Holm Hill Substation

Environmental Appraisal

Chapter 5: Hydrology, Hydrogeology Geology and Soils

November 25

Land & Planning

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5.1 Introduction

5.1.1 This Chapter of the Holm Hill Substation (hereby referred to as the 'Proposed Development') Environmental Appraisal (EA) considers the potential effects of the Proposed Development on geology, hydrology, hydrogeology and soils. For each of these topics, this Chapter sets out a baseline description, identifies and appraises the potential for adverse effects on identified receptors taking into account the successful implementation of embedded mitigation. The potential effects considered in this EA are as follows:

- Hydrology – changes to drainage regime and associated alteration to surface water runoff rates and volumes, erosion/sedimentation, and water quality characteristics throughout the Proposed Development and the wider catchment. Changes to quality and quantity of water resources supporting public and private water supplies are also considered.
- Hydrogeology – changes to groundwater infiltration and groundwater levels, water quality, Groundwater Dependent Terrestrial Ecosystems (GWDTE) and wetland characteristics. Changes to quality and quantity of water resources supporting water supplies are also considered.
- Geomorphology and geology – geomorphological characteristics of the land around the Proposed Development and changes to geological structures or effects on designated sites.
- Soils and peat – changes to soil and peat characteristics related to erosion, compaction, and soil quality, and changes to peat stability within and immediately adjacent to the Proposed Development.

5.1.2 This geology, hydrology, hydrogeology and soils chapter should be read in conjunction with the following supporting documents;

- **Appendix 5.1: Soil & Peat Management Plan (SPMP);**
- **Appendix 5.2: Private Water Supply Risk Assessment (PWSRA);**
- **Figure 5.1: Hydrology Overview**; and
- **Figure 5.2: Peat Depths and Conditions**.

5.2 Legislation, Policy and Guidance

Legislation

5.2.1 This EA is carried out in accordance with the principles contained within the following legislation:

- The Water Environment and Water Services (Scotland) Act 2003[1];
- Environmental Authorisations (Scotland) Regulations (EASR) 2018 as amended by the Environmental Authorisations (Scotland) Amendment Regulations 2025[2];
- The Private Water Supplies (Scotland) Regulations 2006[3];
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017[4]; and

[1] Water Environment and Water Services (Scotland) Act 2003. asp 3 Available at: https://www.legislation.gov.uk/asp/2003/3/contents [Accessed October 2025]

[2] The Environmental Authorisations (Scotland) Amendment Regulations 2025

Available at: https://www.legislation.gov.uk/sdsi/2025/9780111061473/body [Accessed October 2025]

[3] UK Government (2006). The Private Water Supplies (Scotland) Regulations 2006. Available at: http://www.legislation.gov.uk/ssi/2006/209/contents/made [Accessed October 2025]

[4] The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/282/contents/made [Accessed October 2025]

- The Flood Risk Management (Scotland) Act 2009[5].

Policy

5.2.2 This EA is carried out in accordance with the principles contained within the following policy documents:

- National Planning Framework 4 (NPF4) 2023[6]; and
- Scottish Environment Protection Agency (SEPA) Environmental Policy Number 19, Groundwater Protection Policy for Scotland v3[7].

Guidance

5.2.3 This EA is carried out in accordance with the principles contained within the following documents:

- Construction Industry Research and Information Association (CIRIA) (2001) Report C532, Control of water pollution from construction sites: Guidance for consultants and contractors[8];
- CIRIA (2006) Report C648, Control of water pollution from linear construction projects: Technical guidance[9];
- CIRIA (2006) Report C649, Control of water pollution from linear construction sites: Site guide[10];
- CIRIA (2018) Report C753, The Sustainable Drainage Systems (SuDS) Manual[11];
- Scottish Executive (2012) River crossings & migratory fish: Design guidance[12];
- Scottish Executive (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2nd Edition[13];
- NatureScot (2018) Environmental Impact Assessment Handbook, Version 5[14];
- NatureScot (2010) Floating roads on peat[15];
- SEPA (2015) Position Statement WAT-PS-06-02, Culverting of watercourses[16];

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5 Scottish Government (2009). Flood Risk Management (Scotland) Act 2009. Available at: https://www.legislation.gov.uk/asp/2009/6/contents [Accessed October 2025]

6 National Planning Framework 4 (2023). Available at: https://www.gov.scot/publications/national-planning-framework-4/ [Accessed October 2025]

7 SEPA (2019) Groundwater Protection Policy for Scotland v3. November 2009. Environmental Policy Number 19 [online] Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf [Accessed October 2025]

8 CIRIA (2001) Control of water pollution from construction sites: Guidance for consultants and contractors [online] Available at: https://www.ciria.org/ItemDetail?iProductCode=C532&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91 [Accessed October 2025]

9 CIRIA (2006) Report C648, Control of water pollution from linear construction projects: Technical guidance

10 CIRIA (2006) Report C649, Control of water pollution from linear construction sites: Site guide

11 CIRIA (2018) Report C753, The Sustainable Drainage Systems (SuDS) Manual [online] Available at: https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS [Accessed October 2025]

12 Scottish Executive (2012) River crossings & migratory fish: Design guidance [online] Available at: https://studylib.net/doc/7380716/river-crossings-and-migratory-fish--design-guidance [Accessed October 2025]

13 Scottish Executive (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2nd Edition [online] Available at: https://www.gov.scot/publications/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/ [Accessed October 2025]

14 NatureScot (2018) Environmental Impact Assessment Handbook, Version 5 [online] Available at: https://web.archive.org/web/20220901050635/https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf [Accessed October 2025]

15 NatureScot (2010) Floating roads on peat [online] Available at: http://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf [Accessed October 2025]

16 SEPA (2015) Position Statement WAT-PS-06-02, Culverting of watercourses [online] Available at: https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf [Accessed October 2025]

- SEPA (2010) WAT-SG-25, Engineering in the water environment: good practice guide[17];
- SEPA (2006) WAT-SG-31, Prevention of Pollution from Civil Engineering Contracts: Special Requirements[18]; and
- SEPA Guidance: Developments on peat and off-site uses of waste peat WAS-G-52[19].

5.2.4 Further guidance associated with peat and peatlands is presented in **Appendix 5.1: SPMP**.

5.3 Information sources

5.3.1 The following sources of information have been reviewed:

- OS Map data at 1:10,000, 1:25,000 and 1:50,000 scales;
- Dumfries & Galloway Council (D&GC) Register of Private Water Supplies (PWS);
- SEPA River Basin Management Plan classification data (Water Classification Hub)[20];
- Proposed Kendoon North Substation: Report on Ground Investigation[21];
- SEPA Flood Maps[22];
- NatureScot Designated sites mapping[23];
- NatureScot Carbon and Peatland Map[24];
- British Geology Survey (BGS) Hydrogeological Map of Scotland[25];
- BGS Hydrogeology 625K digital hydrogeological map of the UK[26];
- BGS maps for superficial and bedrock geology[27];
- BGS Groundwater Vulnerability (Scotland) User Guide[28]; and
- The James Hutton Institute Soils Map[29].

[17] SEPA (2010) WAT-SG-25, Engineering in the water environment: good practice guide [online]. Available at: https://www.sepa.org.uk/media/151036/wat-sg-25.pdf [Accessed October 2025]

[18] SEPA (2006) WAT-SG-31, Prevention of Pollution from Civil Engineering Contracts: Special Requirements [online]. Available at: https://www.sepa.org.uk/media/152220/wat_sg_31.pdf [Accessed October 2025]

[19] SEPA Guidance: Developments on peat and off-site uses of waste peat WAS-G-52. [online] Available at: https://www.sepa.org.uk/media/287064/wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf

[20] SEPA Water Classification Hub (2018). River Basin Management Plan classification data (Water Classification Hub) [online]. Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/ [Accessed October 2025]

[21] Raeburn Drilling & Geotechnical Limited. 2020. Proposed Kendoon North Substation: Report on Ground Investigation.

[22] SEPA Flood Maps (2015). [online] Available at: http://map.sepa.org.uk/floodmap/map.htm [Accessed October 2025]

[23] NatureScot (2021). SiteLink Map [online]. Available at: https://sitelink.nature.scot/map [Accessed October 2025]

[24] SNH (2016). Carbon and Peatland Map [online]. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 [Accessed October 2025]

[25] BGS Viewer for scanned hydrogeology maps of the UK (1990). Sheet 20: Hydrogeological Map of Eastern Dumfries and Galloway [online] Available at: http://www.largeimages.bgs.ac.uk/iip/hydromaps.html?id=dumfries-galloway.jp2 [accessed October 2025]

[26] BGS Hydrogeological map of the UK (2024). [online]. Available at: https://www.bgs.ac.uk/datasets/hydrogeology-625k/

[27] BGS Geoindex (2020). [online] Available at: http://www.bgs.ac.uk/GeoIndex/ [Accessed October 2025]

[28] BGS (2011). User Guide: Groundwater Vulnerability (Scotland) GIS dataset, Version 2. [online] Available at: nora.nerc.ac.uk/id/eprint/17084/1/OR11064.pdf [accessed September 2024]

[29] James Hutton Institute (2021). [online]. Available at: http://map.environment.gov.scot/Soil_maps/?layer=1 [Accessed October 2025]

5.4 Limitations and Assumptions

5.4.1 Baseline conditions have been established from a variety of sources, including historical data and Site visits, but due to the dynamic nature of certain aspects of the environment, conditions may change during the construction and operation of the Proposed Development.

5.4.2 Information received by third parties is assumed to be complete and up to date.

5.4.3 It is assumed that the Proposed Development's design, construction and operation would satisfy minimum environmental standards, consistent with contemporary legislation, practice, and knowledge.

5.4.4 Habitats with the potential to be GWDTE have been identified based on the 2022 National Vegetation Classification (NVC) habitat data and 2024 update habitat data where available (see **Chapter 3: Ecology**).

5.5 Methodology

5.5.1 The methodology used to appraise the effect of the Proposed Development on the geology, hydrology, hydrogeology and soils of the Proposed Development and the surrounding area is as follows:

- desktop study to obtain baseline and historical data;
- consultation with Dumfries and Galloway Council, Scottish Water and SEPA to identify water abstractions, including PWS and public water supplies;
- field surveys associated with peat and PWS as well as NVC surveys undertaken between December 2022 and October 2024;
- outline mitigation measures to safeguard geology, hydrology, hydrogeology and soil receptors; and
- apprise potential impacts on the basis of the implementation of embedded mitigation and make recommendations for additional measures to reduce residual impacts where required.

5.6 Consultation Undertaken to Date

5.6.1 **Table 5.1** provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Table 5.1 Consultation responses of relevance to Hydrology, Hydrogeology, Geology and Soils

Organisation	Type of Consultation	Response	How response has been considered
Dumfries and Galloway Council	Email request for Register of PWS, January 2024.	PWS information from D&GC received in January 2024.	Information used as part of the assessment of impacts on PWS presented in **Appendix 5.2 PWSRA**
SEPA	Email sent to SEPA in April 2023 requesting any registered abstractions data.	SEPA provided registered abstractions in May 2023.	Abstraction data has been considered within this report.
SEPA	Email correspondence with SEPA between December 2022 and October 2024 concerning the need for a Detailed Quantitative Risk Assessment for a groundwater abstraction in	A survey of the PWS (Holm of Daltallochan) confirmed it was not a groundwater abstraction, nor an abstraction used for domestic supply. This was reported to SEPA who confirmed in October 2024 that no Detailed	A summary of the survey and investigation findings are presented in **Appendix 5.2 PWSRA**

Organisation	Type of Consultation	Response	How response has been considered
	accordance with SEPA LUPS31.	Quantitative Risk Assessment was required.	

5.6.2 Scottish Water (SW) data was gathered in August 2024, directly from SW's asset database under agreement between SW and WSP. This information is considered further within the Water Abstractions section of this report. EASR information within 1 km of the Proposed Development has been included.

5.7 Extent of the Study Area

5.7.1 This appraisal is based upon the land within the Study Area (as defined below) and professional judgement and experience of assessing similar developments in similar environments. The following terms are used across this Chapter:

- Proposed Development as defined in **Chapter 2: Proposed Development**.
- The Study Area extent is 1 km from the Proposed Development as indicated in **Figure 5.1 Hydrology Overview**.
- The Study Area for GWDTE is around the proposed infrastructure (10 m for all activities, 100 m for subsurface activities <1 m deep and 250 m for subsurface activities >1 m depth).

5.8 Baseline Conditions

Designated Sites

5.8.1 NatureScot SiteLink[23] shows that there are no designated sites relevant to hydrology, hydrogeology, geology and soils, within 1 km of the Proposed Development, which are of regional, national, or international importance. Designated sites are therefore not considered further in this appraisal.

Surface Water Hydrology

5.8.2 The Proposed Development is an area of open grassland planted with young broadleaf trees approximately 10-15 years old, located on the gently sloping western flank of Holm Hill above the A713.

5.8.3 Carsphairn Lane (ID: 10566) is located 500 m downstream from the Proposed Development and has been classified under the Water Framework Directive (WFD)[30] as having a 'Poor' Overall status in 2022 due to physical alteration from water storage and hydroelectricity generation.

5.8.4 A review of OS 1:50,000 scale mapping[31] indicates that there are no watercourses within the Proposed Development.

5.8.5 A review of OS 1:25,000 scale mapping[32] indicates there are several unnamed watercourses and small ponds within the Study Area. One unnamed minor tributary of Carsphairn Lane is located within the Proposed Development Red Line Boundary (RLB). The unnamed tributary is located within the eastern extent of the Proposed Development and is shown in **Plate 5.1** and **Plate 5.2**.

[30] Water Framework Directive (2000) Available at: https://eur-lex.europa.eu/eli/dir/2000/60/oj [online] [Accessed October 2025]

[31] Ordnance Survey. Online Mapping (2022) [online] Available at: https://osmaps.ordnancesurvey.co.uk/ [Accessed October 2025]

[32] Ordnance Survey. Online Mapping (2022) [online] Available at: https://osmaps.ordnancesurvey.co.uk/ [Accessed October 2025]

5.8.6 A Site walkover was carried out on 9 November 2023, with showers occurring both prior to and during the survey. The surveys identified the minor tributary of Carsphairn Lane. It is a small, incised channel with falls and plunge pools, with mostly vegetated / peaty riverbed and banks. The water had a strong dark brown discolouration and is likely to be reflective of the abundance of organic-rich mineral soils in the catchment area. In-situ monitoring using a YSI Pro Handheld Monitoring on the day of the survey determined water discharge chemistry dominated by acidic pH (5.9 Units), which was very weakly mineralised (0.073 uS/cm) with high dissolved oxygen content (90%). It's likely the majority of the discharge is derived from rainfall runoff, likely from the flatter areas upslope of the Proposed Development.

Plate 5.1 Looking upstream towards the crossing of the unnamed watercourse at 254567,595695

Plate 5.2 Cross channel photograph where the unnamed watercourse crosses the A173. Taken at 254515,595671

5.8.7 The unnamed watercourses are not classified by SEPA under the WFD[20] but form part of the Carsphairn Lane catchment.

Geology and Soils

Bedrock and superficial geology

5.8.8 According to the BGS 1:50,000 mapping[27], the underlying superficial deposits within the Study Area are hummocky glacial deposits (Devencian), till Devensian (Diamicton), glaciofluvial sheet deposits, Devensian (gravel, sand and silt), alluvium (gravel, sand and silt) and peat.

5.8.9 According to the BGS Bedrock Geology 1:50,000 scale mapping[27] the bedrock geology underlying the Study Area consists of Kirkcolm Formation wacke, Galdenoch Formation - wacke and Moffat Shale group (mudstone).

Structural Features

5.8.10 BGS Linear Features 1:50,000 scale mapping indicates a fault striking (displacement unknown) within the Study Area, 740 m north-east of the Proposed Development.

Soils and Peat

5.8.11 The James Hutton Institute Soil Mapping[29] indicates the Study Area is underlain by areas of blanket peat, mineral alluvial soils with peaty alluvial soils, peaty gleys with blanket peat with brown earths with peaty podzols, peaty podzols with peaty gleys and peaty podzols with peaty gleys with blanket peat (**Figure 5.2: Peat Depth and Condition**).

5.8.12 Based on NatureScot Carbon and Peatland mapping[24], the soils within the Study Area include:

- Class 0 (Mineral soil - Peatland habitats are not typically found on such soils);
- Class 1 (Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value);
- Class 2 (Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential);
- Class 3 (Class 3 - Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat);
- Class 4 (area unlikely to be associated with peatland habitats or wet and acidic type. Area unlikely to include carbon-rich soils); and
- Class 5 (Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat).

5.8.13 Class 1 or Class 2 are not identified within the Proposed Development. The Proposed Development is underlain by Class 0, 4 and 5.

5.8.14 A site-specific Soil and Peat Management Plan has been prepared on account of the mapped presence of peat and full details are provided in **Appendix 5.1: SPMP**. Surveys were undertaken in August 2024 to inform the SPMP were completed with reference to Scottish Government guidance for the completion of peat surveys[33] and comprised of the following:

- the collection of 18 peat survey points across a 100 m x 100 m grid across the Proposed Development and several hundred meters upslope outside The Site boundary;
- the collection of 234 peat survey points across a 10 x 10 m grid within areas of proposed infrastructure; and
- the collection of targeted soil and peat cores in five locations to confirm soil texture and dominating soil association.

5.8.15 The surveys identified peaty soils (<0.5 m) with an average measured thickness of 0.29 m. Soil coring confirmed that the upper organic horizon was wet and humus-rich and was underlain by substrate of soft clay. Coring indicated the organic horizon was typically <0.3 m in thickness and was absent in some areas with mineral soil at the surface immediately beneath a thin rooting layer.

5.8.16 At each survey location the peat condition was recorded in accordance with the Peatland Code[34]. No Near Natural Peat was encountered, with all locations being identified as Modified or 'not applicable' since no peat was identified.

[33] Guidance on Developments on Peatland, PEATLAND SURVEY (2017). [online] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot%3Adocument/Guidance%2Bon%2Bdevelopments%2Bon%2Bpeatland%2B-%2Bpeatland%2Bsurvey%2B-%2B2017.pdf

[34] Peatland Code. Version 2.0 (2023) [online] Available at: https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2024-04/Peatland%20Code%20V2%20-%20FINAL%20-%20WEB_0.pdf

5.8.17 NVC surveys have identified the prevailing habitat at the Proposed Development is M25 *Molina-Potentilla* grassland, which dominates much of the central and southern areas. According to NS[35], M25 Molina grassland is considered a blanket bog when situated on deep peat (>1.0 m) and is usually a replacement for the original bog vegetation following unfavourable management.

5.8.18 Whilst M25 could be priority peatland, peat survey data has indicated that peat depths are consistently <1.0 m and these habitats are unlikely to be constituted as blanket bog and unlikely to rase issues of national interest. According to the findings presented above, the Proposed Development is not protected for its peatland and is considered that would not raise issues of national interest. Further information on occurrence of peatland habitats are discussed in **Chapter 3: Ecology and Ornithology.**

5.8.19 The SPMP (**Appendix 5.1**) demonstrates how the design of the Proposed Development complies with the NPF4 mitigation hierarchy and has avoided the disturbance of sensitive peat and peatlands in the first instance. Peaty soils present in some areas would be safeguarded through good practice mitigation methods including excavation, handling, storage and reinstatement to provide the best environmental outcome. Non-peat soil management including topsoil and subsoil stripping would also follow best practice.

Groundwater

5.8.20 There is one groundwater body underlying the Study Area[20], Galloway (ID:150694), which is described as being associated with the Galloway sandstone aquifer. The quantity and chemical status of the groundwater body were both classified by SEPA under the WFD in 2022 as 'Good', which resulted in an overall status of 'Good'. No specific pressures on this groundwater body were identified.

5.8.21 The BGS Hydrogeological Map of Scotland[25] indicates that the Study Area is underlain by Kirkcolm Formation, a low productivity aquifer of highly indurated greywackes with limited groundwater in near surface weathered zone and secondary fractures.

Water Abstractions

5.8.22 Based on the PWS register provided by Dumfries and Galloway Council in December 2021 and March 2024, there are five PWS within 1 km of the Proposed Development. Following the development of a Conceptual Site Model (CSM) refined through a Site walkover survey and qualitative impact assessment, none of the identified PWS are at risk of adverse water quality or quantity impacts. Further details on the location and consequential assessment of PWS are presented in **Appendix 5.2: Private Water Supply Risk Assessment**.

5.8.23 Based on the dataset provided through consultation with SW, there are no SW abstractions within the Study Area. Based on the CAR licence dataset provided through consultation with SEPA, there are no registered activities within 1 km of the Proposed Development. SW and SEPA abstractions are therefore not considered further within this EA.

5.8.24 According to the Scottish Government website [36], there are no SEPA Drinking Water Protected Areas (DWPA) for surface water, within the Study Area; however, the Proposed Development is located within SEPA DWPA for groundwater.

[35] NatureScot: Advising on peatland, carbon rich soils and priority peatland habitat in development management (Published April, 2023, revised November 2023). Available at: https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management [Accessed October 2025].

[36] Scottish Government (2014). Drinking water protected areas - Scotland river basin district: map 7 [online]. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/map/2014/03/drinking-water-protected-areas-scotland-river-basin-district-maps/documents/surface-water-maps/d2b5da2e-32d1-4b5d-afe1-da1b06686e07/d2b5da2e-32d1-4b5d-afe1-da1b06686e07/govscot%3Adocument/DWPA%2B-%2BScotland%2BRBD%2B-%2Bsurface%2Bwater%2B-%2Bmap%2B8%2Bof%2B22.pdf

Groundwater Dependent Terrestrial Ecosystems

5.8.25 SEPA's guidance on assessing the impacts of developments on GWDTE (SEPA, 2024)[37] requires assessment of GWDTE located within 250 m of excavations greater than 1 m, within 100 m of excavations less than 1 m and within 10 m of all construction activities.

