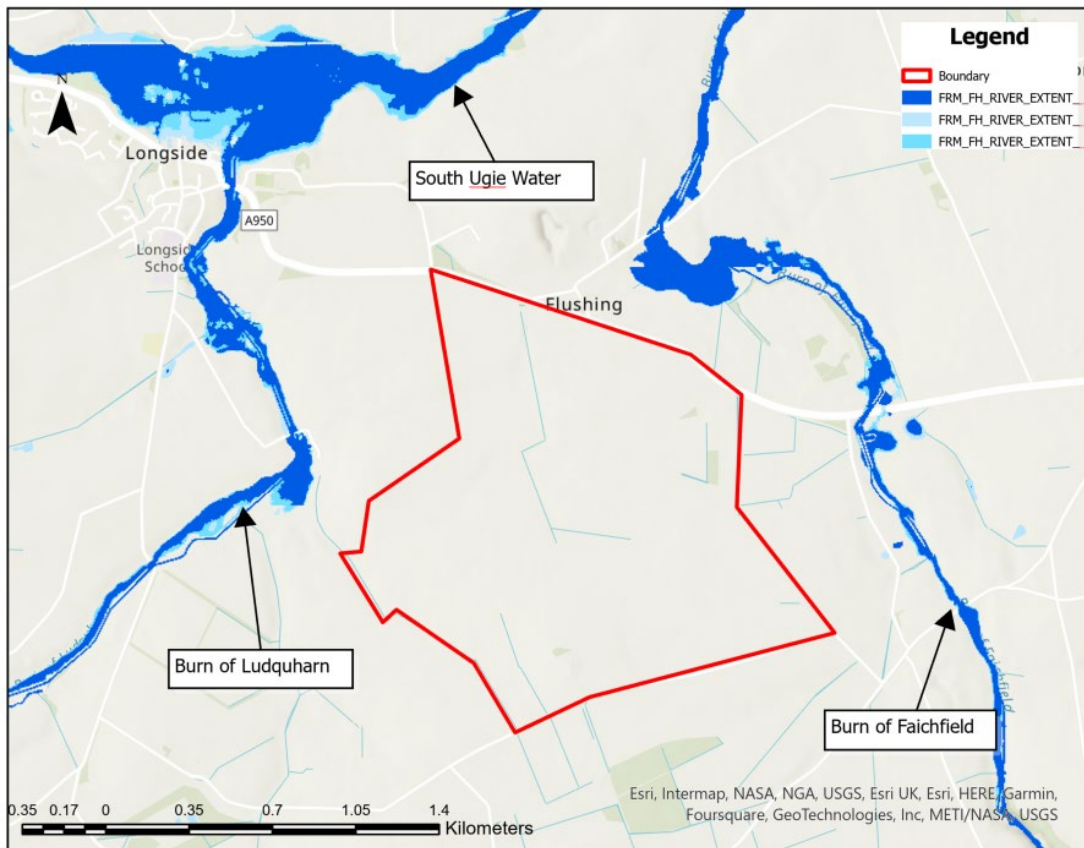


Figure 4-1 SEPA Flood Map Fluvial Extents

4.2.6 Fluvial flood risk to the site is therefore considered to be **very low risk**.

Surface Water (Pluvial) Flooding

4.2.7 Surface water flooding, otherwise referred to as pluvial flooding, is flooding that occurs due to rainfall-generated overland flow before the runoff enters any watercourse, drainage, or sewer system.

4.2.8 As shown in **Figure 4-2** below, the SEPA flood maps show a patch of land to the north of the site and adjacent to the A950 road near Flushing where there is a risk of pluvial flooding where there is a local topographic low.

4.2.9 A few very minor spots of pluvial flooding are also indicated in the middle and southern side of the site, where there is a slight flattening of the topography.

4.2.10 Identified areas of pluvial flooding are indicated as being associated with a varying degree of risk from low to high. Overall, pluvial flood risk is therefore considered to be **medium to high**, particularly in the land to the north of the site.

