CONTENTS

12. HYDROLOGY, HYDROGEOLOGY, GEOLOGY AND SOILS

12.1 Introduction

12.1.1 This chapter sets out the assessment of the potential for effects on hydrology, hydrogeology, geology and soils resulting from the Proposed Development. The assessment considered effects as a result of the Proposed Development and the relevant Study Areas (defined in *Scope of Assessment and Extent* of the Study Area).

12.1.2 For each of the topics listed, this chapter details the baseline description, identifies and assesses the impacts and resultant effects on each receptor and, where relevant, identifies proposed mitigation and describes the likely residual effects following the implementation of mitigation:

- hydrogeology – changes to groundwater infiltration and groundwater levels, water quality and wetland characteristics;
- hydrology – changes to drainage regime and associated alteration to surface water runoff rates and volumes, erosion / sedimentation and water quality characteristics across the Proposed Development and the wider catchment, including designated sites. This topic also assesses changes to water resources such as Scottish Water drinking water abstractions, Private Water Supplies (PWS), and both Scottish Environment Protection Agency (SEPA) and Scottish Water Drinking Water Protected Areas (DWPA);
- geomorphology and geology – geomorphological characteristics of the Proposed Development and changes to geological structures or effects on designated sites; and
- soils – changes to soil characteristics related to erosion, compaction, soil quality, any current or historic evidence of land contamination and unexploded ordnance record.

12.1.3 This chapter should be read in conjunction with the following chapters, figure, and appendices:

- **Volume 2, Chapters 1 – 6: Introduction Chapters;**
- **Volume 3, Figure 12.1: Hydrological Features;**
- **Volume 4, Appendix 12.1: Private Water Supply Risk Assessment (PSWRA);**
- **Volume 4, Appendix 12.2: Drainage Impact Assessment (DIA) (by Fairhurst);**
- **Volume 4 Appendix 12.3: Flood Risk Assessment (FRA) (by Fairhurst);**
- **Volume 4, Appendix 12.4: Geo-Environmental Desk Study Report (by Fairhurst);**
- **Volume 4, Appendix 12.5: Ground Investigation Report (by BAM Ritchies); and**
- **Volume 4, Appendix 12.6: Geotechnical Interpretative Report (by TonyGee and Partners).**

12.2 Scope of Assessment and Methodology

Legislation, Policy and Guidance

12.2.1 This assessment is carried out in accordance with the principles contained within the following legislation:

- The Water Environment and Water Services (Scotland) Act 2003[1];
- The Private Water Supplies (Scotland) Regulations 2006[2];
- The Flood Risk Management (Scotland) Act 2009[3]; and
- Environmental Protection Act (1990)[4].

12.2.2 This assessment is carried out in accordance with the principles contained within the following documents:

1 Water Environment and Water Services (Scotland) Act 2003. asp 3. Available at: https://www.legislation.gov.uk/asp/2003/3/contents [accessed July 2024]
2 The Private Water Supplies (Scotland) Regulations 2006. Available at: http://www.legislation.gov.uk/ssi/2006/209/contents/made [accessed July 2024]
3 Scottish Government (2009). Flood Risk Management (Scotland) Act 2009. Available at: https://www.legislation.gov.uk/asp/2009/6/contents [accessed July 2024]
4 Environmental Protection Act (1990). Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents [accessed July 2024]

- National Planning Framework 4 (NPF4) 2023[5];
- SEPA Policy No. 19, Groundwater protection policy for Scotland[6];
- Aberdeenshire Local Development Plan (HwLDP)[7];
- Scottish Planning Policy (2014)[8];
- Planning Advice Note (PAN) 33: Development of contaminated land (2017)[9];
- Scottish Environment Protection Agency (SEPA) Position Statement on Planning and Soils (2022)[10];
- SEPA's Position Statement on Land Protection (2022)[11];
- Planning Advice Note 60: Natural Heritage (2000)[12]; and
- The Scottish Soil Framework (2009)[13].