5.8.26 NVC surveys were completed at the Proposed Development between April 2022 and August 2024, with north-eastern area of The Site resurveyed in July 2025. The distribution of NVC communities within the Proposed Development is detailed in **Appendix 3.1: Habitats Technical Report** and illustrated in **Figure 3.1.2: NVC Survey Results.** An assessment of the potential for the identified NVC communities to be groundwater dependent in accordance with SEPA (2024)[37] is presented below.

Importance of Potential GWDTE Communities

5.8.27 NVC communities within the Study Area (within 250 m of excavations greater than 1 m) that are indicative of supporting GWDTE according to SEPA (2024) [37] include:

- M15/H10 T*richophorum-Erica / Calluna vulgaris–Erica cinerea* heath, is located 85 m north-west of the Proposed Development;
- M25/M15 *Molinia caerulea – Potentilla erecta/* T*richophorum-Erica*, located within the eastern extent of the Proposed Development, adjacent to the existing tower;
- MG10/M25 *Holcus lanatus–Juncus effusus* rush-pasture/*Molinia caerulea – Potentilla erecta*, is 190 m south-east of the Proposed Development;
- MG10/MG6 *Holcus lanatus–Juncus effusus* rush-pasture/*Lolium perenne–Cynosurus cristatus* grassland, 180 m south-east and one is adjacent to the existing tower;
- U20/U9/MG10 *Pteridium aquilinum–Galium saxatile* community/*Juncus trifidus–Racomitrium lanuginosum* rush-heath/*Holcus lanatus–Juncus effusus* rush-pasture, 165 m and 200 m south-west and south-east and bisected by the A713 from the Proposed Development;
- M25/M23 *Molinia caerulea – Potentilla erecta/Juncus effusus/acutiflorus–Galium palustre* rush-pasture, 105 m south and bisected by the A713 and 210 m southeast from the Proposed Development.

5.8.28 M15 is a community of shallow, wet or intermittently water-logged, acid peat or peaty mineral soils on hillsides, over moraines, and within tracts of blanket mire. It also extends on to deep peat where the original bog vegetation has been damaged or modified by burning, grazing, drainage and peat cutting[38].

5.8.29 MG10 is a vegetation type of damp acid to neutral soils on level to gently sloping ground in enclosed pastures, and in neglected situations such as ditches, pond sides and roadside verges[38].

5.8.30 M23 is common in neglected damp pastures and in ditches around fields and settlements in the upland margins. It occurs on peaty mineral soils and stagnogleys, often with a strong smell of decomposing vegetation[38].

5.8.31 The communities identified are generally minor in extent, and commonplace with the local and regional environmental setting. None of the habitats feature as part of a designated nature conservation site.

Conceptual Model for GWDTE

5.8.32 The BGS Hydrogeology 1:625,000 mapping[26] indicates that the aquifer underlaying the Proposed Development has low productivity.

[37] SEPA (2024). Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems

[38] An Illustrated Guide to British Upland Vegetation (2004). [online]. Available at https://data.jncc.gov.uk/data/a17ab353-f5be-49ea-98f1-8633229779a1/IllustratedGuideBritishUplandVegetation-2004.pdf

5.8.33 The Ground Investigation Report (GIR)[39] identified significant thicknesses of boulder clay glacial till overlying the bedrock. This was confirmed during soil and peat core collection, which identified a thin organic horizon that was consistently underlain by clay. Therefore, diffusely emerging groundwater is unlikely to be the primary source for these habitats.

5.8.34 The retention of surface water in areas of the reduced topographic gradient is likely to be exacerbated by the low permeability of the underlying bedrock as and superficial soils.

5.8.35 Given the hydrogeology and topography factors described above, the identified GWDTE habitats are likely to be primarily fed by rainfall and surface water runoff and not primarily dependent on groundwater.

5.8.36 On the basis that potential GWDTEs communities are commonplace within the local and regional environmental setting, combined with them being assessed as primarily surface water-dependent, GWDTE communities within the Proposed Development are considered of low importance as per the table on Page 3 [37].

Flooding

5.8.37 It is considered that the Proposed Development meets the criteria of Essential Infrastructure with regard to SEPA's land use vulnerability classification[40].

5.8.38 A review of SEPA flood maps[22] and OS mapping was conducted in order to establish areas of potential flooding risk, and to identify floodplain areas. The Study Area contains areas of high, medium and low risk of river flooding and surface water flooding ~500 m downslope of the Proposed Development adjacent to the Carsphairn Lane.

5.8.39 The Proposed Development itself does not contain any areas of river, surface water, coastal, groundwater flooding or flooding from sewers or other infrastructure. The Proposed Development is also not identified as being as risk according to the SEPA future flood risk map[12].

5.8.40 A walkover survey was undertaken in November 2023 and included an appraisal of the possibility of flooding from the unnamed watercourse. The results of the surveys indicate a small channel on a moderately sloping hillside with the majority of flow derived from rainfall runoff / depression storage from the upper catchment above the Proposed Development.

5.8.41 The survey supported the initial outcome of the flood risk assessment based on the review of the SEPA flood maps[22], therefore the flood risk at the Proposed Development was deemed to be low.

5.9 Issues Scoped Out

5.9.1 Operational impacts have been scoped out of this assessment as there are not expected to be any direct or indirect hydrological risks from the operation of the Proposed Development, with good design layout, mitigation measures and production of a Construction Environment Management Plan (CEMP) protecting against longer-term effects.

5.9.2 Potential impacts on designated sites have been scoped out as there are no designated sites in relation to hydrology, hydrogeology, geology and soils.

5.9.3 There are no registered SW and SEPA abstractions within 1 km of the Proposed Development and assessment of these is also therefore not required.

[39] Proposed Kendoon North Substation near Carsphairn Dumfries and Galloway, Report on Ground Investigation, SP Energy Networks

[40] SEPA (2024). Land Use Planning System SEPA Guidance - Flood Risk and Land Use Vulnerability Guidance. Available at https://www.sepa.org.uk/media/ht3bsekc/land-use-vulnerability-guidance.docx

5.9.4 It is acknowledged that the Proposed Development is within a DWPA for groundwater; however, not for surface water. With the assumption that construction good practice and measures detailed within the CEMP are implemented, on account that the majority of Scotland is classified as a DWPA for groundwater and that groundwater is already being considered as part of this assessment, significant effects to the DWPA, specifically, are not anticipated and have therefore been scoped out.

5.9.5 On-site flood risk associated with the Proposed Development has been scoped out on the basis that it is not as risk of flooding. However, there are areas of flood risk downslope associated with the Carsphairn Lane which have been included in the EA.

5.10 Future Baseline

5.10.1 There is potential for climate change to impact on future baseline conditions. Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher annual average temperatures. This suggests that there may be greater pressures on water supplies in summer months in the future. Storms are predicted to be of greater intensity. Therefore, peak fluvial flows associated with extreme storm events may also increase in volume and velocity.

5.11 Embedded Mitigation

5.11.1 The Proposed Development has been designed to reduce potential impacts to geology, hydrology, hydrogeology and soils, as far as reasonably practicable. This includes mitigation that is embedded into the design of the Proposed Development in accordance with industry standard methods and procedures, which would reduce impacts from construction and operation.

Watercourse crossings

5.11.2 Two watercourse crossings are required to facilitate access to The Site (shown in **Photograph 5-1 and 5-2**), one permanent and one temporary. The watercourse is not included on OS 1:50,000 scale mapping. The crossings would require new structures, installed appropriate to local conditions to withstand 0.5% Annual Exceedance Probability (AEP) plus an uplift for climate change[41]. At this stage it is envisaged the crossings would be designed as circular culverts, and would be compliant with SEPA Guidance and best practice. The culverts would be embedded below the existing stream bed and appropriately sized in accordance with SEPA EASR regulations[2]. The sizing and final design of the water crossings would be confirmed following the completion of detailed design.

Sustainable drainage systems

5.11.3 The aim of SuDS is to emulate natural drainage systems to ensure consistency between post-development flows and pre-development flow levels and to provide a degree of water quality treatment alongside habitat creation, while also reducing potential downstream flood risk downstream and maintaining water quality.

[41] SEPA. 2025. Land Use Planning System SEPA Guidance - Climate change allowances for flood risk assessment in land use planning. [online]. Available at: https://www.sepa.org.uk/media/jlwpxuso/climate-change-allowances-guidance_v6.pdf

5.11.4 The proximity of watercourses to the Proposed Development suggests that discharge to a watercourse is likely the most appropriate method for managing surface water. The watercourses at the southern and western boundaries have been identified as being the most suitable discharge points due to their condition and the topography of the Proposed Development. Surface water runoff from the Proposed Development would be quicker than runoff from the current conditions in The Site area, thus discharge to the watercourse would need to be accompanied by attenuation storage and flow restriction to reduce the flood risk to the catchment area. As there is no evidence of existing surface water drainage collection, surface water runoff from the Proposed Development is to be limited to a greenfield development rate. The drainage system is required to function without any flooding of surface water for storm return periods up to and including 1 in 30 year and without any flood water leaving the Proposed Development for storm return periods up to and including 1 in 200 year, plus an allowance for climate change. The final layout of the SuDS naturally follows detailed design and takes into account; ground conditions, gradient, constraints, temporary works and maintenance requirements, and would aim to mimic natural site drainage. The governing principles outlined above would be used to ensure the final SuDS design operates effectively in managing runoff and flood risk.

Good Practice

5.11.5 A number of mandatory good practice measures have been included in the Outline CEMP submitted alongside the planning application. These measures would be further developed in the Detailed CEMP, which the Principal Contractor would prepare following consent of the Proposed Development. wouldA summary of those most relevant to the geology, hydrology and hydrogeology of the Proposed Development are summarised in **Table 5.2**.

5.11.6 Adopting the applicable good practice measures and the CEMP would significantly reduce both the probability and magnitude of any incident. This is achieved through a combination of robust site environmental management procedures, including minimised storage volumes, effective soil management, staff training, contingency equipment, and emergency plans.

Table 5.2 Good Practice Measures included in the summarised from the Outline CEMP

Impacts	Good practice measures
Soil & Peat	• Soil and peat must be excavated, stored and reinstated in accordance with **Appendix 5.1 SPMP**. • Soils types must be appropriately segregated and located 30 m away from watercourses, where possible. • Any excavated turves must be stored vegetation side up and be watered to ensure they do not dry out. The final SPMP must be refined post-consent and implemented.There are inherent design principles to be adopted as good practice measures; • avoidance of removal of slope support; • avoidance of heavy loading on slopes; • good drainage practice to ensure flows not concentrated onto slopes or into excavations; • restricting earthmoving activities during and immediately after intense and prolonged rainfall events; and • creating and managing of geotechnical risk register or similar management system throughout the detailed design and construction phases.
Private Water Supplies	• Mitigation to be implemented in accordance with **Appendix 5.2 PWSRA**.

Impacts	Good practice measures
	• It is the Principal Contractor responsibility to assess the work being undertaken and consider the associated hydrological risks as required throughout the works. • It is the Contractors responsibility to ensure appropriate mitigation is in place in advance of any works and that they are monitored and documented. • Undertaken appropriate monitoring as determined by the PWSRA.
Groundwater Dependant Terrestrial Ecosystems (GWDTE)	• GWDTE - under the WFD the requirement for 'good groundwater status' is dependent upon there being no 'significant damage' to groundwater-dependent terrestrial ecosystems, i.e. groundwater-dependent wetlands. • GWDTE communities within the Proposed Development are considered of low importance, however in order to maintain surface water flow pathways cross drainage would be used in wet areas such as flushes as part of the design where possible in accordance with good practice.
Pollution, erosion and sedimentation	• Application of a 10 m buffer zone from watercourses, except where access is required. • Secure oil and chemical storage in over-ground bunded areas, limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas. • Emergency spill kits retained on-site at sensitive locations. • Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified. • Silt traps would be employed and maintained in appropriate locations. • Interception ditches would be constructed upslope of excavations to minimise surface runoff ingress in advance of excavation activities. • Excavation and earthworks would be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage.
Excavations and dewatering	• Strategies to deal with both groundwater and surface water due to heavy rain shall be in place. • Sufficient equipment (e.g. pumps) and mitigation as detailed on permits to pump and pollution prevention plans must be on site before excavation work is undertaken • Any strategy should also deal with where water would be pumped to. Water considered to be contaminated with silt or oils cannot be pumped straight into the environment without primary and potentially secondary treatment. • Abstraction/ de-watering of excavations must be in excess of 10m from a watercourse (if highly sensitive or prone to flooding this distance may need to increase). The de-watering exercise must be through a silt protection capture layer such as a siltsock, siltbuster, sump/ silt fencing – grassy area with landowner permission to pump. It is the contractors' responsibility to assess the volume discharged is in line with SEPA guidance GBR 15 and Abstraction Licence parameters are adhered to. The 10 metres distance mentioned is the bare minimum, the expectation is this would increase based on risk assessment

Impacts	Good practice measures
	and site specific factors. It must be highlighted that buffer distances should take account of topography, vegetation cover and sensitivity of the receiving watercourse. • The final design of the Proposed Development would incorporate suitable groundwater control in accordance with CIRIA C750 (2016)[42] to manage groundwater ingress. The discharge of this groundwater shall be ncorporated into the permanent sustainable drainage design.
Concrete and Concrete Washout	• Washing out of concrete trucks, crane skips and other equipment must be avoided wherever possible. • Washing out of any concrete mixer & associated chute, tools or equipment must be carried out in a designated area away from drains and watercourses. Truck washout must be off-site as preference. If required on-site this must be chute only (not including the drum) and limited to dry brushing where possible. • Washing out only permitted into an impermeable container/area which must be covered when not in use. Uncured wash waters and cured material to be disposed of in line with WM3.
Surface Water (Discharge of surface water runoff into the water environment/ drainage system)	• A Surface Water Management Plan shall be prepared post-consent and be part of the final CEMP. • Surface water drains and the foul water systems are to be clearly identified on The SiteSite prior to any works being carried out. • Installation of cut of ditches, hydro dams, sumps, silt fencing to manage flow pathways and control silt run off at all times during construction, this includes monitoring the effectiveness of the prevention measures and adapting to changes in flow rate and disturbance. • Installation of SuDS . • Consult SEPA EASR Practical Guide at all times when working near a watercourse as authorisations may be required – it is the contractors' responsibility to consult with SEPA and apply for authorisation where required. General Binding Rules (GBR 10, 16, 9) must be consulted as a minimum for all Sites near a watercourse. • The Principal Contractor shall produce a pollution prevention and/or surface water management plan and identify likely sources of pollution within The SiteSite, particularly those considered to be 'high risk' such as: - Areas of exposed soils during construction; - Dewatering of excavation to SuDS treatment area; - Temporary soil storage areas; - Fuel storage and refuelling activities at Site compound; and

[42] Construction Industry Research and Information Association (2016). Groundwater control: design and practice (second edition) C750. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductcode=C750&Category=BOOK

Impacts	Good practice measures
	- Concrete washout area.
Surface water drainage patterns	• Application of sustainable drainage techniques to increase peak lag time and implementation of cross-drains at appropriate intervals and frequent discharge points to reduce scour potential. • Minimising the size and duration of in-channel works. • Appropriate design of crossing structures to ensure sufficient capacity to convey 0.5% AEP plus climate change design flood event storm flows.
Re-fuelling operations and Control of Substances Hazardous to Health (COSHH) Storage	• Refuelling off-site must be considered to prevent refuelling during works and possible spillage into nearby habitat and water courses. This must be detailed within the Pollution Prevention Plan. Standard practice: • Machines would be refuelled minimum of 30 metres away from water courses. • Ensure fuel and oil storage tanks are bunded, secured and on impermeable surfaces • All funnels, buckets, containers, brushes and other associated equipment should also be kept in a bunded area when not in use. • Fuel storage tanks must be locked when not in use to prevent unauthorised access and to reduce the risk of vandalism • Place a plant nappy under all static plant and mobile plant during fuelling. Spill kits shall be present with the number on site relevant to the works and risks.

5.12 Environmental Appraisal

Potential Effects

5.12.1 This appraisal is based on the Proposed Development as described in **Chapter 2: Proposed Development** and takes into account the embedded mitigation presented above.

5.12.2 During the construction phase of the Proposed Development, there is potential short-term effects on the hydrology, hydrogeology, geology and soils environment related to:

- pollution Incidents;
- erosion and Sedimentation;
- concrete and Cement products;
- new Licensed Activities;
- modification of surface water pathways and flooding;
- modification of groundwater levels and flows;
- impacts on peat and peatlands; and
- peat stability.

5.12.3 Effects and mitigation are appraised in the sections below. Where additional mitigation is required beyond the embedded mitigation, this is presented and any residual impacts considered.

Pollution Incidents

5.12.4 During the construction phase a number of potential pollutants would be present on-site to facilitate civil engineering activities, including oil, fuels, chemicals, unset cement and concrete, and waste and wastewater from construction activities. Any pollution incident occurring on the Proposed Development could have a detrimental effect on the water quality of the nearby unnamed watercourse, groundwater, and/or soil. There may also be indirect effects on ecology.

5.12.5 Taking into consideration the mitigation set out in the CEMP informed by this EA, surface water receptors, groundwater and PWS receptors, would be safeguarded and adverse changes to water quality or quantity (including PWS) are unlikely to be perceptible.

5.12.6 The Proposed Development would require a Construction Runoff Permit, to be considered at preconstruction phase which would provide detail on CAR licence and SuDS requirements. The Permit would be approved and issued by SEPA.

Erosion and Sedimentation

5.12.7 Soil erosion, loss of soil and sediment generation may occur in areas where the ground has been disturbed during construction including in situations where:

- engineering activities occur close to or in watercourses, such as at watercourse crossings; or
- where higher velocity surface water flows may occur due to local slopes and drainage design.

5.12.8 Surface water passing through the drainage network, efficiently draining the new infrastructure, could exhibit higher localised flows, increasing the potential for bank erosion.

5.12.9 Sediment transport in watercourses can result in high turbidity levels which affect the ecology, particularly fish stocks, by reducing the light and oxygen levels in the water. Sediment deposition can further effect watercourses by potentially smothering plant life, invertebrates and spawning grounds, and can reduce the flood storage capacity of channels and block culverts, resulting in an increased flood risk.

5.12.10 Requirements for soil excavation, transport and storage may lead to additional sedimentation issues at locations where new track and construction activities are necessary.

5.12.11 In the case of erosion and sedimentation effects, good practice Site environmental management measures as well as an effective SuDS drainage design would be expected to reduce any potential sedimentation effect downstream. The Proposed Development would require a Construction Runoff Permit, to be considered at preconstruction phase which would provide detail on CAR licence and SuDS requirements. The Permit would be approved and issued by SEPA.

5.12.12 Considering the adoption of such measures, adverse effects associated with erosion and sedimentation on hydrology, hydrogeology, geology and soils receptors (including PWS) are not anticipated.

Concrete and Cement Products

5.12.13 Concrete would be used during construction, therefore the potential for concrete spillages exists in addition to the generation of alkaline leachate in water dependent habitats. Good practice construction techniques would reduce these impacts at the construction stage, as outlined in the outline CEMP.

5.12.14 The major pathways for cement contaminated water to reach surface water bodies are either overland flow (suspended in surface water runoff into drains and watercourses, especially during periods of high runoff rainfall events) or when areas are subject to ‘wash down’. Should it be necessary to mix concrete on-site, the measures within the CEMP, would be adhered to.

5.12.15 With the adoption of good practice and embedded mitigation measures, adverse effects associated with concrete and cement product contamination on hydrology, hydrogeology, geology and soils receptors (including PWS) are not anticipated.

New Licensed Activities

5.12.16 As part of the Proposed Development, new licensed activities would include an abstraction and a septic tank with assumed soakaway discharge to groundwater. The detailed design of the septic tank would ensure any water discharge is in line with SEPA requirements. The exact specification of the septic tank would be confirmed once the Principal Contractor has been appointed.

Modification of surface water drainage patterns and flooding

5.12.17 Surface flows could be impeded by construction activity in or adjacent to stream channels, or inadequately designed crossing structures. Blockages could be caused by inadequate control of earthmoving plant, sedimentation and poor waste management, all of which could lead to flooding upstream.

5.12.18 Constructed impermeable surfaces would restrict the infiltration of rainfall into the soil and underlying superficial deposits, resulting in localised increased volumes of surface runoff. The interception of diffuse overland flow by new tracks and their drains could disrupt the natural drainage regime of the Proposed Development by concentrating flows and influencing drainage in soils.

5.12.19 The design, of the Proposed Development, includes one permanent watercourse crossing structure as well as a temporary one required for the duration of construction. As stated earlier in this Chapter, the watercourse is not being shown on a 1:50,000 scale map; therefore, this crossing is subject to General Binding Rules (GBR) under the EASR regulations[2], and shall be designed to be suitably sized for a 0.5% AEP plus an appropriate climate change uplift. Additional factors relating to the protection of aquatic ecology and geomorphology would also be considered as part of the final design.

5.12.20 Effects on downstream flooding has been mitigated through design of comprehensive drainage and attenuation systems to minimise and mitigate increases to downstream flood risk in line with CIRIA guidance[43]. The drainage system has been designed to function without any flooding of local surface water for storm return periods up to and including 1 in 30 year event and without any flood water leaving the Proposed Development for storm return periods up to and including 0.5% AEP, plus an allowance for climate change. With the implementation of this embedded mitigation there are no anticipated effects on flooding or modification of surface water drainage patterns as a result of the Proposed Development.

Modification of groundwater levels and flows

5.12.21 Excavations could disrupt shallow groundwater systems resulting in the lowering of groundwater levels in the immediate vicinity of the excavations and alterations to flow paths during dewatering activities. The access track could also interrupt shallow groundwater flow.