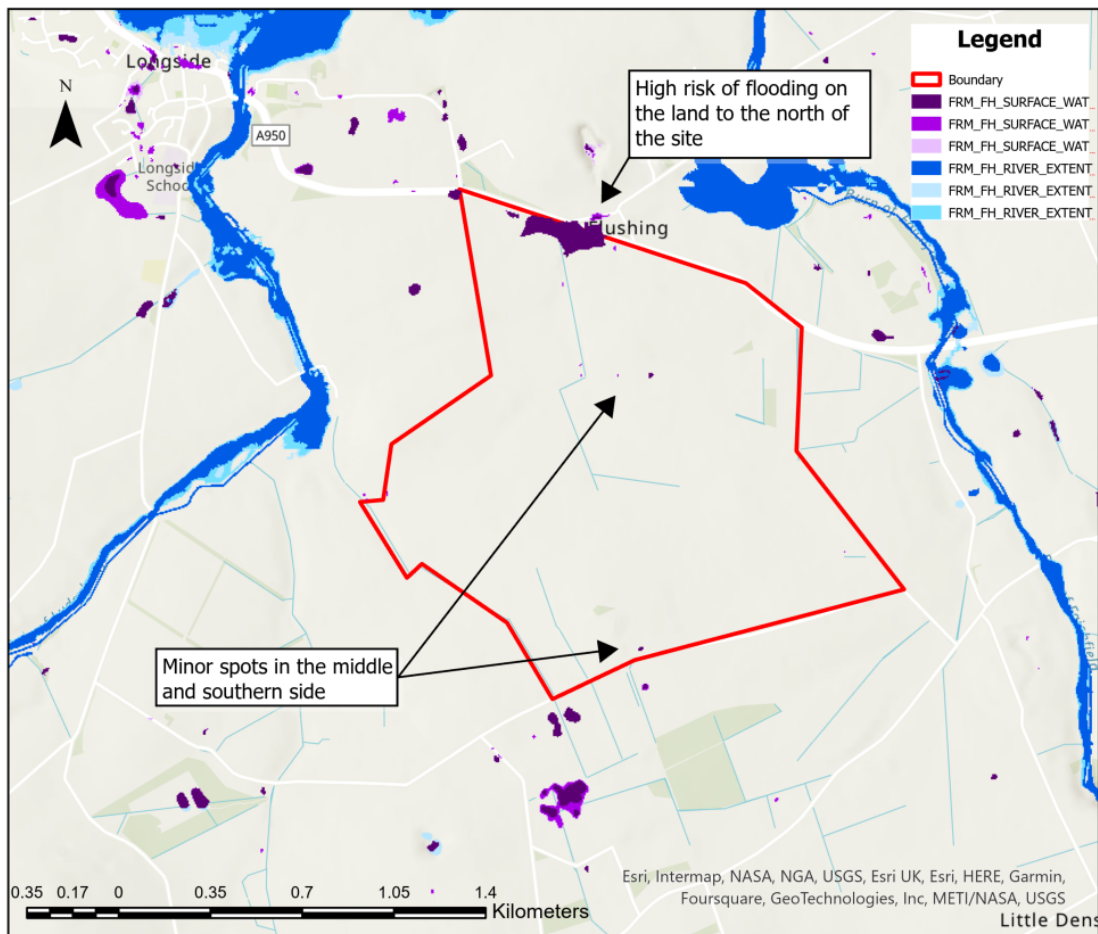


Figure 4-2 SEPA Flood Maps Extents

Coastal Flooding

- 4.2.11 Coastal flooding occurs when low-lying coastal land is overwhelmed by extreme sea levels. Extreme sea levels typically occur due to a combination of four key factors: large waves, high astronomical tides, storm surges, and relative mean sea level.
- 4.2.12 Review of the SEPA online flood risk maps confirm that the development area is not at any risk from coastal flooding, due to it not being within proximity to the coast.
- 4.2.13 As such, flooding from coastal sources is **not considered a risk**.

Groundwater Flooding

- 4.2.14 Groundwater flooding occurs when water rises from the underlying rocks or flows from springs. In Scotland groundwater is usually classified as a contributing factor to flooding, rather than the primary source.
- 4.2.15 SEPA's online flood maps highlight areas where groundwater flooding would influence the duration and extent of flooding from other sources. There is no evidence of groundwater flooding at the site shown on the SEPA Flood Maps.
- 4.2.16 Groundwater flood risk across the site is therefore **low**.

Sewer Flooding

- 4.2.17 Sewer flooding is caused when a drain or sewer becomes full due to heavy rain or a blockage and overflows.
- 4.2.18 The Scottish Water Improving Urban Waters High Priority Assets consists of 108 high priority assets that have been identified as unsatisfactory with regards to sewer overflows and prioritised for improvement. A review of this list found that there were no high priority assets located within the development area.
- 4.2.19 Furthermore, a review of Scottish Water Reported Overflow Event Data to SEPA during the period of 2018-2022 found that no reported overflow events occurred within the vicinity of the site.
- 4.2.20 No records of flooding from sewers within the development area have been received from consultation undertaken for this assessment. As such it is considered that flood risk from sewer flooding is **low**.

4.3 Recommendations

- 4.3.1 Overall, it is deemed that there is a local patch of land that is subject to **medium to high flood risk from pluvial sources** as shown in **Figure 4-2**, and it is recommended that this patch of land is avoided for development.
- 4.3.2 Additional minor spots of pluvial flood risk are all considered too small to provide any meaningful flood risk, but should still be considered as part of the overall layout of the site. These locations may offer useful settings for SuDS and perhaps fire water ponds.
- 4.3.3 **Fluvial, groundwater, coastal and sewer flooding** are not considered to offer a risk to the site being of **very low and no risk**.

5 Conclusions

- 5.1.1 This flood risk assessment was undertaken for the Netherton Hub located to the west of Peterhead, Aberdeenshire.
- 5.1.2 A desktop assessment was undertaken to assess flood risk from fluvial, pluvial, coastal, groundwater, and sewer system sources.
- 5.1.3 The development site has been deemed to be at **low risk** of flooding from fluvial, coastal, groundwater and sewer sources.
- 5.1.4 A patch of land to the north of the site is associated with a **medium to high risk** of pluvial flooding, as it sits at a topographic low within the site.
- 5.1.5 It is therefore advised that the patch noted towards the northern boundary of the site is avoided for critical infrastructure. This area and the other noted very minor spots of land may be suitable for the incorporation of SuDS into the proposed development.

6 References

CEH (2022). Flood Estimation Handbook (FEH) Web Service. Centre for Ecology & Hydrology. Available at: <https://fehweb.ceh.ac.uk/>.

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