12.2.3 This assessment is carried out in accordance with the principles contained within the following documents:

- Construction industry research and information association (CIRIA) Report C532 – Control of water pollution from construction sites: Guidance for consultants and contractors[14];
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide[15]
- CIRIA Report C753 – The SuDS Manual[16];
- Scottish Government – River crossings & migratory fish: Design guidance (2012)[17];
- Scottish Natural Heritage (now 'NatureScot') – A handbook on environmental impact assessment Version 5 (2018)[18];
- SEPA – The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended): A Practical Guide (Version 9.3, June 2023)[19];
- SEPA – Position Statement WAT-PS-06-02 Culverting of watercourses[20];
- SEPA – WAT-SG-25, Good practice guide – river crossings[21];
- SEPA – WAT-SG-31, Special requirements for civil engineering contracts for the prevention of pollution[22];

5 National Planning Framework (2023). Available at: https://www.gov.scot/publications/national-planning-framework-4/ [accessed July 2024]
6 Scottish Environment Protection Agency (2009). Groundwater Protection Policy for Scotland v3, November 2009, Environmental Policy Number 19. Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf [accessed July 2024]
7 Aberdeenshire Local Development Plan (2023) Available at: https://online.aberdeenshire.gov.uk/ldpmedia/LDP2021/AberdeenshireLocalDevelopmentPlan2023IntroductionAndPolicies.pdf [accessed July 2024]
8 Scottish Planning Policy (2014). Available at: https://www.gov.scot/publications/scottish-planning-policy/ [accessed July 2024]
9 Planning Advice Note (PAN) 33: Development of contaminated land (2017) Available at: https://www.sepa.org.uk/media/143286/lups-gu3-planning-guidance-on-land-subject-to-contamination-issues.pdf [accessed July 2024]
10 Scottish Environment Protection Agency (SEPA) Position Statement on Planning and Soils (2022). Available at: https://www.sepa.org.uk/environment/land/soil/ [accessed July 2024]
11 SEPA's Position Statement on Land Protection (2022). Available at: https://www.sepa.org.uk/media/159201/ep-054_position_statement_on_land_protection.pdf [accessed July 2024]
12 Planning Advice Note 60: Natural Heritage (2000). Available at: https://www.gov.scot/publications/pan-60-natural-heritage/ [accessed July 2024]
13 The Scottish Soil Framework (2009). Available at: https://www.gov.scot/publications/scottish-soil-framework/ [accessed July 2024]
14 Masters-Williams, H., Heap, A., Kitts, H., Greenshaw, L., Davis, S., Fisher, P., Hendrie, M. and Owens, D. (2001). CIRIA C532 Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors [accessed July 2024]
15 The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide. Available at: https://www.sepa.org.uk/media/dw5de0kh/car-a-practical-guide.pdf [accessed July 2024]
16 CIRIA (2015). The SuDS Manual (C753) [accessed July 2024]
17 Scottish Government (2012). River Crossings and Migratory Fish: Design Guidance [accessed July 2024]
18 Scottish Natural Heritage and Historic Environment Scotland (2018). Environmental Impact Assessment Handbook [accessed July 2024]
19 Scottish Environment Protection Agency (2022). The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide (Version 9.3, June 2023) [accessed July 2024]
20 Scottish Environment Protection Agency (2011). WAT-PS-06-02: Culverting of Watercourses – Position Statement and Supporting Guidance [accessed July 2024]
21 Scottish Environment Protection Agency and Natural Scotland (2010). Engineering in the Water Environment: Good Practice Guide River Crossings (Second Edition) [accessed July 2024]
22 Scottish Environment Protection Agency (2006). Prevention of Pollution from Civil Engineering Contracts: Special Requirements (Version 2, June 2006) [accessed July 2024]

- SEPA – Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems[23];
- SEPA – Guidance on Assessing the Impacts of Development on Groundwater Abstractions[24];
- Scottish Government (2006), Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2[25];
- British Standard (BS) 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of practice (BSI, 2017)[26];
- BS 5930:2015+A1:2020 Code of practice for ground investigations (BSI, 2020)[27];
- Environment Agency (2020), Land Contamination Risk Management (LCRM)[28];
- Scottish Government, Scottish Natural Heritage (SNH), SEPA (2017), Peatland Survey. Guidance on Developments on Peatland[29];
- SEPA (2022c), Land Remediation and Waste Management Guidelines[30]; and
- DEFRA (2009), Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[31].

Consultation and Scoping

12.2.4 An EIA Scoping Report was submitted to Aberdeenshire Council (AC) in June 2024, which outlined the proposed scope of this EIA based on the available baseline data at the time. In undertaking this assessment, consideration has been given to the scoping responses as detailed in **Table 12-1**.