5.12.22 Soil water conditions at the Proposed Development are likely to be primarily influenced by surface water and direct rainfall, with groundwater having minimal influence due to the occurrence of low permeability bedrock within the Proposed Development. Therefore, the substation foundations are unlikely to permanently alter groundwater flows. Should any alterations occur, such as during any required dewatering, it would be expected that natural conditions of groundwater level and flow would recur close to these locations in a short timeframe.

5.12.23 Changes in groundwater levels and flows have the potential to impact GWDTE and PWS, potentially affecting both the quality and quantity of water nourishing receptors.

5.12.24 The potential for adverse impacts on PWS, including changes in groundwater flow and consequential quantity of water at the point of abstraction have considered for PWS within the vicinity of the Proposed Development in **Appendix 5.2: PWSRA**. The PWSRA indicates that there is no plausible pathway between PWS abstractions and the Proposed Development, and therefore no perceptible adverse effects are anticipated.

[43] CIRIA (2018) Report C753, The Sustainable Drainage Systems (SuDS) Manual [online] Available at: https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS

5.12.25 As described in **Section 5.8**, potential GWDTE habitats identified are considered to ombrotrophic / surface water fed and they are unlikely to be dependent on groundwater. The GWDTE communities within the Proposed Development that could be directly affected include M25/M15 *Molinia caerulea – Potentilla erecta/ Trichophorum-Erica*.

5.12.26 This community has been determined to be of Low Importance. Effects on GWDTE would be **moderate** where there is direct loss but would otherwise be **negligible**. The qualitative assessment of GWDTE concludes that with good practice mitigation the potential impacts as per Page 3, SEPA (2024)[37] are Low or Unimportant.

5.12.27 With the implementation of the mitigation measures set out in the CEMP and the implementation of construction good practice, adverse effects associated with the modification of groundwater levels and flows are not expected.

Impacts on Peat and Peatland

5.12.28 The potential impacts on peat associated with the construction of the Proposed Development is presented in **Appendix 5.1: SPMP**.

5.12.29 The siting of the Proposed Development avoids the disturbance of sensitive peat and peatland habitats in accordance with the NPF4 Mitigation Hierarchy set out in Policy 5, and this has been confirmed through a site-specific peat depth and condition assessment which confirms the Proposed Development is dominated by peaty soils and non-peat soil types. Nearby areas of peat and peatland located upgradient of the Proposed Development would be safeguarded through mitigation to avoid accidental disturbance presented in the SPMP.

5.12.30 Whilst potential impacts on peat have been avoided, impacts on peaty soils (which share some of the ecosystem services of peat) arising from the construction of the Proposed Development shall be minimised through a combination of design measures as well as the implementation of good practice. All contractors would be made aware of the sensitivity of soils, peat and wetland habitats, and would be required to work within the narrowest practical construction corridor when working in or near areas of peat.

Peat stability

5.12.31 Peat slides are a natural occurrence that can occur without human interference, but issues such as removal of slope support or increased loading upon slopes can either increase the likelihood of an event occurring or can increase the scale of the failure.

5.12.32 Peat slides affect soil (and associated habitats) and potentially downstream surface water systems where soil inundation can lead to sedimentation reducing water quality and modification in drainage patterns. The various receptors of a peat stability failure have been separated for this evaluation.

5.12.33 Peat and soil depth surveys as well as intrusive ground investigation[39] (trial pits, boreholes and soil cores) have confirmed the Proposed Development is underlain by shallow and discontinuous peaty soil and glacial till (see **Figure 5.2: Peat Depth and Condition**) and not peat. Surveys did not identify any indicators suggestive of peat, soil or ground instability. As such, the Proposed Development is not at risk of peat slide.

5.12.34 There are inherent design principles to be adopted as good practice measures, which would be summarised in the CEMP (see **Table 5.2**). The Principal Contractor would be responsible for identifying and implementing any required ground stability measures in relation to peat slides as part of the detailed design.

5.13 Further Recommendations

5.13.1 The EA of hydrology, hydrogeology, geology and soils receptors has not identified the need for any additional measures beyond those proposed in **Section 5.11** of this EA or Outline CEMP. However, to ensure that hydrology, hydrogeology, geology and soils receptors are appropriately considered as part of the final detailed design, a number of recommendations are provided which must be implemented by the Principal Contractor;

- Whilst none have been identified in the course of preparing this Chapter, further consultation with SW is required prior to construction to verify that there are no SW assets which require further consideration. Should any such assets be identified, specific mitigation measures would be developed and agreed with SW.

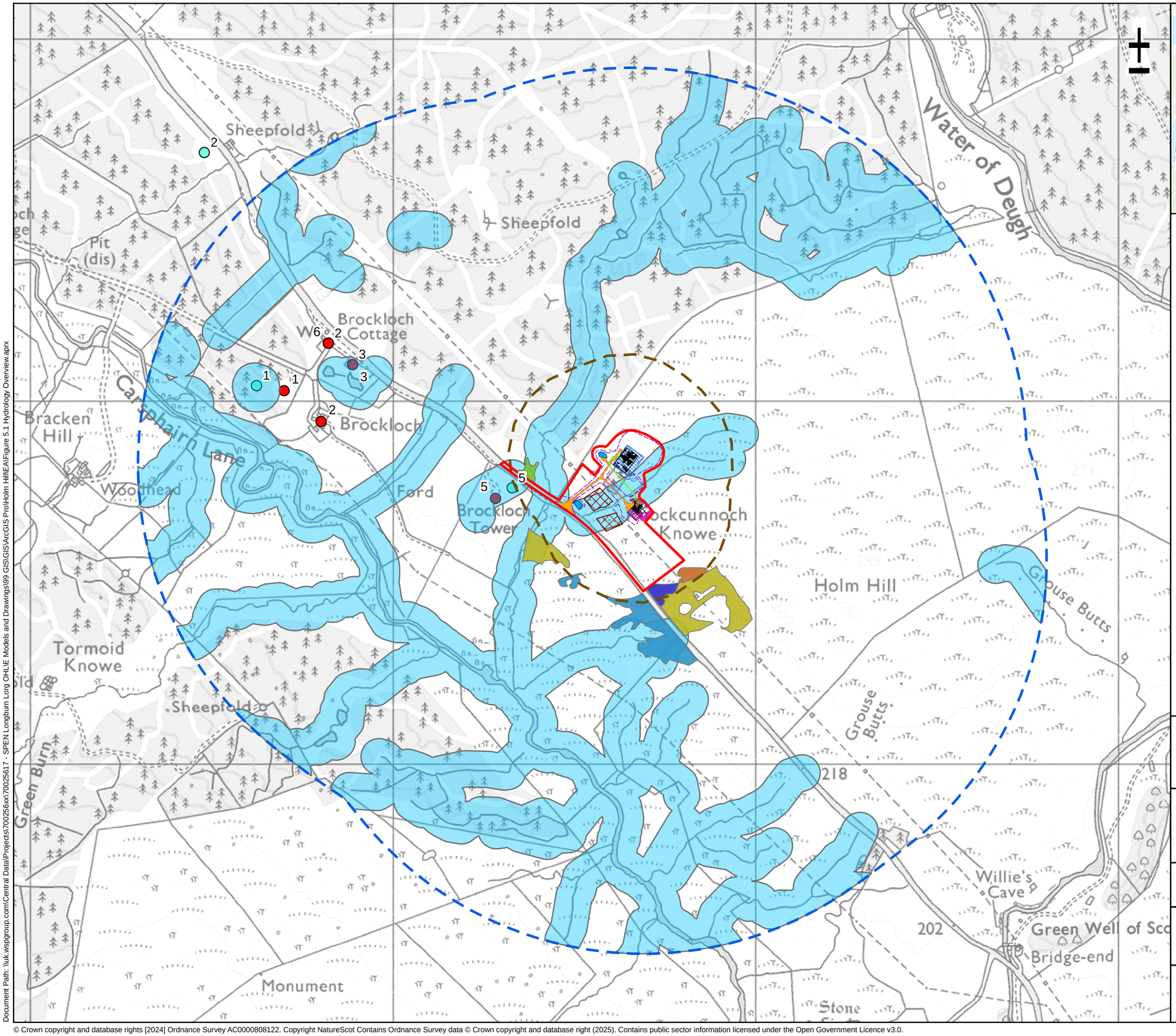
- Further pre-construction surveys are required to identify any authorised abstractions which are not included in the data WSP received during consultation that could be at a potential risk from the Proposed Development. If applicable, measures to mitigate for temporary interruption of water supply, or permanent alternative supply, are to be agreed prior to works commencing.
- As described in **Appendix 5.2: PWSRA**, a *Private Water Supply Method Statement* (PWSMS) would be prepared to establish a scheme of monitoring of PWS within the vicinity of the Proposed Development and would support the detailed design and Detailed CEMP.
- Following the completion of detailed design, **Appendix 5.1: SPMP** must be updated as part of preparing a Stage 2 PMP in accordance with good practice guidance and implemented during construction.

5.14 Summary

5.14.1 The following sensitive hydrology, hydrogeology, geology and soil receptors along the Proposed Development have been identified:

- surface water bodies;
- groundwater bodies; and
- PWS.

5.14.2 The EA has demonstrated how the Proposed Development could affect these sensitive receptors during construction of the Proposed Development. Through successful application of embedded mitigations identified in **Section 5.11**, the appraisal has concluded that impacts from the Proposed Development can be mitigated to prevent any likely direct and indirect environmental impacts on the hydrology, hydrogeology, geology and soil receptors. It is expected this mitigation be delivered through the development of further Site-specific environmental management plans, including a CEMP post-consent, secured by way of Planning Condition.



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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap

Key

Proposed Design Layout

- Holm Hill Red Line Boundary
- Proposed Underground Cable
- Existing Tower
- 132 kV Proposed Substation Platform
- Access Road
- Sealing End Compound
- Temporary Contractor Compound
- SuDS Pond
- Proposed Soakaway
- Infrastructure Footprint

Hydrological Features

- 250 m Infrastructure Buffer (excavation >1 m)
- 1 km Hydrology Study Area
- Watercourse 50 m Buffer

Private Water Supplies

- Abstraction
- Property

Potential GWDTE Parcels

M15/H10, M25/M15, M25/M23, MG10/M25, MG10/MG6, MG10/MG6, U20/U9/MG10

0 100 300 500 Metres

wsp

Client: SP Energy Networks

Project: Holm Hill Substation

Title: Figure 5.1 - Hydrology Overview

Date: 06/11/2025 Scale: 1:10,000 @ A3

Drawn: AS Checked: EE Approved: ML

Drawing Number: 70025617-WSP-HOLM-003

Document Path: \\uk.wspgroup.com\Central Data\Projects\70025617 - SPEN Longburn Lorg OHLE Models and Drawings\99 GIS\GIS\ArcGIS Pro\Holm Hill\EA\Figure 5.1 Hydrology Overview.aprx

Scale: 1:150,000

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap

Key

Proposed Design Layout

- Holm Hill Red Line Boundary
- 1 km Study Area
- Proposed Underground Cable
- Existing Tower
- 132 kV Proposed Substation Platform
- Access Road
- Sealing End Compound
- SuDS Pond
- Temporary Contractor Compound
- Proposed Soakaway
- Infrastructure Footprint

NatureScot Carbon Soils (2016)

- Mineral Soil
- Class 1 - Nationally Important
- Class 2 - Nationally Important
- Class 3 - Peaty Soil with Some Peat Soil
- Class 4 - Mineral Soil with Some Peat Soil
- Class 5 - Peat Soils

0 300 500 Metres

Client: SP Energy Networks

Project: Holm Hill Substation

Title: Figure 5.2 - Peat Depth and Condition
Page 1 of 2

Date: 07/11/2025 Scale: 1:10,000 @ A3

Drawn: SH Checked: AS Approved: ML

Drawing Number: 70025617-WSP-HOLM-004

Document Path: \\uk.wspgroup.com\Central Data\Projects\700256xx\70025617 - SPEN Longburn Lorg OHLE Models and Drawings\99 GIS\GIS\ArcGIS Pro\Holm Hill\EA\Figure 5.2 Peat Depth and Condition.aprx

The central area of the Site, including the southern half of the platform, could not be surveyed due to the presence of an existing 400 kV Overhead Line.

Peat surveys are not required as the area will only be used for landscaping (tree planting).

A713

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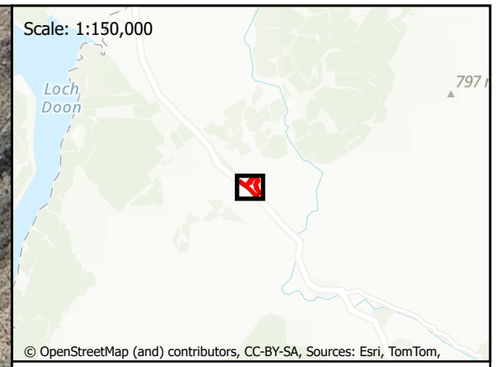

Key

Proposed Design Layout

- Holm Hill Red Line Boundary
- Proposed Underground Cable
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- Proposed Soakaway
- Infrastructure Footprint

Peat Depth and Condition

- Peat Core Location

Peat Depth (m)

- <0.5
- 0.5 - 1.0
- 1 - 1.5

Several peat survey points with recorded depths >0.5 m were located ~300 m upslope of the Proposed Development and are not shown to allow an appropriate resolution for recorded depths within the Proposed Development

0 50 100 Metres

Client: SP Energy Networks

Project: Holm Hill Substation

Title: Figure 5.2 - Peat Depth and Condition
Page 2 of 2

Date: 10/11/2025 Scale: 1:2,000 @ A3
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Holm Hill Substation

Environmental Appraisal

Appendix 5.1: Soil & Peat Management Plan

November 25

Land & Planning

Contents

Page

EXECUTIVE SUMMARY

Avoidance

The assessment presented in **Section 2** of this Soil and Peat Management Plan (SPMP) identifies that the Proposed Development is dominated by 'peaty soils', with soil and peat cores indicating peat thickness is consistently <0.5 m.

Approximately 93% of survey locations identified organic peaty soils or other soft mineral soils that were <0.5 m deep, 6% of survey locations encountered peat within the >0.5 and ≤1.0 m, with only two locations recording deep peat (>1.0 m deep). These locations are outside the footprint of the Proposed Development.

National Vegetation Classification (NVC) surveys have identified the prevailing habitat at the Proposed Development as M25 Molina-Potentilla grassland. Whilst M25 could be a priority peatland, peat survey data has indicated that peat depths are consistently <1.0 m and these habitats are unlikely to be constituted as blanket bog and unlikely to raise issues of national interest. As such, the Proposed Development is not protected for its peatland interest.

Whilst the design has avoided peat and peatland habitat disturbance, measures to minimise impacts on adjacent areas as well as the integrity of identified on-site peaty soils have been proposed. The SPMP demonstrates that peat has been afforded appropriate consideration during the construction phase of the Proposed Development.

Minimising Disturbance

Direct and indirect impacts on peaty soils arising from the construction of the Proposed Development shall be minimised through a combination of design measures as well as the implementation of good practice. All contractors would be made aware of the sensitivity of carbon rich soils and wetland habitats, and would be required to work within the narrowest practical construction corridor when working in or near areas of peat or peaty soils.

Restoration

A site-specific peat balance assessment has concluded there would be no excavation of peat, and that all excavated peaty soils can be re-used as part of the reinstatement of the Proposed Development. All peaty soil would be re-used in the final surface reinstatement.

The re-use of peaty soil shall accord with good practice presented in this SPMP to maximise the potential for the re-used soils to provide the best environmental outcome for the excavated material and habitats.

Offset and Enhancement

No priority peatland habitats which could raise issues of national interest would be disturbed by the Proposed Development, and therefore no compensation is required. Based on the dominance of peaty soils and absence of peatland habitats, there is no requirement (no opportunities) for on-site peatland habitat restoration.

1 INTRODUCTION

1.1 Background

1.1.1 This Soil and Peat Management Plan (SPMP) has been prepared by WSP Ltd. on behalf of The Applicant (Scottish Power Transmission (SPT) to support the construction of a new 132 kV Holm Hill Substation, near Brockloch in Dumfries and Galloway (herein referred to as the "Proposed Development").

1.1.2 The SPMP has been developed on account of the potential presence of peatland and peat within the Proposed Development boundary according to published records (as described in **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of this Environmental Appraisal).

1.1.3 The purpose of the SPMP is to consider potential peat management at the Proposed Development, such that suitable controls and appropriate methodologies can be employed during the construction and commissioning of the Proposed Development to safeguard peatland and peat as far as possible.

1.1.4 This SPMP should be read in conjunction with **Chapter 5: Hydrology, Hydrogeology, Geology & Soils** accompanying the Planning Application.

1.2 Planning Policy, Legislation, Guidance and Good Practice

1.2.1 Scotland's National Planning Framework 4 (NPF4)[1] states that under Policy 5 – Soils [a] "*development proposals should only be supported if they are designed and constructed in accordance with the mitigation hierarchy by first avoiding and then minimising the amount of disturbance to soils on undeveloped land and in a manner that protects soils from damage including from compaction and erosion, and that minimises soils sealing*."

1.2.2 Policy 5[c] also states that "*Development proposals on peatland, carbon rich soils and priority peatland habitat would only be supported for… (ii,) The generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets*".

1.2.3 Policy 5[d] states that "*where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site specific assessment would be required". Policy 5[d] goes on to state that The Site specific assessment "should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan would be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing The Site into a functioning peatland system capable of achieving carbon sequestration*".

1.2.4 This Stage 1 SPMP has accommodated the requirements of NPF4 Policy 5 in demonstrating how the mitigation hierarchy has been followed and provides a site-specific assessment suitable for demonstrating the safeguarding of peat. A Stage 2 SPMP would be produced by the Principal Contractor prior to construction of the Proposed Development.

1.2.5 Planning policy and legislation relevant to the management of peat includes the following:

- The UK Climate Change Act 2008 (c27)[2];
- Environmental Protection Act 1990 (as amended)[3];
- Landfill (Scotland) Regulations 2003 (as amended)[4];

[1] Scotlands national planning framework 4 available online at https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2023/02/national-planning-framework-4/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4.pdf (accessed November 2024)

[2] UK Government (2008). Climate Change Act 2008. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents

[3] UK Government (1990). Environmental Protection Act. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents

[4] Scottish Government (2003). Landfill (Scotland) Regulations 2003 (as amended). Available at: https://www.legislation.gov.uk/ssi/2003/235/contents

- The Waste Management Licensing (Scotland) Regulations 2011[5];
- Scotland's National Planning Framework 4, 2023[6]; and
- Wildlife Management and Muirburn (Scotland) Act, 2024[7].

1.2.6 There are a number of guidance documents appropriate to the activities planned on site, which have been used to guide this assessment, as follows:

- Guidance on Developments on Peatland (NatureScot (NS), Scottish Environmental Protection Agency (SEPA); 2017)[8];
- Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables (SR), SEPA; January 2012)[9];
- SEPA Guidance: Developments on peat and off-site re-uses of waste peat (SEPA; August 2025)[10];
- Advising on peatland, carbon rich soils and priority peatland habitat in development management. Published April, 2023, revised November 2023 (NS; November 2023)[11];
- Good practice during Wind Farm construction (SR, SEPA, Scottish Natural Heritage (SNH), Forestry Commission Scotland (FCS), Historic Environment Scotland (HES); September 2015)[12];
- Floating roads on peat (SNH, FCS; August 2010)[13];
- Constructed tracks in the Scottish Uplands (SNH; September 2015)[14]; and
- Restoration techniques using peat soil from construction works (SEPA; 2011)[15].

Mitigation Hierarchy

1.2.7 SEPA and NS have provided a hierarchy of management approaches through which the effectiveness of the approach to peat management is optimised at development sites, as summarised below:

- **Avoid**
    - Development should first seek to avoid areas of peatland, carbon-rich soils and priority peatland habitat.
- **Minimise**
    - Prevention – prevent or minimise peat excavation/disturbance through considered design that avoids or minimises development infrastructure within areas of peat. Where avoidance is not possible, minimise excavation of peat using engineering solutions such as floating roads.
    - Re-Use/Reinstatement – re-use extracted peat close to its original location in the reinstatement or restoration of temporary infrastructure, road verges and borrow pits. Peat may also be used where appropriate to improve or restore peatland habitats.

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[5] Scottish Government (2011). The Waste Management Licensing (Scotland) Regulations 2011. Available at: https://www.legislation.gov.uk/sdsi/2011/9780111012147/contents

[6] Scottish Government (2023). Scotland's National Planning Framework 4, 2023. Available at: https://www.gov.scot/publications/national-planning-framework-4/

[7] Scottish Government (2024). Wildlife Management and Muirburn (Scotland) Act, 2024. Available at: https://www.legislation.gov.uk/asp/2024/4/contents

[8] Guidance on developments on peatland available online at https://www.sepa.org.uk/media/144152/development_on_peatland_guidance_final_august_2010.pdf (accessed November 2025)

[9] Guidance on assessment of peat volumes available online at https://www.gov.scot/ (accessed November 2025)

[10] Developments on peat and of site re-uses of waste peat available online at https://www.sepa.org.uk/media/287064/wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf (accessed November 2025)

[11] Advice on peatland, carbon rich soils and priority peatland habitat available online at https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management (accessed November 2025)

[12] Good practice on windfam construction available online at https://www.nature.scot/sites/default/files/2018-08/Guidance%20-%20Good%20Practice%20during%20wind%20farm%20construction.pdf (accessed November 2025)

[13] Floating roads on peat available online at https://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf (accessed November 2025)

[14] Construction tracks in the Scottish uplands available online at https://www.nature.scot/doc/archive/constructed-tracks-scottish-uplands (accessed November 2025)

- Recycle/Recover/Treat – while the priority should always be to prevent and re-use peat on site there may be situations in which there may still be a surplus of excavated peat. Where demonstrated that it is suitable for use, peat may be blended, dewatered or treated to improve its properties to support re-use on site.
- Temporary storage – store the peat temporarily during construction prior to re-use in on site reinstatement or restoration activities.

- **Restore**
  - Repairing damaged habitats. Any habitats that are damaged by the proposal (whether direct or indirect impacts) should be restored as far as is possible.
- **Offset**
  - Compensating for residual impact that remains, with preference to on-site over off-site measures.
  - Effective restoration and management of equivalent degraded habitat should compensate for any losses.
- **Enhance**
  - Enhance biodiversity within Priority Peatland, including by restoring degraded habitats and building, and strengthening nature networks.
  - This is a requirement to provide biodiversity enhancements for Priority Peatland; these measures are in addition to the restoration and offsetting requirements.

1.3 Objectives of this SPMP

1.3.1 This SPMP outlines the overall approach of minimising disruption to peatland, and it aims to ensure that all further opportunities to minimise peat disturbance and extraction would be taken during detailed design and construction of the Proposed Development.

1.3.2 The purpose of this report is to ensure that there has been a systematic consideration of peat management and a quantitative assessment throughout the development process.

1.3.3 This SPMP should be updated to produce a Stage 2 SPMP following the completion of detailed design.

1.4 Site Description

1.4.1 Baseline environmental information associated with the Proposed Development is presented in **Chapter 5: Hydrology, Hydrogeology, Geology and Soils**.

1.4.2 The Proposed Development is located on the flanks of Holm Hill, just north-east of the A713 between Dalmellington and Carsphairn. The Site is approximately 3.5 km to the north-west of Carsphairn and 12 km south-east of Dalmellington.

1.4.3 The land-use is currently predominantly open moorland with rough grazing, but contains an existing overhead line as well as an enclosure of previously felled forestry. Pictures illustrating the existing conditions at the Proposed Development are shown in **Photograph 1.1** and **Photograph 1.2** below.

1.4.4 According to the National Soils Map of Scotland[16] the Proposed Development is underlain by peaty podzols and blanket peat. The NS Carbon Soils Map (2016)[17] identifies the soils as Class 0 ("*mineral soils - peatland habitats are not typically found on such soils*"), Class 4 ("*area unlikely to be associated with peatland habitats or wet and acidic type. Area unlikely to include carbon-rich soils*"), and Class 5 ("*no peatland habitat recorded, may also include areas of bare soil. Soils are carbon-rich and deep peat*").

[16] National Soils Map of Scotland. Available at: https://soils.environment.gov.scot/maps/soil-maps/national-soil-map-of-scotland/ [Accessed October 2025].

[17] NatureScot: Carbon Soils Map (2016). Available at: https://www.arcgis.com/apps/webappviewer/index.html?id=31eaa69a03014972b7888bc927714bbc [Accessed October 2025].

1.4.5 On account of the presence of peat soil being mapped at the Proposed Development, an investigation was undertaken to determine the extent, thickness and condition of peat present. Further details of the peat investigation undertaken to support the preparation of this SPMP are provided in **Section 2.1**.

Photograph 1.1 The Proposed Development as viewed from the A713

Photograph 1.2 The Proposed Development as viewed looking east from the proposed access route (NX 54540 95819) (right)

1.5 Development Proposals

1.5.1 The Proposed Development covers an area of approximately 7.53 hectares (ha) and includes both the permanent operational infrastructure and the temporary works and facilities necessary for its construction.

1.5.2 The Proposed Developments permanent operational infrastructure includes:

- a 132 Kilovolt (kV) substation platform (including a control building, earth switch, disconnectors, CVT, and four car parking spaces);
- Sealing End Compound;
- emergency back-up generator;
- ancillary works (lighting, Closed-Circuit Television (CCTV), security fencing);
- a proposed access route and bellmouth junction to the A713 (**Figure 2.1: Proposed Development**);
- an area for landscape planting (**Figure 6.1: Landscape Planting Plan**);
- SuDS, including two ponds, two culverts and a soakaway; and
- stone access road.

1.5.3 A general arrangement plan showing the layout of the Proposed Development and construction elements is shown in **Figure 2.1 Proposed Development**.

1.6 Definitions of Peat

Peat Depth

1.6.1 Peat is an organic material formed by the accumulation of plant matter at various stages of decomposition, formed over many thousands of years. The characteristics of peat vary widely depending on, but not limited to, the nature of plant material that the peat is derived from, the degree of decomposition, the type of peat bog and the quality of the water sustaining the bog.

Peat

1.6.2 Peat soil (or 'peat') is defined by *SEPA Guidance: Developments on peat and off-site uses of waste peat* (2025) as an organic soil surface layer which contains more than 60 percent of organic matter and is at least 50 cm in thickness. Deep peat is generally considered peat which is >1.0 m. Peat can be classed into two principal types: the acrotelm and the catotelm.

1.6.3 The acrotelm is found in the upper layer of a peat deposit and comprises living vegetation and partially decomposed plant material. Hydraulic conductivity in this layer tends to be higher in relation to distance from the underlying (but seasonally variable) water table. The thickness of the acrotelm layer is typically controlled by seasonal variations in the water-table that creates cycles of aerobic and anaerobic conditions near the surface, and varies depending on topography such as steepness of slope, peat hags and hummocks. In particular, the acrotelm layer can be affected during periods of drought or as a consequence of drainage. Fibrous in texture, the acrotelm layer has some tensile strength and is generally considered to be stable for storage and re-use. The acrotelm has very similar properties to peaty soils.

1.6.4 The catotelm layer is found under the acrotelm layer and comprises decayed plant material and organisms and is denser and with a very low hydraulic conductivity. The catotelm layer is located below the water table, resulting in permanent anaerobic conditions. The catotelm layer is fibrous in its upper horizon but usually becomes increasingly amorphous with depth. Amorphous peat has very low tensile strength, with poor structural characteristics and higher sensitivity to handling, making it less suitable for storage and re-use.

Peaty Soil

1.6.5 Where soil conditions are predominantly organic (and potentially carbon-rich) but have a shallower peat layer (<50 cm) at the surface, these are referred to as 'peaty soils'. The pedology and hydrological characteristics of peaty soils may be similar to "*peat*", but due to thickness, fail to meet the definition of peat according to SEPA.

Priority Peatland

1.6.6 According to NS[18], priority peatland corresponds with particular habitat communities that show evidence of being undisturbed and actively forming peat, as defined below:

- M1 Sphagnum denticulatum, M2 Sphagnum fallax/S. cuspidatum and M3 Eriophorum angustifolium. Bog pools occupy waterlogged depressions, shallow pools and erosion channels on bogs;
- M17 Trichophorum-Eriophorum and M18 Erica-Sphagnum. Communities of wetter peat and have species such as Molinia caerulea, Trichophorum cespitosum, Myrica gale and Erica tetralix; and
- M19 Calluna-Eriophorum. Communities of drier raised bog surfaces dominated by Calluna vulgaris and Eriophorum vaginatum, often interspersed with Sphagnum capillifolium and Sphagnum papillosum. The presence of these species indicate stable peat accumulation and limited surface water movement.

1.6.7 Certain vegetation communities occurring in blanket bog above 600 m (known as montane bogs) are also identified as priority peatland habitat, these are particularly sensitive and can be difficult to restore.

1.6.8 Peat and peatlands can be degraded over time due to natural erosion and anthropogenic factors such as dewatering from land drainage and erosion from livestock. Climate change, in particular weather extremes, warmer temperatures and intensive rain, can further exacerbate these natural and anthropogenic causes. Particular vegetation and habitat communities can indicate degradation, being unlikely to be reflective of priority peatland. These include:

- M20 Eriophorum vaginatum. A degraded form of M19 where the heather and most of the Sphagna have been eliminated by heavy grazing, repeated burning and/or atmospheric pollution;

[18] NatureScot: Advising on peatland, carbon rich soils and priority peatland habitat in development management (Published April, 2023, revised November 2023). Available at: https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management [Accessed October 2025].

- M15 Trichophorum-Erica, M16 Erica-Sphagnum and M25 Molinia-Potentilla. Classed as blanket bog when they are on deep peat, as they are almost always a replacement for the original bog vegetation, following unfavourable management such as regular burning and/or heavy grazing.

1.6.9 In accordance with the mitigation hierarchy presented in **Mitigation Hierarchy Section** of this SPMP, priority peatland communities should be avoided by development or impacts minimised through design and mitigation. Areas of degraded peatland present opportunities for restoration of enhancement.

2 OCCURRENCE OF PEAT

2.1 Field Surveys

2.1.1 The soil and peat investigation was undertaken with reference to Scottish Government guidance for peat surveys[19]. The surveys were undertaken in August 2024 and comprised the following;

- a Phase 1, 100 x 100 m grid survey within an initial option area north of the A173 comprising the collection of 18 points;
- a Phase 2 (detailed) survey using a 10 x 10 m grid across the Proposed Development footprint, and comprised the collection of 234 points; and
- soil and peat coring was also undertaken at selected locations using a Russian Corer. The following information was recorded during peat core sampling;
    - depth of acrotelm;
    - degree of humification using Von Post classification;
    - water content; and
    - substrate underlying the peat (where possible), described with reference to BS5390.

2.1.2 Peat depth survey methods followed good practice. Depths were measured using utility probes advanced by hand through the soil until refusal. Notations on morphology, peat condition[20] and a judgement of the likely substrate was also recorded.

2.1.3 Where non-peat soils were encountered, basic soil texture analysis used field techniques to provide a coarse description of the encountered soil type, including the following key soil attributes;

- general description of soil profile;
- soil wetness;
- colour;
- stoniness;
- soil texture; and
- substrate.

2.1.4 The texture analysis flow chart used during the surveys was undertaken in accordance with Forest Research – The Identification of Soils[21].

2.1.5 Peat surveys in the centre of The Site were constrained by the presence of an existing overhead line (OHL), and locations were not surveyed to comply with the minimum standoff distance according to WSP's safe system of working around live utilities. The eastern area of the Temporary Contractor compound could not be surveyed due to a late change to the design.

2.2 Soil & Peat Conditions

Peat Depth and Distribution

2.2.1 A total of 252 soil probing measurements were undertaken over the course of the surveys, with the results summarised in **Table 2.1** below, and illustrated in **Figure 5.2 Soil and Peat Depths**.

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[19] Scottish Government: Guidance on carrying out peatland site surveys (2017). Available at: https://www.gov.scot/publications/peatland-survey-guidance/ [Accessed October 2025].

[20] NatureScot: Peat Condition Assessment Leaflet (2023). Available at: https://www.nature.scot/sites/default/files/2023-02/Guidance-Peatland-Action-Peatland-Condition-Assessment-Guide-A1916874.pdf [Accessed October 2025].

[21] Forest Research: The Identification of Soils – Field Guide (2023). Available at: https://cdn.forestresearch.gov.uk/2002/01/Soil-Guide-2023-digital.pdf [Accessed October 2025].

2.2.2 The recorded peat and soil depths were found to vary slightly across the Proposed Development in terms of thickness and extent, but were almost entirely <0.5 m thickness and are therefore considered peaty soils.

Table 2.1 Soil & Peat Depth Survey Descriptive Statistics

Probed thickness (m)	Survey points (no.)	Average depth in range (m)	Percentage (of total points)
<0.5 m (peaty soil)	236	0.25	93
0.5 to 1.0	14	0.64	6
1.0 to 1.5	1	1.03	<1
1.5 to 2.0	0	0.00	0
2.0 to 3.0	1	2.77	<1
>3.0	0	0.00	0
Total	**252**	**-**	**100**

2.2.3 Approximately 93% of survey locations identified organic peaty soils or other soft mineral soils that were <0.5 m deep, 6% of survey locations encountered peat within the >0.5 and ≤1.0 m, with only two locations recording peat >1.0 m deep. These locations of peat >1.0 m are outside the footprint of the Proposed Development.

2.2.4 Soil and peat texture analysis has indicated that the soil column contains a generally thin organic horizon, which is underlain by clay matrix supported sands and gravels (known as composite soils). Clay soils were found to be soft in the upper margins and therefore peat probing measurements presented in **Table 2.1** are likely to be exaggerated with measured values including underlying sections of non-peat soil horizons.

2.2.5 As noted in **Paragraph 2.1.5**, part the Proposed Development could not be surveyed due to the presence of an OHL. The un-surveyed area corresponds to the southern extent of the proposed substation platform, one of the SuDS pond, a short section of access track, and part of the platform required for the Sealing End Compound. This area comprises an enclosure of previously felled forestry and exhibits signs of recent surface reworking, likely associated with temporary activities linked to the existing OHL. Additionally, the eastern part of the Contractor compound was also not surveyed due to a design change implemented after the completion of field surveys. Based on the observed surface disturbance and the consistent presence of peaty soils (rather than peat) across the entire surveyed area, it is considered highly unlikely that the absence of soil and peat depth data within these locations materially affects the validity of the dataset or the conclusions presented in this SPMP.

Peatland Habitat

2.2.6 NVC surveys have identified that the prevailing habitat at the Proposed Development is M25 *Molina-Potentilla* grassland, which dominates much of the central and southern areas. According to NS[18] M25 Molina grassland is considered a blanket bog when situated on deep peat (>1.0 m) and is usually a replacement for the original bog vegetation following unfavourable management.

2.2.7 Whilst M25 could be priority peatland, peat survey data have indicated that peat depths are consistently <1.0 m and these habitats are unlikely to be constituted as blanket bog and unlikely to raise issues of national interest. As such, the Proposed Development is not protected for its peatland interest and, based upon the results outlined above, it is considered that the Proposed Development would not raise issues of national interest.

Soil & Peat Characteristics and Condition

2.2.8 Peat condition information in accordance with the Peatland Condition Assessment[20] categories were collected on targeted peat surveys undertaken in 2024. The most common condition category was 'N/A' on account of the absence of peatland habitat. Where peatland habitat characteristics were evident, conditions were considered to be 'Modified'. Modifying pressures were generally associated with erosion from livestock or historic ground disturbance. Some land drainage was also evident.

2.2.9 None of the survey locations were described as 'near-natural' or 'actively eroding'.

2.2.10 The peat survey also collected five soil and peat cores from across the Proposed Development targeting areas of proposed infrastructure. The locations of the peat cores are illustrated in **Figure 5.2 Soil and Peat Depths**. A summary of the information obtained from the soil and peat cores is presented below in **Table 2.2.** Soil and peat core logs are presented in **ANNEX B: PEAT CORE LOGS.**

Table 2.2 Summary of ground conditions encountered through soil and peat coring

Core ID	BNGR	Target	Probed Depth (m)	Core Depth (m)	Description of Soils
Core 1	NX 54540 95819	West of earthworks associated with new access	0.49	0.49	Very weakly decomposed peat soil (H3) to 0.3 m below ground level (bgl), overlying sandy clay.
Core 2	NX 54538 95724	Near temporary compound	0.45	0.44	Very weakly decomposed becoming weakly decomposed peat soil (H3-H4) to 0.3 m bgl, overlying sandy clay loam.
Core 3	NX 54660 95856	Substation platform, central	0.38	0.20	Thin organic horizon (likely H2, almost undecomposed peat soil) ~0.1 m bgl, overlying firm sandy clay.
Core 4	NX 54639 95722	Sealing End Compound	0.30	0.30	Thin organic horizon (likely H2, almost undecomposed peat soil) to 0.1 m bgl, becoming very weakly decomposed peat soil (H3) by 0.3 m bgl. Substrate not retrieved.
Core 5	NX 54619 95843	Substation platform, south	0.60	0.50	Thin organic horizon (likely H2, almost undecomposed peat soil) becoming strongly decomposed peat (H6) to 0.35 m bgl. The organic horizon was underlain by silty sandy clay.

2.2.11 An organic (O) horizon was identified at all core locations, however none of the cores identified an O horizon >0.5 m thickness and therefore does not meet the required definition of peat and is instead a peaty soil.

2.2.12 The O horizon had a thin surface rooting layer, under which was very weakly to occasionally strongly decomposed fibrous peat (generally H2, rarely H6). The O horizon generally contained the water table and was ~0.2 m bgl. The dominant substrate identified was sandy clay and was typically ~0.3 to 0.4 m bgl. The lower part of the O horizon was frequently mixed with the underlying mineral horizon (A or B horizons). A photograph illustrating the clay substrate is shown below in **Photograph 2.1.**

Photograph 2.1 Photograph obtained from a core log section Core 5 (substation platform) illustrating a thin horizon of wet fibrous weakly decomposed peat underlain by soft brown sandy clay

2.3 Additional Investigation

2.3.1 The field survey information obtained by WSP has been supplemented using information from a Ground Investigation Report (GIR) prepared by Raeburn Drilling & Geotechnical Limited, dated September 2020. The GIR and associated site work comprised the advancement of four boreholes sunk by cable percussion and rotary methods and fifteen trial pits.

2.3.2 The boreholes and trial pits encountered peat and organic topsoil to depths up to 0.7 m, overlying mainly granular glacial till. Peat and organic topsoil are reduced in thickness from south to north, with the soils at the proposed substation platform being more granular and better drained. Most of the trial pits were completed in the glacial soil at depths ranging from 2.4 m to 4.0 m. However, underlying bedrock was encountered in several of the boreholes and trial pits at depths ranging from 2.5 m to 5.0 m. Photographs of the trial pits are presented in **Photograph 2.2** and **Photograph 2.3**.

2.3.3 Groundwater was generally encountered at the surface, with resting water heads also at the surface.

Photograph 2.3 Photograph from the GIR of Trial Pit 1 (access track, south)

Photograph 2.2 Trial Pit 12 (substation platform).

3 POTENTIAL IMPACTS FROM CONSTRUCTION

3.1.1 The key elements for construction of the Proposed Development comprise the excavation of a substation platform, Sealing End Compound, as well as formation of access to and around The Site. These would require the stripping of peat or peaty soil down to a suitable load-bearing substrate and formation level, and applies to the following elements of the Proposed Development:

- Substation platform (3800 m^2);
- Sealing End Compound (900 m^2);
- Permanent drainage (two SuDS ponds and a soakaway) (680 m^2);
- Permanent access track (2400 m^2); and
- A temporary contractor compound and access (4,690 m^2).

3.1.2 In addition to the above, a further 16,100 m^2 would be required for earthworks associated with the construction of the Proposed Development. Whilst it is anticipated that these areas would need to be cleared during construction, it is assumed these areas would provide a suitable opportunity for peaty soil and other soil reinstatement.

3.1.3 Other construction activities that have the potential to disturb peat and peaty soils include:

- trafficking of plant and machinery over areas underlain by peat and peaty soils;
- drawdown of the water table for adjacent peatland during excavation dewatering;
- laydown of materials (including excavated peat and mineral soils) on peat or peatland
- vegetation; and
- reinstatement of peat and peaty soils and/or other revegetation activities to reinstate or tie pre-construction peatland habitats into the Proposed Development.

3.1.4 These activities have the potential to cause a range of effects during construction and operation, including the loss of integrity and vegetation, drying, erosion, oxidation, interruption of peatland hydrology, as well as loss of function:

- loss of structural integrity and peat strength, due to stripping or damaging the surface vegetation turf, excavation, handling and transporting peat (particularly wet, sub-surface peat);
- erosion and gullying, caused by exposure and desiccation of bare peat surfaces, primarily caused by water erosion, due to surface runoff after rainfall;
- contamination, caused by leaks, spillages or inappropriate laydown of materials; and
- peat slide, caused by laying wet peat on top of wet peat, laying other heavy materials (including excavated mineral soil or other construction materials) on top of wet peat or by inappropriate stockpiling, such as attempting to create stockpiles of peat that are too high, without bunding, engineering or geotechnical support.

4 AVOIDANCE & MINIMISING PEAT DISTURBANCE DURING CONSTRUCTION

4.1 Avoidance

4.1.1 Peat and carbon-rich soils have been considered as a critical constraint in relation to the design process for the Proposed Development.

4.1.2 The positioning of part of the Proposed Development on previously disturbed ground has reduced potential impacts on previously undisturbed areas of peat and peaty soils, thus providing avoidance.

4.1.3 The field surveys have confirmed that peat is generally absent from the Proposed Development, which is dominated by clay rich acid soils with a thin overlying organic horizon, which was generally <0.5 m and did not exceed 1.0 m within the platform footprint nor other temporary areas.

4.1.4 Soil and peat depths >0.5 m were rare, with inspection of the soil column through coring demonstrating that increased probed thickness was a result of soft clay substrate composite soil types, as opposed to an organic horizon sufficiently thick as to meet the required 0.5 m thickness definition of peat.

4.1.5 The dominant habitat within the Proposed Development is M25 Molinia-Potentilla grassland on shallow peaty soil, which is not a priority peatland habitats or likely to raise issues of national interest.

4.1.6 Areas of peat >1.0 m were identified several hundred meters upgradient of the Proposed Development infrastructure. These areas are not expected to be influenced by the construction and operation of the Proposed Development.

4.2 Measures to Protect In-Situ Peat

4.2.1 Field surveys have demonstrated that the Proposed Development would not result in the direct disturbance of peat. Notwithstanding, good practice mitigation measures would be deployed to minimise unnecessary peat disturbance in adjacent areas, to protect any minor areas of as-yet undiscovered peat, as well as to minimise disturbance of carbon rich peaty soils.

4.2.2 All contractors would be made aware of the sensitivity of peat, peaty soils and peatland habitats and would be required to work within the narrowest practical construction corridor when working in or near areas of peat. If required, an access plan following the consented access track routes would be developed and physically demarcated. The plan and demarcated route would provide a controlled route and a permissible corridor within which service vehicles and plant can operate prior to peat stripping. The purpose of this is to protect in situ peat in areas that would not be affected by the Development layout and prevent unnecessary damage.