Table 12-1 provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 12-1 Consultation Responses of Relevant to Hydrology, Hydrogeology, Geology and Soils

Organisation	Type of Consultation	Response	How Response has been Considered
Aberdeenshire Council (AC)	PWS data for AC administrative area - requested in February 2024.	Response received February 2024. AC provided PWS records for Aberdeenshire administrative areas.	This is considered further in **Section 12.3 Baseline Conditions** and **Section 0 Assessment of Effects, Mitigation and Residual Effects**. PWS information within 1 km of the Site has been included in **Volume 3, Figure 12.1 Hydrological Features** and also in **Volume 4, Appendix 12.1: PWSRA**

23 Scottish Environment Protection Agency (2024). Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems[accessed July 2024]
24 Scottish Environment Protection Agency (2024). Guidance on Assessing the Impacts of Development on Groundwater Abstractions [accessed July 2024]
25 Scottish Government (2006), Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2 [accessed July 2024]
26 BS 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of practice (BSI, 2017) [accessed July 2024]
27 BS 5930:2015+A1:2020 Code of practice for ground investigations (BSI, 2020) [accessed July 2024]
28 Environment Agency (2020), Land Contamination Risk Management (LCRM) [accessed July 2024]
29 Scottish Government, Scottish Natural Heritage (SNH), SEPA (2017), Peatland Survey. Guidance on Developments on Peatland [accessed July 2024]
30 SEPA (2022c), Land Remediation and Waste Management Guidelines [accessed July 2024]
31 DEFRA (2009), Construction Code of Practice for the Sustainable Use of Soils on Construction Sites [accessed July 2024]

Organisation	Type of Consultation	Response	How Response has been Considered
SEPA	SEPA abstractions data for the whole of Scotland - requested in March 2024.	Response received March 2024. SEPA provided all records of activities authorised under the CAR[32].	This is considered further in **Section 12.3 Baseline Conditions** and **Section 0 Assessment of Effects, Mitigation and Residual Effects**
AC	Pre-application consultation (ENQ / 2024 / 0141) - 3 July 2024.	**Contaminated Land** Contaminated Land The Site includes the farm buildings at Main of Greens, the historical location of a sheep wash, mill dam and timber mill. These site uses are potentially contaminative (via infill in the case of the mill dam). There is insufficient information in the enquiry documents to assess the likelihood of any impact of the previous / current Site uses of the Mains of Greens on the Proposed Development. Therefore, given the lack of information, should the proposals be the subject of a planning application, an assessment of what, in terms of contaminated land, is required.	This is considered further in **Section 12.3 Baseline Conditions** and **Section 0 Assessment of Effects, Mitigation and Residual Effects**
		SEPA, Environmental Health Impact on Private Water Supplies The applicant has previously supplied SEPA with a report that identified a PWS within the proposed site boundary. PWS are the responsibility of owners and users and are regulated by local authorities. All private water supplies must be registered with the local authority. SEPA does not hold these records, SEPA only hold records for applications for a license to extract water. Roads, excavations and other works associated with developments can disrupt groundwater flow and impact on groundwater abstractions such as private water supplies. If groundwater abstractions are identified, then the applicant should seek to ensure that: i) roads, tracks and trenches are routed at least 100 m; and ii) buildings, excavations and quarries are located at least 250 m from the abstraction. If these buffers are not achieved, then applicants must demonstrate there will be no impact to the groundwater through a risk assessment. From the previous report it appears the PWS may be surface water and groundwater fed. Due to its location upstream of the proposed works it appears unlikely that the PWS will be significantly impacted. However, this should be clearly demonstrated at the planning application stage. Environmental Health records show that there are properties supplied by PWS in the close vicinity of the Site.	This is considered further in **Section 12.3 Baseline Conditions** and **Section 0 Assessment of Effects, Mitigation and Residual Effects** PWS information within 1 km of the Site has been included in **Volume 3, Figure 12.1 Hydrological Features** and also in **Volume 4, Appendix 12.1: PWSRA**

[32] The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available here: https://www.legislation.gov.uk/ssi/2011/209/contents/made [accessed July 2024]