4.2.3 Measures to minimise peat disturbance outlined in this SPMP would be adopted into the Stage 2 SPMP, as well as the Construction Environmental Management Plan (CEMP), which shall be prepared and implemented by the Principal Contractor, which would be based on the Outline CEMP included in this application. The Environmental Clerk of Works (ECoW) shall monitor compliance of the construction activities with the CEMP and Stage 2 SPMP.

4.3 Mitigation – Excavation, Storage and Transport

4.3.1 **Section 2.2** describes how the soil conditions at the Proposed Development are dominated by a thin organic horizon (peaty soil) underlain by clay.

4.3.2 Best practice mitigation measures would be adopted for very minor areas of organic rich wet peaty soils within working areas. Given the heterogeneous distribution of soil types, best practice handling methods are provided and would be applicable for peaty soils as well as any as-yet minor undiscovered deposits of peat.

Preparation

4.3.3 All infrastructure would be marked out on the access plan and demarcated on the ground to minimise unnecessary disturbance.

4.3.4 Excavation would be undertaken by suitably experienced personnel in appropriately sized plant, such as 360-degree low-pressure tracked excavators.

4.3.5 The timing of excavation should be planned to allow reinstatement to be undertaken as quickly as possible in order to minimise the peat and vegetation drying out, which would adversely affect successful re-use. The disturbance of peaty soils should also avoid very wet weather.

4.3.6 Excavation activities should be undertaken in accordance with other good practice mitigation, including drainage management and pollution prevention. It is essential to minimise the effects of erosion on excavated peat and peatlands through good practice.

Excavation

4.3.7 Excavated peat should be excavated as turves, including the acrotelm (surface vegetation) and a layer of adjoining catotelm (more humified peat) typically up to 0.5 m thick in total, or as blocks of catotelm;

- the turves should be as large as possible to minimise desiccation during storage;
- contamination of excavated peat with substrate materials such as clay should be avoided; and
- consider timing of excavation activities to avoid very wet weather and multiple handling to minimise the likelihood of excavated peat losing structural integrity.

4.3.8 This technique would maintain connectivity between the surface vegetation and more decomposed underlying layers.

4.3.9 Any dewatering of excavations in peat and peatland should only be undertaken when absolutely necessary. Measures to minimise the effects of dewatering from upgradient areas around excavations should be implemented where possible, including the use of stripped vegetation to seal low angled cut peat faces.

4.3.10 For peaty soils and non-peat soils, the precise method of stripping and the depth to which the topsoil and subsoil would be stripped would be determined during the detailed design phase prior to construction and would be location specific. Soil horizons should be stripped sequentially in the order they are present – topsoil to upper subsoil horizons, to lower subsoil horizons. Care should be taken to avoid compacting vegetation and topsoil horizons.

Transport

4.3.11 Movement of turves should be kept to a minimum once excavated, and therefore it is preferable to plan to transport peat planned for translocation and reinstatement to its receptor destination at the time of excavation (to avoid double-handling via temporary storage locations).

4.3.12 If Heavy Goods Vehicles (HGVs) / dump trucks that are used for transporting non-peat material are also to be used for peat materials, measures should be taken to minimise cross-contamination of peat soils with other materials.

Temporary Storage

4.3.13 Consideration for the storage of peat has been undertaken with respect to the Scottish Renewables Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste[22]. The storage of non-peat soils should follow the relevant best practice, such as Department for Environment Food and Rural Affairs (DEFRA) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[23].

4.3.14 The priority should be to transfer peat straight to a suitable area for reinstatement. However, where peat cannot be transferred immediately, short term storage would be required, and the following good practice applies:

- where accessible, the storage of peat should be located in areas that have been previously subject to necessary disturbance and should be at least 25 m from a watercourse;

[22] Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (SR, SEPA, January 2012).

[23] Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009)

- local gullies, diffuse drainage lines (or very wet ground) and locally steep slopes should be avoided for peat storage;
- the Principal Contractor, ECoW and appointed Geotechnical Adviser would determine the requirements for any preparatory works including ground smoothing, benching, or bunds. Drainage and pollution prevention controls would be implemented as necessary;
- peat and peat turves would be transported intact, with vegetation upright (**Photograph 4.1**), in a single layer on top of geotextile membrane. Stored peat would also be covered with turves in a manner to maximise coverage (**Photograph 4.2**);
- stored upper turves (incorporating vegetation) should be organised and identified according to NVC community (assisted by the ECoW) for reinstatement adjacent to like communities in the intact surrounding peat blanket;
- wet peat can be stored to a thickness <1.0 m, drier and more stable peat can be stored to a thickness of <2.0 m;
- drying of stored peat should be avoided by irrigation (although this is unlikely to be significant for peat materials stored for less than 2 months);
- regular inspection of the temporary storage areas should be undertaken by the ECoW. Issues or concerns should be appropriately actioned by the Principal Contractor; and
- when peat storage is no longer required, the removal of peat would be subject to the same controls outlined for Peat Excavation.

Photograph 4.1 Good practice temporary storage of turves: stored upright, with minimal overlapping

Photograph 4.2 Use of turves in a "checker-board" pattern on top of catotelmic peat to maximise coverage and minimise drying out.

4.4 Restoration & Re-Use

Suitability for Re-Use

4.4.1 The characteristics of the excavated peat (e.g. fibrosity and water content) determines its suitability for re-use with the wettest most amorphous peat generally being the least suitable. The von Post classification undertaken indicated that humification values were typically ~H1 to H3 fibrous peat.

4.4.2 The following assumptions have been made with regard of the characteristics of the peat and the intended suitable reuses at the Development:

- acrotelmic peat / peaty soils – when stripped with the vegetation, intact turves of acrotelmic peat or peaty soils would be suitable for surface reinstatement, dressing back and tying in the platform to the surrounding vegetation and habitats.
- fibrous catotelmic peat (not expected) – most suitable for reinstatement beneath the replaced acrotelm. It may also be used as a surface layer with careful site selection and management to control erosion and encourage vegetation recovery (e.g. seeding, translocation of vegetation and fencing to deter deer grazing).
- amorphous peat (not expected) – peat of this type would only be suitable for reinstatement of excavations beneath a surface vegetation layer.

4.4.3 Based on site specific observations and the general avoidance of deep peat through the careful placement of infrastructure, it is unlikely that amorphous / catotelmic peat would be generally encountered, and therefore reinstatement volumes are likely to be minimal.

4.4.4 Where excavated peat contains large volumes of residual forest materials such as brash or stumps, this can affect the suitability of the peat for reinstatement.

Re-use in Infrastructure Dressing

4.4.5 In line with NPF4 and associated good practice guidance, the primary design aim is to avoid peat and therefore peat excavation. Whilst the design has avoided deep peat, due to engineering, logistical, or to avoid other environmental constraints, the complete avoidance of peaty soils by Proposed Development infrastructure isn't possible. Therefore, the Development must minimise the effects of disturbance through design and mitigation, namely reinstatement of peaty soil that allows it to function and not comprise the ecosystem services offered by peat and peaty soils.

4.4.6 All excavated material (including peat and non-peat soils) from the construction of the Proposed Development would be re-used on site to provide the best environmental outcome. The principles of peat re-use and reinstatement of excavated peat as part of development reinstatement are as follows:

- peat and peaty soils should not be re-used where no peat is present before (and includes types of peat, i.e. avoiding re-using catotelmic peat if it was not there before);
- peaty soils would be reinstated on low angled batter slopes within areas of topographic convergence / flush features that would facilitate wet soil conditions. This may include the preferential re-use of peat of the upgradient side of access tracks;
- the placement of catotelmic peat in locations that encourages catotelmic peats functionality within the peatland system (i.e. connected to the water table); and
- the placement of acrotelmic peat and turves over the top of catotelmic peat.

4.4.7 In following these principles, the following must be considered:

- the placement of catotelmic peat must be in a location that would encourage the retention of water and thus decrease the risk of the peat drying, oxidising and degrading;
- the placement of catotelmic peat must not form topographic highs, at an elevation above the likely surrounding water table;
- the source of the catotelmic peat should be from excavations / temporary storage as local as possible in order to minimise transport distances; and
- the placement of catotelmic peat must not result in any geotechnical instability.

4.5 Re-Seeding & Monitoring

4.5.1 Natural regeneration of vegetation is the preferred option for reinstatement and re-use.

4.5.2 During the construction works, in areas where the spreading of seed rich materials or natural regrowth is considered impractical, ineffective, or where re-establishment of vegetation is observed to be failing, consideration would be given to re-seeding methods.

4.5.3 Where additional re-seeding is deemed necessary, a suitable seed mix would be agreed with the local planning authority.

4.5.4 The success of construction and the subsequent re-use of peat across The Site would be monitored to ensure that adverse effects on the peatland environment are appropriately understood and subsequently reduced via any remedial works that may be required (although not expected).

4.6 Auditing and Inspection

4.6.1 The success of construction and the subsequent re-use of peaty soil across The Site would be monitored by the ECoW to ensure that effects on the peatland environment are appropriately understood and disturbance reduced via any remedial works that can be undertaken. The details of monitoring would be discussed and agreed with SEPA, NS and the Local Planning Authority prior to commencement. Appropriate monitoring is important to:

- provide reassurance that established mitigation and reinstatement measures are effective and that The Site is not having a substantial adverse impact upon the local and/or wider environment;
- indicate whether further investigation is required, where pollution is identified or unsuccessful reinstatement, with the need for additional mitigation measures; and
- understand the long-term effects of The Site on the natural environment.

4.6.2 Due to the nature of the construction activities and the possibility that such works can increase the volume of dissolved and particulate matter from entering the natural drainage network, a robust hydrological monitoring strategy would be implemented.

4.6.3 A reinstatement monitoring strategy can also be implemented, where surveys can be carried out to monitor the success of peat re-use and subsequent reinstatement. Complementary to the hydrological monitoring highlighted above and best practice geotechnical monitoring, the success of vegetation reinstatement can provide an insight into the effects of the Proposed Development on the local environment. Full details of the environmental monitoring strategies would be finalised following consultation with SEPA, NS and the Local Planning Authority.

5 PEAT BALANCE ASSESSMENT

5.1 Introduction

5.1.1 To estimate the volume of peaty soil that could be re-used as part of construction and demonstrate that no excavated material shall be generated as waste, an indicative estimate has been calculated based on best practice and past project experience. This estimate has incorporated the predicted volumes of peaty soil to be excavated and opportunities for re-use. No peat (acrotelmic or catotelmic) has been identified.

5.1.2 Estimated peat re-use assumptions are aligned with good practice outlined in **Section 4.4**. Soil and peat re-use shall be appropriate to the setting, i.e. where acrotelmic or catotelmic peat was not widely present before, re-use estimates are not provided. It should be noted that this assessment has not accounted for excavation volumes of glacial sub-soils or weak bedrock material which may be deemed unsuitable for incorporation into foundations and hardstand elements. Due to the minor extent of the development, no bulking factor has been applied.

5.2 Peaty Soil Excavation

5.2.1 The following section provides a summary of the peaty soil excavation requirements for the Proposed Development. The individual elements of the Proposed Development, as described below, are illustrated in **Figure 5.2 Soil and Peat Depths**.

5.2.2 Anticipated volumes of peat and peaty soil requiring excavation to construct the Proposed Development are presented in **Table 5-1**.

Excavated Stoned Access Tracks

5.2.3 Excavate and replace ('cut') construction of access tracks is proposed for all of the proposed on-site access. This is owing to the shallow nature of the peaty soils present within the Proposed Development, which would not support floating track construction methods. The cut construction method requires the removal of soil deposits down to a suitable sub-grade layer within the superficial or bedrock geology. Excavated material is then reinstated carefully along cut access track landscaped verges on either side of the cut access track or utilised in appropriate landscaping across the Proposed Development infrastructure. Cut access track construction sequences shall be designed in accordance with local ground conditions and following a detailed site investigation. For the purpose of this SPMP, a 5 m running width with additional 1 m to either side to accommodate for drainage is assumed.

Substation & Sealing End Compound platform

5.2.4 The substation would require the formation of a platform which would require the excavation of superficial soils down to a suitable load bearing stratum. The Sealing End Compound platformwould be separate to the substation and require the formation of an additional platform. The substation would be served by a SuDS pond as part of the drainage network, which would similarly require the excavation of superficial soils.

Contractor compound

5.2.5 The contractor compound would be a temporary feature and would require the formation of a platform. It would require the excavation of superficial soils down to a suitable load bearing stratum.

Table 5.1 Summary of ground conditions encountered through soil and peat coring

Infrastructure	Average Peat Depth (m)	Peaty Soils (m^3)	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Assumptions / design information
Permanent infrastructure elements requiring excavation					
Substation platform	0.22	836	0	0	The permanent substation platform would be 600 m by 405 m, with a total area of approximately 3,800 m^2.

Infrastructure	Average Peat Depth (m)	Peaty Soils (m^3)	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Assumptions / design information
Sealing End Compound platform	0.24	216	0	0	The permanent Sealing End Compound would be 30 m by 30 m with a total area of approximately 900 m^2
SuDS pond 1 (Substation platform) & Soakaway	*0.49**	170	0	0	The permanent SuDS pond for the substation platform would have an area of approximately 250 m^2. The soakaway is approximately 90 m^2.
New Access Tracks	0.23	552	0	0	The two new sections of cut access track and the bell mouth junction would have a total area of approximately 2,400 m^2
Temporary infrastructure elements requiring excavation					
Earthworks footprint and infrastructure periphery tie-in	0.28	4,510	0	0	In order to provide suitable landscape tie in and to accommodate for the slightly sloping nature of The Site, peripheral areas around permanent infrastructure would require excavation of superficial soils and would have a total area of approximately 16,100 m^2
Contractor compound Area 1 and access	0.32*	858	0	0	The temporary compound and access would have a total area of approximately 2,680 m^2
Contractor compound Area 2 and access	*0.49**	985	0	0	The temporary compound and access would have a total area of approximately 2,010 m^2
Totals (m^3)		**8,127**	**0**	**0**	**-**

**No soil or peat data could recorded within the footprint of the SuDS pond for the substation platform due to the presence of an existing overhead line. Similarly, no soil or peat data was available for the eastern of the two temporary contractor compounds. As such, a conservative value based on wider site observations of 0.49 m for average peaty soil depth has been adopted.*

5.2.6 As illustrated in **Table 5.1**, the total excavation requirement for peaty soil is 8,127 m^3. No acrotelmic or catotelmic peat is expected to require excavation as part of the construction of the Proposed Development, with soils being determined as peaty soils.

5.3 Peaty Soil Re-Use

5.3.1 Peaty soil re-use would be in accordance with the principles presented in **Section 4.4**. Excavated peaty soil permanently removed from the Proposed Development infrastructure would be used to reinstate peripheral areas of temporary earthworks, comprising batter slopes and verges, which would allow suitable tie-in with surrounding vegetation. An average peaty soil reinstatement thickness of 0.39 m is assumed across the total earthworks area.

5.3.2 The verges of new cut access tracks would be reinstated to ensure visible tie-in with surrounding vegetation and habitat, but also to ensure stability and functionality of the re-used peaty soil. The reinstatement calculations are based on the earthworks footprint associated with track construction. Verge dressing diameters for tracks are estimated at 0.5 m depth and 2 m wide.

5.3.3 The substation and Sealing End Compound verges shall be reinstated with peaty soil on sides not adjoining the access track and as indicated by the earthworks extent. Acrotelmic peat or turves may be used to dress cut slopes (if present) to minimise dewatering effects in upgradient areas. The temporary contractor compound would be reinstated with peat following completion of construction. Due to the longevity of this temporary infrastructure element, it is likely that peat excavated from the footprint (if required) would be re-used elsewhere to enable more rapid reinstatement.

Table 5.2 Proposed uses of excavated peat and peaty soil together with indicative volumes

Infrastructure	Peaty Soils (m^3)	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)	Re-Use Volume (m^3)	Assumptions / design information
Substation platform	0	0	0	0	The permanent substation platform would be 600 m by 405 m, with a total area of approximately 3,800 m^2. The permanent Sealing End Compound platform would be 30 m by 30 m with a total area of approximately 900 m^2 The permanent SuDS pond for the substation platform would have an area of approximately 250 m^2. The soakaway is approximately 90 m^2. The two new sections of cut access track and the bell mouth junction would have a total area of approximately 2,400 m^2
Sealing End Compound	0	0	0	0	
New Access Tracks	0	0	0	0	
SuDS ponds & Soakaway	0	0	0	0	
Earthworks footprint and infrastructure periphery tie-in	6279	0	0	6279	Peaty soil would be re-used to reinstate peripheral earthworks with an average placement thickness of 0.39 m. The final placement thickness across the earthworks margins would be subject to detailed design, but it is envisaged the placement thickness would not exceed 1.0 m in any single area.
Contractor compound and access	1843	0	0	1843	The contractor compound and access would be fully reinstated to their original peaty soil profile.
Total (m^3)	**8,122**	**0**	**0**	**8,122**	**-**

5.3.4 An overall summary of the peat and peaty soil excavation and re-use balance is presented below in **Table 5.3.**

Table 5.3 Peat and peaty soil excavation and re-use balance summary

	Peaty Soils (m^3)	Acrotelmic Peat (m^3)	Catotelmic Peat (m^3)
Total excavation volume requirement	8,127	0	0
Total re-use opportunity within the Proposed Development	8,122	0	0
Peat Balance*	**+5**	**0**	**0**
**A negative balance volume indicates there is more than sufficient capacity for re-use during reinstatement. A positive value indicates a surplus of material could be generated and it would need to be re-used locally as part of other reinstatement or an alternative re-use strategy*			

5.3.5 Comparing the total capacity for peat and peaty soil re-use presented in **Table 5.2** with the total volume of excavated peat presented in **Table 5.1**, it is indicated that the Proposed Development would have sufficient capacity to accommodate all excavated peaty soil on site.

5.3.6 This SPMP has demonstrated that there is no peat within the Proposed Development and therefore measures for the recycling, other recovery and disposal of waste peat (and consequential peat waste management plan) are therefore not required.

5.3.7 The assessment has also demonstrated through detailed calculations, that all arising peaty soil can be reused within the Proposed Development.

6 DISCLAIMER

6.1.1 The information presented in this SPMP is based on the results of peat surveys carried out by WSP prior to EA submission.

6.1.2 It is highlighted that whilst attempts have been made to collect peat depth and condition information, further investigations can be carried out as part of detailed site investigation (post-consent). This process can provide further information across all infrastructure locations (including the few small areas which could not be surveyed), which should be used to further refine the peat excavation and reuse volumes as part of the Stage 2 SPMP.

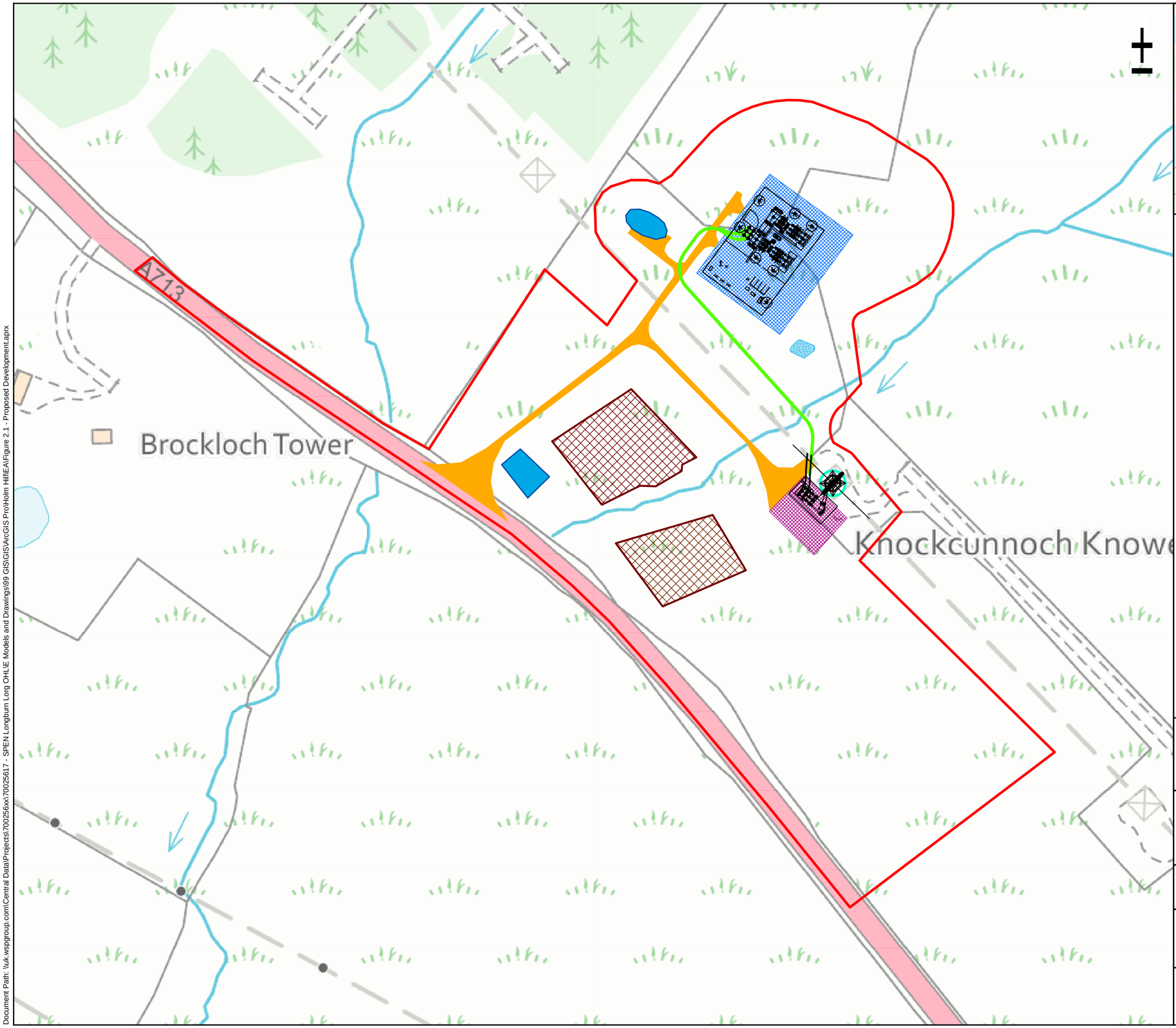
6.1.3 This SPMP should be considered a live document throughout the planning process and any future pre-construction phases of works. As such, additional information can be incorporated following the results of detailed site investigations carried out prior to construction, as well as from any discussions with SEPA or other engaged stakeholders throughout the development process.