Organisation	Type of Consultation	Response	How Response has been Considered
		SEPA Flood Risk The proposed access route crosses the Burn of Greens and appears to include associated land raising across the flood extent of the Burn of Greens. Avoidance to be the first principle and SEPA's strong preference would be for this watercourse crossing to be removed and the access road brought south to meet the existing minor road to the south to avoid any development within the Burn of Greens flood extent and minimise other environmental impacts. To comply with NPF4 Policy 22, no land raising will be acceptable within the flood extent without suitable compensatory storage. For information SEPA Future Flood Maps show the flood extent could be 50-60m wide at the proposed crossing point. A detailed Flood Risk Assessment will need to be submitted if any land raising is proposed in the flood extent to demonstrate adequate compensatory storage is provided and there is no increase in flood risk elsewhere. In addition, SEPA recommend the proposed SUDS pond associated with the new access road is relocated outwith the flood extent of the Burns of Greens. Flood Risk and Coastal Protection Ongoing discussions are underway with Flood Risk and Coastal Protection. These will be addressed as part of the Scoping process.	This is considered further in **Section 12.3 Baseline Conditions, Volume 4, Appendix 12.2: DIA** and **Volume 4, Appendix 12.3: FRA**

Organisation	Type of Consultation	Response	How Response has been Considered
		SEPA Watercourse crossings As highlighted in previous SEPA responses direct to the applicant, SEPA's preference would be, in accordance with NPF4 mitigation hierarchy, to minimise watercourse crossings and for the proposed access road to make use of the existing minor road to the south of the Site with an upgrade of this and the associated existing crossing of Burn of Greens. This would not only cause significantly less environmental impact in terms of soils, flood risk and water environment but also provide potential betterment to the existing watercourse crossing. Watercourse diversions SEPA re-iterate that they are not against a watercourse diversion in principle when it has been demonstrated these have been heavily modified previously. However, it will need to be demonstrated any watercourse diversion is achievable and capable of being authorised under the Water Environment (Controlled Activities) (Scotland) 2011. Well-designed watercourse diversion of previously modified watercourses can help to achieve further project aims such as biodiversity net gain and this we welcome if demonstrated this is appropriate and achievable. SEPA will require detailed design drawings of both proposed water course diversions with proposed cross sections, long sections within a detailed hydro geomorphological study and a flood risk assessment of each at the planning application stage that demonstrate this.	This is considered further in **Section 12.3 Baseline Conditions, Section 12.6 Assessment of Effects, Mitigation and Residual Effects, Section 12.6 Assessment of Effects, Mitigation and Residual Effects, Volume 4, Appendix 12.2 DIA and Volume 4, Appendix 12.3 FRA**
AC	Scoping Response (ENQ / 2024 / 0903) 30 July 2024	Contaminated Land There is no mention of prior contaminative uses of the Site (sheep wash, timber / threshing mill and dam at Mains of Greens) and how they may impact of the proposed site use. The EIA should include an assessment of the risks arising from the prior site use to the proposed site use.	This is considered further in **Section 12.3 Baseline Conditions**

Organisation	Type of Consultation	Response	How Response has been Considered
AC	Scoping Response (ENQ / 2024 / 0903) 16 July 2024	Environmental Health The Proposed Development may impact on private water supplies within the area. The applicant must carry out an appropriate assessment on the private supplies that could be affected and ensure mitigation measures are introduced.	This is considered further in **Section 12.3 Baseline Conditions** and **Section 0 Assessment of Effects, Mitigation and Residual Effects.** PWS information within 1 km of the Site has been included in **Volume 3, Figure 12.1 Hydrological Features** and also in **Volume 4, Appendix 12.1: PWSRA**
SEPA	Scoping Response (ENQ / 2024 / 0903) 10 July 2024	Watercourse crossings As highlighted in Pre-application consultation (ENQ / 2024 / 0141) Watercourse diversions As highlighted in Pre-application consultation (ENQ / 2024 / 0141) CAR Authorisation is required for all natural watercourse diversions and culverting for land gain (to which SEPA has a presumption against in most cases) for any watercourse (not just those that appear on the 1:50,000 OS Mapping). Flood risk As highlighted in Pre-application consultation (ENQ / 2024 / 0141)	This is considered further in **Section 12.3 Baseline Conditions, Section 0 Assessment of Effects, Mitigation and Residual Effects, Volume 4, Appendix 12.2 DIA** and **Volume 4, Appendix 12.3 FRA**
Scottish Water (SW)	Scoping Response (ENQ / 2024 / 0903) 9 July 2024	SW indicates that there are no SW drinking water catchments or water abstraction sources, which are designated as DWPA under the Water Framework Directive, in the area that may be affected by the Proposed Development. Scottish Water records indicate that there is live infrastructure in the proximity of the development area that may impact on existing Scottish Water assets. The Applicant must identify any potential conflicts with Scottish Water assets and contact our Asset Impact Team via our Customer Portal for an appraisal of the proposals.	This is considered further in **Section 12.3 Baseline Conditions**

Organisation	Type of Consultation	Response	How Response has been Considered
AC	Scoping Response (Flood Risk and Surface Water Drainage) (ENQ / 2024 / 0903) 9 July 2024	The Council's Flood Risk Management Team (FRM) noted that full drainage details have not yet been provided and therefore have the following comments with regards surface water drainage and associated flood risk: • A Drainage Impact Assessment, prepared in accordance with Council Guidelines would be required. This should cover all potential phases of the application; • If surface water soakaways are to be used to disperse of surface water; testing and sizing calculations should be done by a suitably competent person and in accordance with BRE Digest 365 or Ciria Project Report 23. Consideration should also be made to the location of the soakaways to ensure a minimum distance of 5m from any building foundations or boundaries; • If infiltration testing proves that ground is impervious then suitable attenuation calculations should be provided to prove that on-site surface water drainage system has adequate storage capacity for a 30 year return period rainfall event. Prior to a controlled discharge into either an available watercourse or public sewer (to be agreed with Scottish Water), controlled as a minimum to the pre-development runoff rate. As such, the pre-development runoff rate should be confirmed and a reduction made for any areas not included in the drainage design i.e. areas within the site application boundary that are to be left undeveloped; • Soakaway or Attenuation System construction details to be provided (including discharge control if necessary); • A statement on how future maintenance of the proposed drainage system will be performed and confirmation of who will be responsible; • Confirmation that any existing site or field drainage will be located and suitably altered, if indeed disturbed; • All calculations must be approved and certified by a suitably qualified person; • To fully consider flood risk to the Site the applicant will need to submit a Flood Risk Assessment (FRA) which must consider flood risk from all sources. This is to be undertaken in accordance with the current version of SEPAs 'Technical Flood Risk Guidance for Stakeholders – SEPA requirements for undertaking a Flood Risk Assessment; and • SEPA to be consulted as part of the production of any FRA and DIA associated with the proposal.	This is considered further in **Section 12.3 Baseline Conditions, Section 0 Assessment of Effects, Mitigation and Residual Effects, Volume 4, Appendix 12.2 DIA** and **Volume 4, Appendix 12.3 FRA**

12.2.5 Records of SW abstractions were gathered in January 2024, directly from SW's asset database under agreement between SW and WSP. This information is considered further within **Section 12.3 Baseline Conditions**.

Scope of Assessment and Extent of the Study Area

12.2.6 The Proposed Development and the Site are defined in **Volume 2, Chapter 3: Project Description** of this EIA Report.

12.2.7 Due to the scale of the Proposed Development the extent of the Study Area encompasses hydrology, hydrogeology, geology, and soil receptors within the zone of influence of the Site, which using professional judgement is set to 1 km. This radius is considered conservative for the assessment of potential adverse effects resulting from the Proposed Development. Professional judgement has been applied with regards to including water abstractions which are >1 km from the Site. For chemical and sedimentation impacts, it is considered that at distances of more than 1 km, the Proposed Development is unlikely to have a hydrological impact, as attenuation and dilution of substances is likely to occur.

12.2.8 In accordance with SEPA guidance[23] the Groundwater Dependant Terrestrial Ecosystems (GWDTE) Study Area comprises a 250 m buffer of the Site where excavations are likely to be greater than 1 m depth and within 100 m of excavations less than 1 m depth.

12.2.9 The Study Area for human health receptors comprises a 50 m buffer of the Site. In the absence of relevant guidance, a 50 m buffer has been chosen based on professional judgement.