6.1.4 The peaty soil extraction and re-use volumes are intended as a preliminary indication. The total peaty soil volumes are based on a series of assumptions for the infrastructure layout and peat depth data averaged across discrete areas of the Proposed Development. Such parameters can still vary over a small scale, and therefore, local topographic changes in the bedrock profile may impact the total accuracy of the volume calculation.

6.1.5 The accuracy of these predictions may be improved through further detailed site investigation (post consent). It is therefore important that the SPMP remains a live document throughout pre-construction and construction phases and is encapsulated within a wider CEMP. The SPMP and volumetric assessments can be updated as more accurate information becomes available.

6.1.6 The purpose of this report is to demonstrate that there has been a systematic consideration of peat management and a quantitative assessment throughout the development process, as required by Local and National Planning Policy.

Annex A: Site Layout Plan



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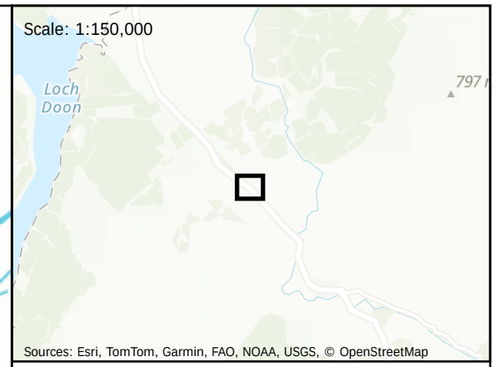


Key

- Holm Hill Red Line Boundary
- Proposed Underground Cable
- Existing Tower
- 132 kV Proposed Substation Platform
- Access Road
- Sealing End Compound
- Temporary Contractor Compound
- SuDS Pond
- Proposed Soakaway

0 0.03 0.06 0.1 km

wsp

Client: SP Energy Networks

Project: Holm Hill Substation

Title: Annex A - Site Layout Plan

Date: 06/11/2025 Scale: 1:2,000 @ A3

Drawn: AS Checked: JE Approved: ML

Drawing Number: 70025617-WSP-HOLM-007

Document Path: \\uk.wspgroup.com\Central Data\Projects\700256xx\70025617 - SPEN Longburn Lorg OHLUE Models and Drawings\99 GIS\GIS\ArcGIS Pro\Holm Hill\EA\Figure 2.1 - Proposed Development.aprx

Annex B: Peat Core Logs

Holm Hill 132kv Substation Peat Core Log

DATE:	30 October 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Holm Hill 132kv Substation Peat Core Log		
CLIENT:	SPEN	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

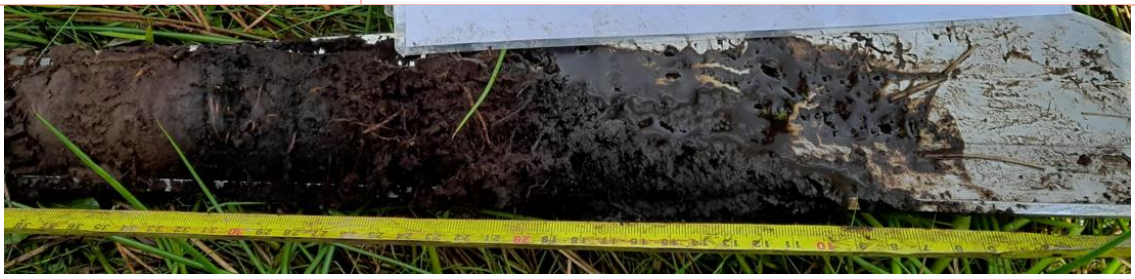
Core 1			
Date	20/08/2024	Weather	Overcast with showers
Surveyors	JL	**Location**	Proposed SuDS Pond
Equipment	Russian corer	**Coord.**	NX 54540 95819
Probed Peat Depth (m)	0.49 m	**Substrate**	Very stiff clay (partial recovery)

Sample	**Depth collected (m bgl)**	**Description / Observations**
1	0 – 0.3	H3: Very weakly decomposed, plant structure distinct; yields distinctly turbid brown water, no peat substance passes between the fingers, residue not mushy.
	0.3 – 0.49	Soft dark brown sandy clay becoming brown sandy clay with occasional gravel
		
Notes & Overview	Peat core location situated within proposed SuDS Pond. The area is generally level with a slight sloping towards the south. The water table was very close to the surface within organic hozion.	
		

Holm Hill 132kv Substation Peat Core Log

DATE:	30 October 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Holm Hill 132kv Substation Peat Core Log		
CLIENT:	SPEN	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

Core 2			
Date	20/08/2024	Weather	Overcast with showers
Surveyors	JL	**Location**	Access track
Equipment	Russian corer	**Coord.**	NX 54538 95724
Probed Peat Depth (m)	0.44 m	**Substrate**	Very stiff clay (partial recovery)

Sample	**Depth collected (m bgl)**	**Description / Observations**
1	0 – 0.2	H3: Very weakly decomposed, plant structure distinct; yields distinctly turbid brown water, no peat substance passes between the fingers, residue not mushy.
	0.2 – 0.3	H4: Weakly decomposed, plant structure distinct; yields strongly turbid water, no peat substance escapes between the fingers, residue rather mushy.
	0.3 – 0.44	Soft dark brown becoming brown sandy clay loam
		
Notes & Overview	Peat core location situated under proposed access. The area is generally level with a slight sloping towards the south. The water table was very close to the surface within organic hozion.	
		

Holm Hill 132kv Substation Peat Core Log

DATE:	30 October 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Holm Hill 132kv Substation Peat Core Log		
CLIENT:	SPEN	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

Core 3			
Date	20/08/2024	Weather	Overcast with showers
Surveyors	JL	**Location**	Substation platform, central
Equipment	Russian corer	**Coord.**	NX 54660 95856
Probed Peat Depth (m)	0.38 m	**Substrate**	Very stiff clay (partial recovery)

Sample	**Depth collected (m bgl)**	**Description / Observations**
1	0 – 0.05	Thin dark brown organic horizon – likely H2 (almost undecomposed: plant structure distinct; yields only clear water coloured light yellow-brown).
	0.1 – 0.2	Firm to stiff light brown becoming grey sandy clay
		
Notes & Overview	Peat core location within proposed substation platform. The area is generally level with a slight sloping towards the south. No water table was encountered.	

Holm Hill 132kv Substation Peat Core Log

DATE:	30 October 2024	**CONFIDENTIALITY:**	Public
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CLIENT:	SPEN	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

Core 4			
Date	20/08/2024	Weather	Overcast with showers
Surveyors	JL	**Location**	Cable Sealing End Compound
Equipment	Russian corer	**Coord.**	NX 54639 95722
Probed Peat Depth (m)	0.3 m	**Substrate**	Rock (not recovered)

Sample	**Depth collected (m bgl)**	**Description / Observations**
1	0 – 0.1	H2: Almost undecomposed: plant structure distinct; yields only clear water coloured light yellow-brown.
	0.1 – 0.3	H3: Very weakly decomposed, plant structure distinct; yields distinctly turbid brown water, no peat substance passes between the fingers, residue not mushy.
		
Notes & Overview	Peat core location situated under Cable Sealing End compound. The area is generally level with a slight sloping towards the south. A small watercourse is located immedately south east. No water table was encountered.	
		

Holm Hill 132kv Substation Peat Core Log

DATE:	30 October 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Holm Hill 132kv Substation Peat Core Log		
CLIENT:	SPEN	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

Core 5			
Date	20/08/2024	Weather	Overcast with showers
Surveyors	JL	**Location**	Substation platform, south
Equipment	Russian corer	**Coord.**	NX 54619 95843
Probed Peat Depth (m)	0.60 m	**Substrate**	Clay

Sample	**Depth collected (m bgl)**	**Description / Observations**
1	0 – 0.2	H3: Very weakly decomposed, plant structure distinct; yields distinctly turbid brown water, no peat substance passes between the fingers, residue not mushy.
	0.2 – 0.35	H6: Strongly decomposed: plant structure somewhat indistinct but clearer in the squeezed residue than in the undisturbed peat; about one-third of the peat escapes between the fingers, residue strongly mushy.
	0.35 – 0.50	Soft dark brown silty sandy clay becoming stiff light brown silty clay
		
Notes & Overview	Peat core location situated in south of proposed substation platform. The area is generally level with a slight sloping towards the south. The water table was very close to the surface within organic hozion. The ground surface appeared to have previously disturbed	

Holm Hill 132kv Substation Peat Core Log

DATE:	30 October 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Holm Hill 132kv Substation Peat Core Log		
CLIENT:	SPEN	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

Annex C: Peat Depth Data

Table 0.1 Peat Depth Data

ID	Easting	Northing	Measured soil & Peat depth (m)
1	254543	595677	0.01
2	254674	595888	0.04
3	254734	595858	0.08
4	254674	595898	0.08
5	254892	596112	1.03
6	254724	595848	0.09
7	254704	595878	0.09
8	254714	595848	0.10
9	254624	595868	0.10
10	254704	595847	0.12
11	254663	595887	0.12
12	254534	595688	0.12
13	254634	595908	0.13
14	254624	595887	0.13
15	254694	595858	0.13
16	254654	595897	0.14
17	254664	595898	0.14
18	254614	595878	0.15
19	254624	595878	0.15
20	254654	595868	0.15
21	254674	595828	0.15
22	254664	595907	0.16
23	254663	595867	0.16
24	254694	595808	0.16
25	254714	595867	0.17
26	254643	595898	0.17
27	254694	595818	0.17
28	254892	595810	0.18
29	254644	595908	0.18
30	254624	595907	0.18

ID	Easting	Northing	Measured soil & Peat depth (m)
31	254644	595888	0.18
32	254683	595868	0.18
33	254683	595828	0.18
34	254514	595698	0.18
35	254674	595848	0.19
36	254654	595907	0.19
37	254654	595887	0.19
38	254644	595878	0.19
39	254653	595857	0.19
40	254664	595838	0.19
41	254664	595828	0.19
42	254524	595698	0.19
43	254793	595810	0.20
44	254704	595888	0.20
45	254614	595888	0.20
46	254653	595838	0.20
47	254684	595848	0.21
48	254614	595898	0.21
49	254634	595867	0.21
50	254644	595857	0.21
51	254714	595877	0.22
52	254714	595827	0.22
53	254704	595818	0.22
54	254704	595867	0.22
55	254694	595878	0.22
56	254633	595877	0.22
57	254684	595818	0.22
58	254792	595711	0.23
59	254664	595848	0.23
60	254694	595887	0.23
61	254674	595877	0.23
62	254644	595868	0.23

ID	Easting	Northing	Measured soil & Peat depth (m)
63	254674	595838	0.23
64	254504	595717	0.23
65	254714	595858	0.24
66	254692	595910	0.24
67	254634	595888	0.24
68	254654	595878	0.24
69	254684	595837	0.24
70	254724	595868	0.25
71	254714	595888	0.25
72	254674	595858	0.25
73	254993	595810	0.26
74	254724	595858	0.26
75	254693	595898	0.26
76	254624	595898	0.26
77	254694	595827	0.26
78	254484	595727	0.26
79	254724	595878	0.27
80	254704	595828	0.27
81	254634	595897	0.27
82	254664	595857	0.27
83	254693	595868	0.27
84	254504	595708	0.27
85	254694	595847	0.28
86	254684	595887	0.28
87	254674	595867	0.28
88	254664	595878	0.29
89	254643	595848	0.29
90	254514	595707	0.29
91	254793	595907	0.30
92	254683	595898	0.30
93	254684	595857	0.30
94	254474	595737	0.30

ID	Easting	Northing	Measured soil & Peat depth (m)
95	254704	595858	0.31
96	254673	595818	0.31
97	254634	595858	0.31
98	254494	595718	0.31
99	254893	596008	0.32
100	254694	595837	0.32
101	254684	595878	0.33
102	254484	595738	0.33
103	254494	595727	0.34
104	254654	595848	0.36
105	254694	596009	0.38
106	254604	595889	0.38
107	254993	596010	0.40
108	254704	595898	0.42
109	254474	595728	0.44
110	254714	595837	0.46
111	254704	595838	0.47
112	254684	595807	0.47
113	254694	595798	0.49
114	254792	596010	0.53
115	254993	595911	0.54
116	254593	595910	0.64
117	254894	595910	0.87
118	254793	596110	2.77
119	254540	595832	0.29
120	254554	595808	0.39
121	254564	595798	0.01
122	254574	595798	0.14
123	254574	595787	0.14
124	254584	595777	0.34
125	254594	595768	0.49
126	254604	595758	0.49

ID	Easting	Northing	Measured soil & Peat depth (m)
127	254613	595747	0.49
128	254622	595738	0.29
129	254622	595738	0.14
130	254634	595728	0.14
131	254644	595718	0.14
132	254654	595707	0.14
133	254664	595698	0.14
134	254674	595688	0.14
135	254674	595688	0.19
136	254683	595678	0.19
137	254674	595678	0.19
138	254664	595687	0.49
139	254654	595696	0.24
140	254644	595708	0.09
141	254634	595718	0.24
142	254625	595728	0.39
143	254614	595738	0.64
144	254604	595747	0.54
145	254594	595758	0.34
146	254584	595768	0.39
147	254574	595777	0.19
148	254564	595788	0.39
149	254553	595798	0.24
150	254544	595797	0.39
151	254554	595787	0.29
152	254564	595778	0.34
153	254574	595767	0.29
154	254583	595757	0.29
155	254594	595747	0.64
156	254604	595738	0.44
157	254614	595728	0.29
158	254624	595718	0.49

ID	Easting	Northing	Measured soil & Peat depth (m)
159	254634	595707	0.29
160	254644	595698	0.24
161	254654	595687	0.29
162	254664	595677	0.24
163	254654	595677	0.34
164	254644	595688	0.14
165	254634	595697	0.09
166	254624	595708	0.39
167	254614	595708	0.29
168	254624	595698	0.09
169	254614	595717	0.49
170	254603	595718	0.54
171	254603	595728	0.44
172	254594	595738	0.44
173	254584	595748	0.29
174	254574	595758	0.39
175	254563	595768	0.29
176	254554	595778	0.19
177	254543	595788	0.29
178	254533	595798	0.14
179	254534	595788	0.39
180	254544	595778	0.39
181	254554	595768	0.30
182	254564	595758	0.39
183	254574	595747	0.39
184	254584	595738	0.54
185	254594	595727	0.64
186	254583	595728	0.49
187	254574	595738	0.34
188	254564	595748	0.93
189	254554	595758	0.39
190	254544	595768	0.34

ID	Easting	Northing	Measured soil & Peat depth (m)
191	254533	595778	0.64
192	254523	595788	0.14
193	254524	595778	0.34
194	254534	595768	0.44
195	254544	595758	0.29
196	254554	595747	0.44
197	254564	595738	0.24
198	254574	595728	0.24
199	254584	595717	0.49
200	254573	595718	0.39
201	254564	595727	0.19
202	254554	595737	0.09
203	254544	595748	0.14
204	254533	595759	0.14
205	254524	595768	0.14
206	254514	595779	0.39
207	254514	595767	0.29
208	254524	595757	0.39
209	254534	595748	0.14
210	254544	595737	0.14
211	254554	595728	0.09
212	254564	595718	0.14
213	254574	595708	0.34
214	254564	595708	0.39
215	254554	595718	0.09
216	254544	595728	0.49
217	254533	595737	0.19
218	254523	595748	0.24
219	254514	595757	0.14
220	254504	595768	0.19
221	254454	595748	0.39
222	254464	595748	0.49

ID	Easting	Northing	Measured soil & Peat depth (m)
223	254464	595738	0.29
224	254474	595748	0.29
225	254505	595757	0.14
226	254514	595748	0.19
227	254524	595738	0.19
228	254534	595727	0.39
229	254544	595718	0.39
230	254554	595708	0.39
231	254564	595697	0.59
232	254554	595698	0.09
233	254544	595708	0.19
234	254534	595717	0.44
235	254524	595728	0.39
236	254513	595738	0.19
237	254504	595748	0.49
238	254494	595758	0.49
239	254484	595747	0.69
240	254494	595737	0.39
241	254504	595728	0.34
242	254514	595717	0.44
243	254524	595708	0.14
244	254534	595697	0.14
245	254544	595688	0.04
246	254494	595748	0.19
247	254503	595738	0.29
248	254514	595728	0.24
249	254524	595717	0.39
250	254534	595707	0.14
251	254544	595698	0.19
252	254554	595688	0.14

Holm Hill Substation

Environmental Appraisal

Appendix 5.2: Private Water Supply Risk Assessment

November 25

Land & Planning

Contents

Page

1 INTRODUCTION

1.1 General

1.1.1 A Private Water Supply Risk Assessment (PWSRA) has been carried out for water supplies that may be affected during the construction and operation of Holm Hill Substation (the 'Proposed Development').

1.1.2 The Proposed Development would be in the Dumfries and Galloway Council area near Carsphairn. The Proposed Development would consist of the construction and operation of the substation, as well as associated infrastructure, including permanent access track and drainage network. A location and layout plan, including Red Line Boundary (RLB), is presented in **Figure 5.1: Hydrology Overview**.

1.1.3 This Appendix should be read in conjunction with the Environmental Appraisal (EA) **Chapter 5: Hydrology, Hydrogeology, Geology & Soils.**

1.2 Scope

1.2.1 This PWSRA forms a Technical Appendix to **Chapter 5: Hydrology, Hydrogeology, Geology & Soils** of the EA. The purpose of this assessment is to ascertain the potential risk to the identified private water supplies (PWS) within 1 km of the Proposed Development, which could be affected as a result of its construction and/or operation. This includes identifying any groundwater abstractions within the following buffers;

- 10 m for all construction activities;
- 100 m radius of all subsurface activities less than 1 m in depth; and
- 250 m of all subsurface activities deeper than 1 m.

1.2.2 Where there is evidence that a PWS could be adversely affected or an abstraction is within the identified buffer distances, a Qualitative Impact Assessment (QIA) is required.

1.3 Policy & Guidance

1.3.1 Legislation and guidance related to good practice during the construction of onshore energy developments, that has been considered in the preparation of this PWSRA, are provided within **Chapter 5: Hydrology, Hydrogeology, Geology & Soils** of the EA.

1.3.2 The PWSRA has been written with reference to the Scottish Environment Protection Agency's (SEPA) *guidance on assessing impacts to groundwater abstractions*, dated 2024[1], as well as the now superseded Land Use Planning Guidance Note 31 (LUPS31) *guidance on assessing impacts to groundwater dependent terrestrial ecosystems and groundwater abstractions*, 2017[2].

1.3.3 In addition to SEPA, the main legislation and policy also relevant to this assessment are:

- Environmental Authorisations (Scotland) Regulations (EASR) 2018 as amended by the Environmental Authorisations (Scotland) Amendment Regulations 2025[3];

[1] SEPA (2024). Guidance on assessing impacts to groundwater abstractions. Available at: https://www.sepa.org.uk/media/mfzpnjwb/guidance-on-assessing-the-impacts-of-developments-on-groundwater-abstractions.docx

[2] SEPA (2017). Land Use Planning Guidance Note 31 (LUPS31) guidance on assessing impacts to groundwater-dependent terrestrial ecosystems and groundwater abstractions. Available at: https://www.sepa.org.uk/media/143868/lupsgu31_planning_guidance_on_groundwater_abstractions.pdf

[3] The Environmental Authorisations (Scotland) Amendment Regulations 2025
Available at: https://www.legislation.gov.uk/sdsi/2025/9780111061473/body [Accessed October 2025]

- The Private Water Supplies (Scotland) Regulations 2006[4];
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017[5]; and
- The Water Framework Directive (2000/60/EC)[6];

[4] UK Government (2006). The Private Water Supplies (Scotland) Regulations 2006. Available at: http://www.legislation.gov.uk/ssi/2006/209/contents/made [Accessed October 2025]

[5] The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/282/contents/made [Accessed October 2025]

[6] The Water Framework Directive (2000/60/EC). Available at: https://eur-lex.europa.eu/eli/dir/2000/60/oj/eng [Accessed October 2025]

2 METHODOLOGY

2.1 General

2.1.1 The PWSRA has been undertaken based on the following methodology:

- completion of a desktop assessment and conceptual site model (CSM) to put the hydrological and hydrogeological setting of the Proposed Development into context (available in **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of the EA);
- consultation with Dumfries and Galloway Council (December 2021 and March 2024) and PWS users (August and September 2024), to confirm the location and nature of each supply. An additional review of Ordnance Survey (OS) and aerial imagery aided in the identification of any potentially unregistered PWS;
- based on the information provided, screening out of supplies that are considered unlikely to be affected by the Proposed Development. For PWS with a plausible hydrological / hydrogeological connection to the development, further consideration or a Site visit to verify the location and nature of their supply;
- preparing a risk assessment to determine the potential effects of the Proposed Development. The risk assessment methodology is presented in **Annex D – Risk Assessment Methodology**; and
- identification of any additional measures, that should be included as part of the environmental documentation and risk assessments, to avoid and mitigate against any potential adverse effects resulting from the Proposed Development.