Methodology

12.2.10 **Volume 2, Chapter 5: EIA Methodology** of this EIA Report outlines the overall assessment methodology. This methodology has been adapted in order to assess hydrology, hydrogeology, geology and soils, details of this are outlined below.

12.2.11 To investigate baseline conditions and to consider potential effects of the Proposed Development with respect to hydrology, hydrogeology, geology, and soils, a review of available desk-based information has been undertaken.

12.2.12 The collation of baseline information was supported by a site visit undertaken by the WSP Hydrology Team in June 2024.

12.2.13 The general methodology used to assess the effect of the Proposed Development on the hydrology, hydrogeology, geology, and soils receptors within the Study Area are as follows:

- Desktop study to obtain baseline and historical data;
- Consultation with SW, AC, and landowners to identify water abstractions and PWS;
- Identification of the potential effects of the Proposed Development on sensitive receptors; and
- Identification of options for the mitigation of potential effects, taking account of the Applicant's General Environmental Management Plans (GEMPs) **(Volume 4, Appendix 3.1 GEMPS and SPPs)**.

Determining Magnitude of Change and Sensitivity of Receptors

12.2.14 The assessment of significance has considered the magnitude of change (from the baseline conditions), the sensitivity of the affected environment / receptors and (in terms of determining residual effects) the extent to which mitigation and enhancement would reduce or reverse adverse effects.

Sensitivity of Receptor

12.2.15 The sensitivity of the receptor will be determined using professional judgement, consideration of existing designations and quantifiable data, where possible. The criteria used to determine the sensitivity of receptors is shown in **Table 12-2**.

Table 12-2 Sensitivity of Receptor Criteria

Sensitivity of Receptor	
High	• Receptor has 'High' or 'Good' Water Framework Directive (WFD) overall status and / or water quality status for surface water or groundwater body. • Receptor is a designated site protected under national or international legislation, such as Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), or Special Protection Area (SPA). • Receptor contains Geological Conservation Review (GCR) sites designated as SSSIs or Candidate SSSIs. • Receptor contains areas of regionally important economic mineral deposits. • Receptor supports key species and habitats sensitive to changes in suspended sediment concentrations and turbidity, such as salmon or freshwater pearl mussels. • Receptor supports GWDTE evaluated as potentially highly groundwater dependent. • Receptor contains a range of hydromorphological features with very little modification. • Receptor is a watercourse or floodplain, with a possibility of direct flood risk to populated areas, which are sensitive to increased flood risk by the possible increase in water levels. • Receptor provides clear flood alleviation benefits. • Receptor is used for abstraction for public water supply, or private water supply (domestic). • Receptor is Class 1 or 2 priority peatland, with carbon-rich and peaty soils covering ≥20% of the Site. • Receptor is classed as a high productivity aquifer. • Receptor is human health in a high sensitivity land use (e.g. residential, public open space, or construction and maintenance workers where extensive earthworks / demolition are proposed).
Medium	• Receptor has 'Moderate' WFD overall status and / or water quality status for surface water or groundwater body. • Receptor contains GCR sites with Local Geodiversity Site (LGS) status. • Receptor contains areas of locally important economic mineral deposits. • Receptor supports GWDTE evaluated as potentially moderately groundwater dependent. • Receptor contains limited hydromorphological features and a limited range of fluvial processes, such areas may have been subject to past modification such as straightening, bank protection and culverting or other anthropogenic pressures. • Receptor is a watercourse or floodplain, with a possibility of direct flood risk to high value agricultural areas, which are moderately sensitive to increased flood risk by the possible increase in water levels. • Receptor provides limited flood alleviation benefits. • Receptor used for abstraction or storage for private water supply for agricultural / industrial use. • Receptor contains Class 1 or 2 priority peatland, with carbon-rich and peaty soils covering <20% of the Site, or Class 3 and 5 peatland areas, carbon rich and peaty soils present within the Site. • Local or regional ecological status / locally important fishery. • Receptor is classed as a moderate or low productivity aquifer. • Receptor is human health in a medium sensitivity land use (e.g. commercial or industrial. Construction workers where limited earthworks are proposed).

Sensitivity of Receptor	
Low	• Receptor has 'Poor' or 'Bad' WFD overall status and / or water quality status for surface water or groundwater body. • Receptor contains GCR sites without SSSI (or Candidate SSSI) designation or LGS status, and non GCR sites with potential geodiversity interest. • Receptor supports no key species and habitats sensitive to changes in suspended sediment concentrations and turbidity. • Receptor supports GWDTE based on National Vegetation Classification (NVC) mapping, with local water sources not considered as predominantly groundwater. • Receptor contains no hydromorphological diversity and / or are identified as 'heavily modified water bodies' or 'artificial water bodies'. • Receptor is a watercourse or floodplain which passes through low value agricultural areas, less sensitive to increased flood risk by the possible increase in water levels. • Receptor provides limited flood alleviation benefits. • Receptor does not support any water abstractions. • Receptor contains Class -2, -1, 0, and 4 non-peatland areas, with no carbon-rich and peaty soils. • Receptor is classed as a very low productivity aquifer. • Sporadic fish presence. • Receptor is human health in a low sensitivity land use (construction workers where minimal ground disturbance proposed or infrastructure (roads, railways, bridges).

Magnitude of Change

12.2.16 The likely magnitude or extent of an impact (or change) on a receptor is established by assessing the degree of the impact relative to the nature and extent of the Proposed Development. The criteria used to determine the magnitude of change is shown in **Table 12-3**.

Table 12-3 Magnitude of Change Criteria

Magnitude of Change	
Major	• Long-term (≥12 months) or permanent change in surface water quality, resulting in a change in WFD status and / or prevention of attainment of target status of 'Good'. • Results in loss of feature(s) and failure of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Major loss or damage to existing habitats. Replacement of natural bed and / or banks with artificial materials. Extensive change to channel planform. • Loss of floodplain due to construction within flood risk area. • Permanent loss of water supply. • Major or total loss of a geological site or mineral deposits or where the value of the receptor would be severely affected. • Major or total loss of soils or peatland deposits or where the value of the receptor would be severely affected. • Long-term (≥12 months) or permanent change in groundwater quality, resulting in a permanent change in WFD status and / or prevention of attainment of target status of 'Good'. • Major loss of an aquifer in terms of water level or yield, with total loss of or major changes to dependent abstractions / habitats. • Major change or total loss of a GWDTE, where the value of the Site would be severely affected. • Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements; exposure to acutely toxic contaminants.
Moderate	• Mid-term (≥6 months) change in local surface water quality, potentially resulting in a temporary change of WFD status (or equivalent status at local scale) or preventing attainment of target overall status of 'Good' during this period. • Results in adverse change on integrity of hydrological feature(s) or loss of part of feature / moderate shift away from baseline conditions. Failure of one or more hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Some damage or loss to habitat due to the modifications. Replacement of the natural bed and / or banks with artificial material. • Floodplain reduction due to extensive increases in impermeable area within catchment and / or drainage design which would result in an increase in peak flood level. • Temporary loss of water supply. • Partial loss of a geological site or mineral deposit, with major change to the settings, or where the value of the receptor would be affected. • Partial loss of soils or peatland deposits or where the value of the receptor would be affected. • Mid-term (≥6 months) change in local groundwater quality, not affecting overall WFD status. • Changes to an aquifer in terms of water level or yield, with small changes to nearby dependent abstractions / habitats. • Partial change or loss of a GWDTE, where the value of the Site would be affected. • Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements; short-term exposure to contaminants with chronic (long-term) toxicity.

Magnitude of Change	
Minor	• Short-term (≥1 month) change in local surface water quality, resulting in minor temporary changes such that ecology is affected for short-term. Equivalent to a temporary minor, but measurable, change within WFD status class. • Potential failure in one of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Results in minimal shift away from baseline conditions or partial loss or damage to habitat due to modifications. • Floodplain changes due to limited increases in impermeable area within catchment and / or drainage design which would result in a minor increase in peak flood level. • Temporarily reduced quality and quantity of water supply. • Small loss to a geological site or mineral deposit, such that the value of the receptor would not be affected. • Small loss of soils or peatland, or where soils will be disturbed but the value not affected. • Short-term (≥1 month) change in local groundwater quality. • Small change to an aquifer in terms of water level or yield, with little discernible change to dependent abstractions / habitats. • Small change to or loss of a GWDTE, where the value of the Site would not be affected. • Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
Negligible	• Negligible change to surface water quality, very slight temporary change in water quality with no discernible change to watercourse ecology. • No alteration to hydromorphological elements. Some change on feature(s), but of insufficient level to affect the use / integrity, approximating to a 'no change' situation. • Floodplain variations of negligible change. • No anticipated change to water supply. • Minimal or no change to a geological site or mineral deposit. • Minimal or no change to soils or peatland deposits. • Negligible change to groundwater quality, very slight temporary change in local water quality. • Minimal or no change to an aquifer in terms of water level or yield, with no discernible change to dependent abstractions / habitats. • Minimal or no change to or loss of a GWDTE. • Very minor loss or detrimental alteration to one or more characteristics, features or elements.