2.2 Conceptual Site Model

2.2.1 A desktop assessment has been used to compile a CSM and was supported using the following secondary data sources:

- geological and hydrogeological information obtained from The British Geological Survey[7], as well as Scotland's Aquifer Reports[8];
- monthly precipitation and climate data from The Met Office[9];
- soils and water quality information from information from the Scotland's Environment website[10];
- SEPA River Basin Management Plans[11]; and

2.2.2 Details of the existing Site conditions can be found in the Baseline section of **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of the EA.

2.2.3 The CSM has also been supported by site-specific walkover surveys by a suitably qualified professional. These include walkovers of specific PWS as well as the wider catchment areas.

[7]British Geological Society, Geology of Britain Viewer, available at: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/ [Accessed October 2025]
[8] BGS. Scotland's aquifers and groundwater bodies. Available at https://www2.bgs.ac.uk/groundwater/waterresources/ScotlandsAquifers.html [Accessed October 2025]
[9] Met Office, At: https://www.metoffice.gov.uk/public/weather/climate/gcv3mcrf9[Accessed October 2025]
[10] Scotland's Environment, Web Interactive Map, At: https://map.environment.gov.scot/sewebmap/ [Accessed October 2025]
[11] Scottish Environment Protection Agency, River Basin Management Plans, Web Mapping Application, At: https://informatics.sepa.org.uk/RBMP3/ [Accessed October 2025]

2.3 Screening

2.3.1 Consultation with Dumfries and Galloway Council was undertaken regarding the records held on PWS within a 1 km buffer of The Site. Following data returns, an initial screening was carried out to determine which properties required direct consultation. The screening exercise excluded properties where hydrological or hydrogeological connectivity is implausible.

2.3.2 PWS abstractions were screened out of requiring further assessment using the following criteria;

2.3.3 For surface water abstractions:

- not within same hydrological catchment as the Proposed Development;
- within the same hydrological catchment, but >500 m upgradient of the Proposed Development with no apparent risk to PWS delivery infrastructure; and
- within the same hydrological catchment, but the abstraction is 1 km downgradient of the Proposed Development.

2.3.4 For groundwater abstractions:

- not within 250 m of the Proposed Development in accordance with SEPA' guidance[1]. To provide a cautious assessment, this distance was extended to the typical bedrock groundwater flow path length distance according to Scotland's Aquifer Bodies[8]; and
- the dominant land use and hydrogeological factors topography were considered, such as the presence of intervening watercourses or topographical high points, which can act as a barrier to groundwater flow.

2.3.5 PWS with no plausible pathway between their source abstractions and the Proposed Development infrastructure were screened out of further assessment.

2.4 Consultation

2.4.1 Where a plausible connection was identified in the screening of PWS, users were contacted to obtain more information regarding their PWS. This process involved sending residents a letter, questionnaire and map:

- the letter explained the nature of the works and the purpose of the assessment;
- the brief questionnaire asked residents to provide details on their supply;
- amap showing the location of the property was also included, with residents asked to indicate the location of their supply; and
- the questionnaire also included a request for permission for WSP to undertake an inspection should further information be needed.

2.4.2 Information obtained from consultation / Site walkover survey was used to develop the CSM and Risk Assessment. A copy of the letter and questionnaire is provided in the **Annex A – Copy of PWS Questionnaire** to this PWSRA.

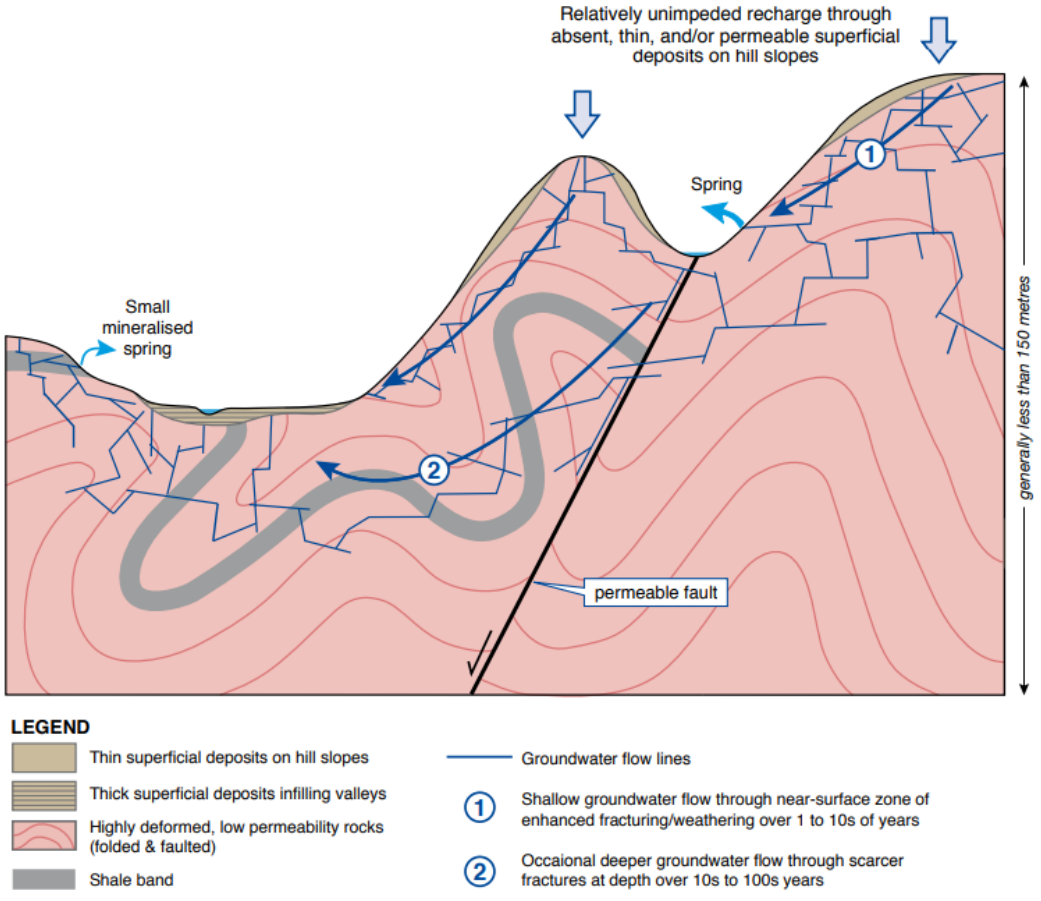
3 CONCEPTUAL SITE MODEL

3.1.1 For a pollutant linkage to exist, sources, pathways and receptors must align in a manner that facilitates the transmission of a pollutant (or harm) to a receptor. The main impacts that can be imparted upon a PWS receptor are a degradation in water quality or a reduction in quantity.

3.1.2 Information concerning the environmental setting of the Proposed Development and the surrounding area is presented in **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of the EA. Based on the assessment, the following CSM is presented that will be used to support the assessment of potential risks to PWS.

3.1.3 The desktop assessment indicates the presence of two main groundwater systems: a shallow system that is largely dependent on surface water runoff (1) and a deeper system heralding from the underlying bedrock (2) (see **Plate 3.1**). The former may comprise of catch pits and collection systems that obtain surface runoff and shallow throughflow over large areas which are topographically constrained. Supplies obtaining water from the underlying bedrock geology will be constrained by the nature and extent of tectonic features or fractures. Under such circumstances, the upper weathered margins of the bedrock or fractures will be a preferential flow pathway typically extending 0.1 to 1.0 km. The majority of rainfall will discharge as runoff, with infiltration to the bedrock aquifer limited where glacial till or peat are present. Owing to the local bedrock being a low productivity aquifer and with the exception of tectonic features, surface water catchments will provide a reasonable proxy for modelling groundwater. In the cases of the PWS considered, it is possible that recharge to abstraction points may be via a combination of surface / shallow and bedrock systems.

Plate 3.1 Cross sectional illustration of the CSM for the Proposed Development and underlying groundwater



4 IDENTIFICATION, SCREENING & SITE INSPECTION (STEP 1)

4.1 General

4.1.1 A request was submitted in 2023 to Dumfries and Galloway Council Environmental Health for a copy of the Register of Private Water Supplies. The Register identified five (no.) PWS sources within the Study Area.

4.1.2 **Table 4.1**presents information collected from the returned questionnaires, public consultation events, Dumfries and Galloway Council, and the conceptual model.

4.1.3 The findings from **Table 4.1** can be summarised as follows;

- one PWS source (Brockloch Tower) is derived from groundwater and potentially at risk from the development as it is broadly downgradient and potentially within the same catchment as the RLB. The PWS source is >100 m from an excavation <1 m depth and also >250 m from an excavation >1 m depth. Further assessment is required; and
- four PWS source are unlikely to be plausibly impacted by the development, or are connected to Scottish Water mains supply, and require no further assessment.

4.2 Site Inspection

4.2.1 Hydrological walkover surveys were undertaken in August, September and October 2024. Photographs and notes from the walkover surveys are presented in **Annex C – Walkover Survey Notes & Photographs**.

Table 4.1 Identified PWS within 1 km of the Proposed Development

Property ID	Property Name	Abstraction Type	Abstraction BNGR (Property if Unknown)	Distance to Proposed Development	Potential complete Source-Pathway-Receptor link?	Details	Further Assess. Required?
1	Annwn	Unknown, suspected groundwater spring	253623, 596045	Property is ~960 m west	No – PWS source and pipework not considered to be at risk	Abstraction is a spring, and the exact location is unknown but assumed to be within the vicinity of the property. The likely location of the abstraction is unlikely to be hydrologically connected to the Proposed Development on account of the topography, and consequential surface overland and shallow groundwater flow pathway. There is no plausible S-P-R linkage.	No
2	Brockloch (shared with Brockloch Cottage).	Groundwater spring	253479, 596688	Property is ~750 m west, but abstraction is a further 820 m west of the property and is not in the Study Area.	No – PWS source and pipework not considered to be at risk	Abstraction is a groundwater spring / catchpit collection system that is within boggy ground south of the A713. The location of the abstraction is unlikely to be hydrologically connected to the Proposed Development on account of the topography, and consequential surface overland and shallow groundwater flow pathway. There is no plausible S-P-R linkage.	No
3	Four Winds	Borehole	253888, 596103	Property and abstraction ~730 m west	No – PWS source and pipework not considered to be at risk	Abstraction is a borehole situated adjacent to the property. No development is proposed upstream nor within 250 m of the borehole abstraction. The Proposed Development is also situated within a separate catchment. There is no plausible S-P-R linkage.	No
4	Holm of Daltalochan	Surface water & groundwater spring	255153, 594771	The storage tank is located approximately ~900 m south-east	No – PWS source and pipework not considered to be at risk	The property owner confirmed Holm of Daltallochan is currently connected to the Scottish Water main supply. The property owner confirmed the storage tank historically served the Holm of Daltallochan property, however, is now no longer in use. There are several watercourses which were indicated by the property owner as being used as “spring abstractions” for livestock. A survey was undertaken and has confirmed that the indicated “springs” are surface watercourse that drains from the top of the hill. An analysis of the water chemistry within the channels indicates very low levels of mineralisation and acidic pH, and is comparable with a system of surface water storage and runoff, as opposed to a groundwater spring.	No

						Further enquires on the “abstraction” has eluded it is also not point-specific; livestock use the stream for drinking but access it directly from the banks along its entire length. Further details are provided in **Annex C**.	
5	Brockloch Tower	Groundwater well	254328, 595736	~40 m south	Yes – PWS source / pipework potentially at risk	Abstraction is a groundwater well situated just north of property in the garden. Abstraction is broadly down / cross gradient from the Proposed Development RLB and therefore requires further assessment	Yes

5 QUALITATIVE IMPACT ASSESSMENT (STEP 2)

5.1 General

5.1.1 The nature of the potential risk to the PWS abstraction is either a reduction in water volume (quantitative) or adverse change in the quality of the water (qualitative).

5.1.2 Risk management techniques involve managing one or more of the components in the Source-Pathway-Receptor chain. Where practical, actual or potential pollutant linkages should be broken to eliminate the risk of a hazard impacting the receptor and where a residual risk remains, management controls and contingency arrangements should be implemented to minimise risks to an acceptable level.

5.1.3 The risk assessment process involves identifying the probability of an impact and the likely magnitude of change at the receptor and assumes that embedded and good practice mitigation have been successfully implemented. This is based on a more detailed consideration of a PWS with reference to the CSM presented in **Section 3**. In the event the risk remains elevated, then additional mitigation would be used to further reduce the residual risk.

5.1.4 The methodology for the Risk Assessment is presented in **Annex D – Risk Assessment Methodology** and has been developed with reference to SEPA's guidance, specifically Step 2 (Qualitative Impact Assessment).

5.2 Hazards

5.2.1 The main hazards which can manifest at a PWS are related to degradation in quality or quantity. The specific activities and operations associated with the Proposed Development, which have the potential to impact water quality and quantity, have been adapted from CIRIA guidance documents and are presented below.

- activities potentially affecting water quality; and
    - accidental discharges of fuels / oils / chemicals as a result of spillages;
    - accidental discharge of effluent as a result of spillages;
    - introduction and release of concrete materials;
    - discharge of sediment from surface water networks; and
    - accidental damage to the supply delivery infrastructure.
- activities potentially affecting water quantity;
    - modification of overland flow pathways (i.e. installation of new drainage and addition of impermeable surfaces); and
    - modification of groundwater flow pathways (i.e. removal of superficial sediments, additional of impermeable surfaces, excavation of borrow pits and associated dewatering).

5.2.2 Point source pollution may arise from accidental releases of fuels / chemicals / effluent from a discrete location. Such sources may introduce contaminants of potential concern into surface waters or groundwater, depending on the circumstances of the incident. This could include the accidental release of fuels or oils during construction, or the leaching of transformer oils or chemicals from permanent infrastructure such as the Substation. Other point source pollution may include the pouring of concrete foundations, or specific discharges from damaged or inadequate drainage networks.

5.2.3 Diffuse source pollution may arise from non-point source specific activities such as the discharge of water from drainage networks. In such circumstances isolated and discrete discharges may not pose a source of contamination, however cumulatively these can combine to amplify the risk under more confining conditions, such as within a watercourse.

5.2.4 A full list of the effects considered to have the potential to affect hydrological receptors arising from the construction and operation of the Proposed Development are presented in **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of the EA.

5.3 Standard Good Practice Mitigation

5.3.1 As presented within the EA, good practice mitigation measures would be implemented as outlined in The Site-specific Pollution Prevention Plans and Drainage Management Plans as part of the Construction Environmental Management Plan (CEMP) for the Proposed Development. The Site-specific CEMP would facilitate the implementation of industry good practice measures in such a manner as to prevent or minimise effects on the surface and groundwater environment.

5.3.2 An outline CEMP summarising good practice mitigation measures relevant to the safeguarding of private water supplies is submitted as part of the planning application. A detailed CEMP would be prepared by the Principal Contractor following consent of the Proposed Development

5.3.3 Prior to construction the Principal Contractor may undertake additional investigation to confirm abstraction locations for PWS. Where required, this PWS should be updated to accommodate new information.

5.4 Additional Measures

Further Investigation & Demarcation

5.4.1 The information on PWS presented in this PWSRA is robust and sufficient for the identification risks and mitigation requirements as part of EIAR. Nonetheless, the Principal Contractor and The Applicant would ensure that further investigation takes place prior to construction activities taking place near the PWS. Non-intrusive means of investigation would be prioritised, including the use of cable avoidance technology (CAT) scanners (if metallic), ground penetrating radar (GPR) or other geophysical survey methods. Intrusive methods, such as a systematic trial pit survey, would be done by-hand.

5.4.2 Following the completion of further investigation, it may be necessary to implement additional measures to safeguard PWS quality and quantity. These include;

- demarcation, or fencing off the PWS intake and / or storage tank to avoid accidental damage;
- demarcation of the supply route on the ground using wooden pegs (or similar) to avoid accidental damage; and
- making Site operatives aware of PWS and the sensitivity of the catchment through toolbox talks and Site induction.

Suitable Engineering Solution

5.4.3 If, following further investigation, it's confirmed there is the potential for the PWS infrastructure to be impacted through planned construction works, then specific construction or working methods, such as the use of a fit for purpose engineering design and detailed drawing for crossing the PWS infrastructure, would be prepared to ensure the continuity of the PWS.

5.4.4 The Applicant and Principal Contractor would be responsible for establishing a dialogue with PWS users to ensure the appropriate communication of construction programmes.

5.4.5 Any engineering solutions should be discussed with Dumfries and Galloway Council and SEPA post-consent.

5.5 PWS Monitoring Plan & Method Statement

5.5.1 Prior to construction, a PWS Monitoring Plan and Method Statement (PWSMS) would be prepared detailing all mitigation measures to be delivered to secure the quality, quantity and continuity of water supplies which may be affected by the Proposed Development. The PWSMS would also contain contact information for the Construction Site Manager (or similar) that would be provided to the PWS User prior to construction. PWS Users would be informed of any planned works that may affect their supply.

Monitoring Arrangements

5.5.2 A water quantity and quality monitoring programme would be undertaken prior to any construction and during construction. The PWSMS shall include water quality sampling methods and shall specify abstraction points. Post-construction monitoring would also be completed to ensure there is no long-term impact on water quality or quantity that could be associated with the Proposed Development.

5.5.3 The PWS water monitoring programme would be aligned with the CEMP, including wider surface water or groundwater monitoring programme related to the Proposed Development, i.e. sampling, frequency, and analysis suite (with exception to taste) are matched at the surface water monitoring locations. The document would also outline any site-specific additional mitigation outlined in this assessment relevant to each PWS.

5.5.4 An example monitoring strategy is included as **Annex B – Example Monitoring Schedule**. The final monitoring arrangements would be discussed with Dumfries and Galloway Council and SEPA post-consent.

Contingency Arrangements

5.5.5 The PWSMS would also include a pollution response plan and contingency measures that would detail responsibilities and lines of communication between Principal Contractor, PWS users and other stakeholders. Contact details (land and mobile numbers / email addresses) for PWS users would be maintained by the Principal Contractor at all times.

5.5.6 Contingency measures would include provisions to provide alternative water supplies on a temporary and permanent basis in the event of an unforeseen impact on the existing PWS arising from the construction and operation of the Proposed Development;

- provision of bottled potable water in the event of a short or transient derogation of a water supply (bottled water would be retained on-site ready for quick dispatch to any effected property); and
- provision of an alternative water source (e.g. spring, borehole, alternative surface water abstraction location) in the very unlikely event of a permanent derogation of a water supply.

5.5.7 In the event of an alternative water source being implemented, Dumfries and Galloway Council would be advised as soon as is practical.

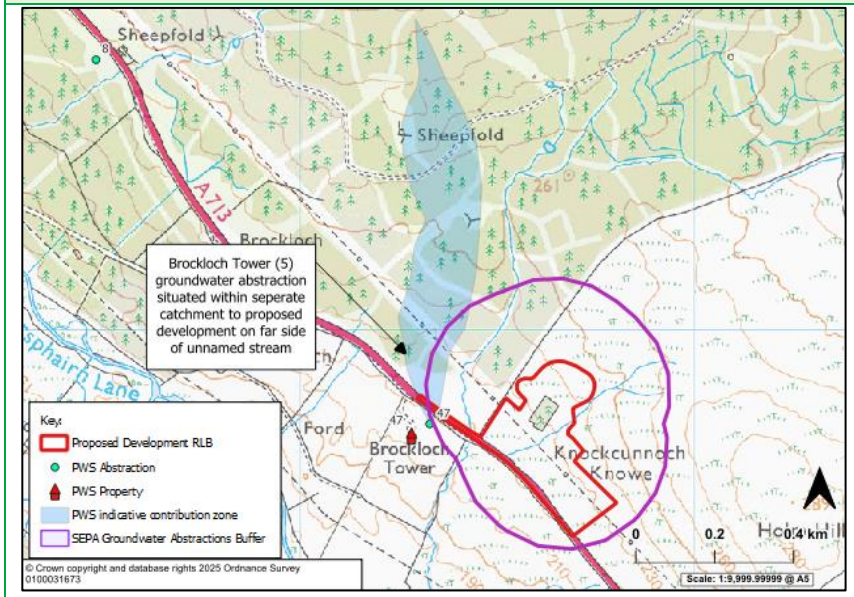
5.6 Risk Assessment Summary

5.6.1 This section details the results of the QIA based on the methodology presented in **Annex D – Risk Assessment Methodology**.

5.6.2 The QIA assumes implementation of good practice mitigation, as well as the construction management measures provided within **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of the EA. Where applicable, the residual risk following additional control measures is also presented.

Brockloch Tower PWS

Proximity of abstraction to Proposed Development



Assessment Notes

Brockloch Tower (ID: 5) is groundwater well supply (254328, 595736) 40 m downgradient from the Proposed Development. The abstraction location was confirmed through Site inspection with further details provided in **Annex C – Walkover Survey Notes & Photographs**. The RLB upgradient of the abstraction is for visibility splays only and no construction works are anticipated. The nearest construction works are associated with the bellmouth upgrade on the public road and new access track. Therefore, the abstraction is >100 m from an excavation <1 m and >250 m from an excavation >1 m. The abstraction is situated within the boundary of the property, and therefore PWS delivery infrastructure between the abstractions and property is not at risk of impact from the Proposed Development (negligible probability and magnitude). Based on the findings of the walkover survey (Annex C) and CSM (Section 3), the groundwater well is likely to be fed by topographically constrained shallow groundwater from upgradient areas. Glacio-fluvial sands and gravels which are mapped extending upslope to the north-west would follow the riparian basin of a nearby minor watercourse. The indicative zone of contribution has been modelled (shown in adjacent figure) and illustrates the Proposed Development is not within the source catchment. Furthermore, the presence of an intervening watercourse would act as a hydrogeological boundary which when also considered with the public road modifying and precluding any overland flow routes, the probability of any pathway from the Proposed Development to the abstraction is **low**. Given the general absence of a pathway, any change in water quality or quantity would not be perceptible and therefore the magnitude of change is considered to be **negligible,** giving a combined risk of **negligible**.

Mitigation

- good practice mitigation delivered through the CEMP;and
- a programme of water quality and quantity monitoring would be developed to monitor this supply; and

Monitoring and management measures (including contingency) which would be outlined in PWSMS prior to construction and be based on the results of further investigation.

Hazard Identification	Receptor	Probability of Impact	Magnitude of Change	Combined Risk	Additional Measures?	Residual Probability	Residual Magnitude of Change	Residual Risk
Activities affecting water quality	Source of water serving PWS	Low	Negligible	**Negligible**	No	-	-	-
	Pipework delivering water from PWS to Property	Negligible	Negligible	**Negligible**	No	-	-	-
Activities affecting water quantity	Source of water serving PWS	Low	Negligible	**Negligible**	No	-	-	-
	Pipework delivering water from PWS to Property	Negligible	Insignificant	**Negligible**	No	-	-	-

6 CONCLUSION

6.1.1 A PWSRA has been carried out for PWS that may be affected during the construction and operation of the Proposed Development. The formation of this Report has included a desk review of baseline information as well as data returns provided by Dumfries and Galloway Council on identified PWS within a 1 km buffer of The Site, consultation with selected residents, OS mapping data and targeted Site visits.

6.1.2 The QIA was undertaken using the Source-Pathway-Receptor model to establish the likelihood of a potential pollutant linkage existing between the Proposed Development and the supply of the identified PWS. Factors taken into consideration in the QIA include the proximity of the Proposed Development to the PWS source, layout of PWS infrastructure and pipework, the type of works being undertaken, the likely presence of pathways between the development and the source, the local topographic conditions, and the underlying geology.

6.1.3 The PWS has been evaluated based on the information provided to determine the risks based on the prescribed matrix scenarios. To minimise the risk of the Proposed Development construction activities potentially impacting any PWS supply, mitigation measures have been outlined, which would be implemented by the Principal Contractor.

6.1.4 Standard good practice mitigation would be incorporated within a CEMP, which would be prepared prior to construction. In addition to this mitigation, a PWSMP would be prepared prior to construction and would detail all relevant mitigation, management measures, monitoring requirements and contingency plans relevant to PWS considered within this assessment and those listed in **Chapter 5: Hydrology, Hydrogeology, Geology and Soils** of the EA. This includes safeguarding measures required for Brockloch Tower.

6.1.5 In the event that further information on PWS is obtained, this risk assessment should be updated to ensure that PWS are appropriately safeguarded.

6.2 Limitations of Assessment

6.2.1 This Report has been prepared by WSP with all reasonable skill, care and diligence for the Client, for the specific purpose of assessing the risk to PWS posed from the construction and operation of the Proposed Development. This Report details the findings of the risk assessment considering information provided by Dumfries and Galloway Council, the relevant landowners and PWS users and is therefore, as accurate as this information would allow. Whilst this PWSRA provides a robust assessment representing a realistic worst-case scenario, it is expected that this Document would be updated post-consent following the completion of detailed design, as well as where further investigation is undertaken by the Principal Contractor with regards to PWS abstractions.

6.2.2 WSP accepts no responsibility whatsoever to third parties to whom this Report, or any part thereof, is made known, unless formally agreed by ScottishPower Energy Networks beforehand. Any such party relies upon the report at their own risk. WSP disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the services.

6.2.3 Owing to the inherent complexity of the subsurface, it is rarely possible to determine the mechanics of any hydrological system with absolute certainty. In this regard, investigations as part of this assessment would strive to determine the circumstances of each supply based on the evidence available to support this assessment. Where uncertainty exists associated with understanding the details of a PWS or in accurately conceptualising the subsurface, this would be stated and risks and assessment considered conservatively in accordance with the precautionary principle. Whilst the assessment assesses relative risk, no detailed quantitative risk assessment has been completed.

ANNEXES

Annex A – Copy of PWS Questionnaire

PRIVATE WATER SUPPLY QUESTIONNAIRE

Your details

Name: .....

Property name and address: .....

.....

Telephone number and email address: .....

.....

If you are a tenant, please also provide your landlord's contact details:

Name: .....

Address: .....

Telephone number and/or email address: .....

Supply source type *(Please tick or specify if other)*

Borehole (please indicate approx. depth below) ☐ Well ☐ Spring ☐ River ☐

Lake ☐ Pond ☐ Stream ☐ Surface water ☐ Mains (Scottish Water) ☐

Other: .....

Supply source location

Source of supply known and marked on enclosed map? Yes ☐ No ☐

Approximate grid coordinates of source of supply: .....

Is water fed into a storage tank or reservoir prior to distribution? Yes ☐ No ☐

If yes, please provide grid coordinates for location of storage tank: .....

Supply uses *(Please tell us what the water is used for at your property – please tick as appropriate and tell us any other uses not listed)*

Domestic use ☐ Holiday let ☐ B&B/Hotel ☐ Catering ☐

Dairy farm ☐ Brewery ☐ Residential care home ☐ Tenanted property ☐

Livestock drinking water ☐

Other: .....

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110 Queen St, Glasgow G1 3BX
www.wsp.com

Supply usage

Number people supplied (approximately): .....

Number of animals supplied (approximately): .....

Type of animals (if applicable): .....

Approximate volume of water abstracted (m^3/day): .....

Supply water treatment and condition *(Please tick or specify if other)*

Type of water treatment:

Chlorination ☐ UV with pre-filter ☐ UV without pre-filter ☐ Filtration ☐

Other: .....

Is the water supply checked periodically (for condition and maintenance): Yes ☐ No ☐

Has the supply been risk assessed formally by owner/council/others to date? Yes ☐ No ☐

If so, approximately when was this conducted: .....

Any comment on the condition/quality/yield of your water supply: .....

.....

.....

Supply users

Please provide the addresses of any other properties on the same supply as you, including name and telephone number if known (continue on the enclosed Additional Information Sheet if required):

.....

.....

.....

.....

If you have any questions or queries, please contact Sam Wainwright on sam.wainwright@wsp.com .

WSP
110 Queen St, Glasgow G1 3BX
www.wsp.com

Annex B – Example Monitoring Schedule

Introduction

PWS Monitoring is recommended at properties that maintain a PWS source and where there is a plausible source-pathway-receptor linkage to the Proposed Development (i.e. those assessed in **Section 5.6** of this PWSRA).

The scheme of monitoring aims to ensure appropriate monitoring of PWS prior to commencement of development, during construction and upon completion of construction. The approach to PWS monitoring is based on extensive experience and good practice.

Pre-construction monitoring can be used to establish baseline water levels and quality, and assessment or trigger values to which routine monitoring data collected during construction can be compared against. These can be used to benchmark the effectiveness of pollution prevention measures in protecting users of the PWS and baseline status from any potential impacts from the construction of the development.

The approach to PWS monitoring is based on extensive experience and good practice. The approach offers proportionate but robust programme that is suited to the requirements of LPAs in their role as the regulatory authority for PWS. Where Step 3 (Detailed Quantitative Risk Assessment) is undertaken, it may be appropriate to modify to the approach to conform with SEPA's guidance, **Annex B – Example Monitoring Schedule**, to monitor the effectiveness of site-specific mitigation.

The final monitoring arrangements, including the analytical suite, locations, frequency and escalation procedure, would be outlined in the PWSMS and would be in agreement with SEPA and Dumfries and Galloway Council and are expected to be secured by way of planning condition.

Methodology

PWS Monitoring would be undertaken by an appropriately qualified and experienced contractor.

Monitoring methods would include visual and extractive, with the former comprising pictures and notes on water conditions, weather, pollution, etc. The latter involves the collection of a water sample from the abstraction with analysis at a suitably accredited laboratory. All samples would be dispatched to the laboratory, under chilled conditions, accompanied by the relevant chain of custody documentation. All samples would be dispatched to the laboratory within 24 hours of being collected.

An example analytical suite, along with trigger values (assessment criteria) against which water quality results should be benchmarked, is provided below in **Table C.0.1**.

Table C.0.1 Example Monitoring Analysis Suite

Parameter	Units	Limit of Detection**	Method	Assessment Criteria*
pH	-	-	Probe	6.5-9.5
Colour	Pt/Co	1	Colorimetric	20
Electrical Conductivity	uS/cm	10	Potentiometric	2500
Alkalinity (as CaCO3)	mgCaCO3/L	3	Discrete Analyser	-
Calcium (dissolved)	mg/L	0.012	ICP-OES	-
Magnesium (dissolved)	mg/L	0.005	ICP-OES	-
Potassium (dissolved)	mg/L	0.025	ICP-OES	-
Sodium (dissolved)	mg/L	0.01	ICP-OES	200
Sulphate as SO4	mg/L	0.045	ICP-OES	250
Chloride	mg/L	0.15	Discrete Analyser	250

Parameter	Units	Limit of Detection**	Method	Assessment Criteria*
Orthophosphate (as PO4)	µg/L	62	Discrete Analyser	-
Nitrate (as N04)	mg/L	0.05	Colorimetric	50
Aluminium (dissolved)	µg/L	1	ICP-MS	200
Selenium (dissolved)	µg/L	0.6	ICP-MS	10
Iron (dissolved)	µg/L	0.004	ICP-OES	200
Manganese (dissolved)	µg/L	0.05	ICP-MS	50
Zinc (dissolved)	µg/L	0.5	ICP-MS	5000
Copper (dissolved)	µg/L	0.5	ICP-MS	10
Suspended Solids	mg/L	2	Gravimetric	-
Turbidity	NTU	1	Spectrophotometry	4
Dissolved Organic Carbon (DOC)	mg/L	0.1	TOC Analyser	-
TPH CWG inc BTEX & MTBE	µg/L	1 - 10	GC/MS	10
Total coliforms	MPN/100 ml	0	-	0
E.coli	MPN/100 ml	0	-	0
Enterococci	cfu/100 mls	0	-	0
**PCV values taken from Statutory Instrument No. 209 - The Private Water Supplies (Scotland) Regulations 2006. Available at https://www.legislation.gov.uk/ssi/2006/209/pdfs/ssi_20060209_en.pdf (accessed 02/11/2022).* *Total Petroleum Hydrocarbon Criteria Working Group (TPH CWG) PCV value taken from Statutory Instrument No. 2790 – The Private Water Supplies Regulations 1991 (revoked). Available at http://www.legislation.gov.uk/uksi/1991/2790/made (accessed 29/01/2018).*				
***Actual LOD may vary and can be confirmed with the nominated laboratory if required by the LPA*				

Frequency and Duration

During the baseline (pre-construction), monthly visits should be undertaken across a minimum of 12 months and ideally capture a variety of flow and weather conditions. During the construction phase, monitoring should be continued monthly, but additional ad-hoc monitoring may also be required in the event of a spurious result or pollution incident. A period of post-construction monitoring should be undertaken with the frequency and duration subject to consultation with SEPA and Dumfries and Galloway Council, with guidance suggesting at least 12 months.

Reporting

Reports summarising the results of water monitoring should be provided following the completion of each phase. Additional reporting requirements during the construction phase may be subject to consultation with SEPA and Dumfries and Galloway Council.

Trigger Levels and Escalation Procedures

6.2.4 Trigger levels refer to actions which must be taken in the event of an environmental incident that may affect a PWS. Trigger level actions could be required following the reporting of an incident by the Principal Contractor. In the event of a potential incident the Principal Contractor and the ECoW would undertake a preliminary assessment to decide whether an incident requires an immediate stop to works. This should be undertaken as soon as possible following an incident being reported. In the event of a stop to works, a proportionate investigation should be undertaken to determine the cause for the impact and complete actions to minimise / mitigate any effects. Communication of any incident potentially affecting a PWS should be undertaken by the Project Manager or delegated representative as soon as possible. Depending on the scale of the incident, Dumfries and Galloway Council and SEPA may also need to be notified.

It is not proposed that the results of monitoring would trigger suspension of the construction works unless the results of the above assessment indicated a high risk to water quality if work is continued. Where exceedances have been recorded, a re-test of the samples may be requested, or confirmatory samples collected for confirmation of water quality degradation. This protocol should be included to avoid unnecessary cessation of Site works on the basis of single results. Should works be suspended as a result of the monitoring values, the source of the problem would be investigated with emergency monitoring being undertaken and would continue whilst mitigation measures are being implemented. The duration of emergency monitoring would be determined based on the severity of the incident and following consultation with the Principal Contractor and the ECoW, and works would resume following consultation and approval with Dumfries and Galloway Council and SEPA.

Annex C – Walkover Survey Notes & Photographs

Brockloch Tower

A walkover survey was undertaken by WSP of the abstraction and likely catchment / contribution zone for the groundwater abstraction for Brockloch Tower on 2 October 2024. Weather conditions during the survey were dry and bright. An inspection of the well with the property owner indicated it comprised several stacked concrete cylinders sunk ~2 m into the ground. The well has no inflow pipe, and it appears water seeps diffusely in through the base and walls of the well. The water level was ~1.5 m bgl, and the water has a slight peat discolouration. The ground surrounding and upgradient of the PWS was rush pasture and wet grassland with a minor watercourse intervening the area upslope and the Proposed Development. Photographs are presented below.

Photographs C.0.1 to C.0.4: Photographs taken during the walkover of the abstraction for Brockloch Tower. The well headworks is shown in the top photographs. A picture of inside the well is shown bottom left. The minor watercourse bounding the east of the likely catchment area is shown bottom right.

Holm of Daltallochan

The PWS abstraction for Holm of Daltallochan is no longer in use and is instead supplied by Scottish Water mains supply.

During the course of issuing questionnaires to properties within the vicinity of PWS Study Area, the Property Owner at Holm of Daltallochan indicated the presence of several additional spring abstractions that were used for livestock.

The Applicant had previously contacted SEPA concerning the proposed Holm Hill substation in 2023 to discuss the necessity for an assessment under Option 4 SEPA LUPS, for a suspected groundwater abstraction (spring 1, 255439, 595741), downslope of the Proposed Development. The "*groundwater abstraction*" is for agriculture only, and the associated property and domestic water source is from Scottish Water Mains supply.

WSP has undertaken a survey of the "*spring*" and corroborated that it is a surface watercourse that drains from the top of the hill. An analysis of the water chemistry within the channel indicates very low levels of mineralisation and acidic pH, and is comparable with what we'd expect for a system of surface water storage and runoff, as opposed to a groundwater spring. Further enquires on the "*abstraction*" has eluded it is also not point-specific; livestock use the stream for drinking but access it directly from the banks along its entire length.

In summary, the "spring" is a surface watercourse, and the "*abstraction*" is livestock drinking directly from the stream at no fixed point. It is WSP's professional judgement that SEPA LUPS 31 is not applicable to the stream, nor the abstraction, and that quantitative assessment is not necessary. The safeguarding of the stream and its water quality will still be captured in the EA when considering potential effects on surface runoff from the development, and any required mitigation measures implemented through the CEMP.

A study undertaken associated with the survey described above is provided overleaf.

Annex D – Risk Assessment Methodology

Introduction

This PWSRA is based on development of a conceptual Site model (CSM). The CSM is a representation of the relationships between contaminant sources, pathways and receptors developed on the basis of hazard identification. The objective of PWSRA is to identify the nature and magnitude of the potential risks posed by these hazards. This involves consideration of;

- each potential pollutant linkage (contaminant S-P-R);
- current status of The Site, construction activity, proposed
- new use, etc.;
- short-term and long-term risks; and
- uncertainty.

The Source-Pathway-Receptor (SPR) concept model was used as the underlying model to assess the risk posed by the development activities. In this model:

- source refers to the source of the potential hazard (not to be confused with water source);
- pathway refers to the mechanisms by which the hazard is transmitted to the receptor; and
- receptor refers to anything or anyone that could be adversely affected by the hazard (including the source of water supplying the abstraction and associated infrastructure).

Where hydrological/hydrogeological connectivity exists between a potential contamination source and the receptor by means of a pathway, then a 'pollutant linkage' and associated risk exists. Where there is no pollutant linkage, there would be no associated risk. For any water supply it must first be established if there is a risk to mitigate and then, if necessary, introduce mitigation measures to reduce the risk. Such risks are often sufficiently reduced through embedded design and good practice mitigation. In the event a risk remains after these, then additional mitigation may be required to sufficiently reduce residual risks.

Probability and Impact Magnitude Criteria

The potential impact to the receptor has been assessed in relation to the probability of an impact occurring on the receiving environment and the magnitude of any event that did occur.

The probability has been classified as high, medium, low, or negligible based on criteria outlined in **Table D.0.2**. The likelihood of any impacts on the quality and quantity is influenced by the environmental setting and its source abstraction location within the catchment in relation to Proposed Development activities.

Table D.0.2: Probability of impacts

Probability	Definition	Examples
High	There is pollutant linkage, an event is likely in the short-term and very likely in the long-term.	Baseline Conditions provides strong evidence of a pathway from hazards to receptor i.e. highly productive aquifer (bedrock or superficial); Proposed Development overlies point of abstraction or is within same water body, and is immediately upgradient (<100 m); Proposed infrastructure footprint occupies >25% of indicative source zone catchment area.
Medium	There is pollutant linkage, it is possible that an event shall occur in short term, likely over the long-term.	Baseline Conditions indicates evidence of a pathway from hazards to receptor i.e. moderately productive aquifer (bedrock or superficial); Proposed Development is within same water body and upgradient, >100 m to 250 m; Proposed infrastructure footprint occupies 5-25% of indicative source zone catchment.

Probability	Definition	Examples
Low	There is pollutant linkage. However, it is very unlikely an event would occur in short term, rising to unlikely in the long term.	Baseline Conditions indicates there is limited evidence of a potential pathway i.e. low productivity aquifer (bedrock or superficial); Proposed Development is within the same water body and upgradient but >250 m to 500 m from point of abstraction; Proposed infrastructure footprint occupies <5% of indicative source zone catchment area.
Negligible	There is a plausible pollutant linkage, but circumstances are such that it is improbable to occur in any timeframe.	Baseline Conditions indicates no evidence of a pathway from hazards to receptor i.e. bedrock / superficial deposits identified as not a significant aquifer. Proposed Development is within the same catchment area and upgradient but >500 m from point of abstraction.

As outlined above, the potential impacts have been assessed taking account of the possible connection to the source through the presence/absence of pollutant linkages. The magnitude of potential change to that supply is defined below in **Table D.0.3.**

Table D.0.3: Magnitude of change to PWS

Magnitude	Definition
Major	Major change to the hydrological/hydrogeological conditions resulting in temporary or permanent change. Complete disruption to operation of supply, impacting on quality and quantity available in long-term.
Moderate	Detectable change to the hydrological/hydrogeological conditions resulting in non-fundamental temporary or permanent change. Partial disruption to the operation of the supply, impacting on quality and quantity.
Minor	Detectable but minor change to the hydrological/hydrogeological conditions, returning to previous condition in short-term. Minor degradation in the operation of the supply in terms of quantity and or quality.
Negligible	No perceptible change to the hydrological/hydrogeological conditions.

Combined Risk Matrix

The likelihood and magnitude of the potential impacts are combined to define the overall combined risk, as shown in **Table D.0.4**. This table provides a guide to assist in the decision making but should not be considered a substitute for professional judgement and interpretation. In some circumstances, the magnitude of change may be unclear and professional judgement, including precautionary considerations where data is uncertain, has been applied to identify the potential significance.

The combined risk considers the successful implementation of the good practice environmental management practices that would be adopted throughout the works. Should the receptor still be considered at risk, further details on additional mitigation measures and monitoring are provided, with an associated residual risk outcome.

A PWS abstractions for human consumption is considered of **medium** sensitivity in accordance with the recommendations outline by SEPA on page 3 of their *Guidance on Assessing Impacts of Developments on Groundwater abstractions* (2024)[1].

Table D.0.4: Risk matrix for PWSRA

Probability of Impact	Magnitude of Change			
	Major	Moderate	Minor	Negligible
High	Very High	High	Medium	Med / Low

Probability of Impact	Magnitude of Change			
	Major	Moderate	Minor	Negligible
Medium	High	Medium	Med / Low	Low
Low	Medium	Med / Low	Low	Negligible
Negligible	Med / Low	Low	Negligible	Negligible

The risk categories are further defined in **Table D.0.5**. An additional column '*SEPA Guidance Term*' has been presented to demonstrate the relationship between the risk categories used in this assessment and those proposed by SEPA in Table 1, page 3 of their *Guidance on Assessing Impacts of Developments on Groundwater abstractions* (2024)[1].

Consultation undertaken with SEPA as part of the development of this assessment method has informed that **low** or **negligible** risks from **Table D.0.3** are interpreted as equating to **low** or **unimportant** as per effect-importance matrix from Page 3 of SEPA's *Guidance on Assessing the Impacts of Developments on Groundwater Abstractions*. These and the translation of other PWSRA and SEPA guidance terms are presented below, along with the definition of the combined QIA risk outcome in **Table D.0.5**.

Table D.0.5 Risk definitions

PWSRA Term	SEPA Guidance Term	Definition
Very High	**Major**	There is a high probability that significant harm could arise to a designated receptor from an identified hazard at The Site without appropriate mitigation.
High	**Major**	Significant harm is likely to arise to a designated receptor from an identified hazard at The Site without appropriate mitigation.
Medium	**Medium**	It is possible that without appropriate mitigation, harm could arise to a designated receptor, but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild
Low	**Low**	It is possible that significant harm could arise to a designated receptor from an identified hazard, but it is likely that at worst this harm if realised would normally be mild.
Negligible	**Unimportant effect / Negligible effect**	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be notable