Probability

12.2.17 The probability of the occurrence of an effect has been evaluated as being high, medium, or low. Professional judgement is used to determine the probability of occurrence. The application of good practice, as detailed in the Applicant's GEMPs and mitigation measures, reduces the probability of an effect occurring.

Significance

12.2.18 The criteria considered when evaluating the significance of an effect have been applied using a matrix (**Table 12-4**). The outcome of this matrix will be used to apply a significance to each potential effect identified within this chapter.

12.2.19 Through the assessment, potential effects are concluded to be of major, moderate, minor, or negligible significance. Major and moderate effects are considered significant and minor and negligible effects are considered not significant. Effects are considered adverse unless stated otherwise.

Table 12-4 Significance Matrix

Sensitivity	Magnitude	Probability	Significance of Effect
High	Major	High	Major
		Medium	Major
		Low	Moderate
	Moderate	High	Moderate
		Medium	Moderate
		Low	Minor
	Minor	High	Minor
		Medium	Minor
		Low	Minor
	Negligible	High	Minor
		Medium	Negligible
		Low	Negligible
Medium	Major	High	Major
		Medium	Moderate
		Low	Minor
	Moderate	High	Moderate
		Medium	Minor
		Low	Minor
	Minor	High	Minor
		Medium	Minor
		Low	Negligible
	Negligible	High	Negligible
		Medium	Negligible
		Low	Negligible
Low	Major	High	Moderate
		Medium	Minor
		Low	Negligible
	Moderate	High	Minor
		Medium	Minor
		Low	Minor
	Minor	High	Minor
		Medium	Negligible
		Low	Negligible
	Negligible	High	Negligible
		Medium	Negligible
		Low	Negligible

Temporal Scope

12.2.20 The assessment of impacts relating to human health comprise:

- short to medium term temporary effects (< 1 month to 12 months); and

- long term, permanent effects (> 12 months).

Limitations and Assumptions

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

12.2.22 A limitation of the PWS assessment has been the difficulty to obtain PWS information from all properties contacted, despite multiple attempts. During the site investigation permission to access properties to review PWS and confirm their location was refused by multiple landowners. Due to restricted property access and the limited return of completed questionnaires, WSP encountered constraints in the assessment process. To address these limitation's, WSP used professional experience in conjunction with a comprehensive desktop study to provide the most accurate and detailed information feasible.

12.2.23 PWS data received from AC did not always contain all the required relevant information (such as source type and use), this missing information was a limitation to the PWS desk survey.

12.2.24 It is assumed that information received by third parties, including the register of PWS provided by Aberdeenshire Council, is complete and up to date.

12.2.25 It is assumed that the design, construction and completed stages of the Proposed Development will satisfy minimum environmental standards, consistent with contemporary legislation, practice, and knowledge.

12.3 Baseline Conditions

Designated Sites

12.3.1 NatureScot Sitelink[33] confirms that there are no nationally or internationally important designated sites relevant to hydrology, hydrogeology, geology and soils within 1 km of the Site.

Surface Water Hydrology

12.3.2 **Volume 3, Figure 12.1 Hydrological Features** presents details of the hydrology within the Study Area.

12.3.3 Based on Scotland's Environment mapping[34], the majority of the Study Area is located within the River Ythan catchment (ID: 33). A small part of the Study Area, 540 m west of the Site, is located within the River Deveron catchment (ID: 30). The Site is situated 390 m west from Little Water / Black Burn.

12.3.4 A review of the SEPA Water Classification Hub[35] and Ordnance Survey (OS) 1:50,000[36] scale mapping indicates that the Site is within 1 km of multiple named and unnamed water bodies. Named water bodies are listed below:

- Little Water / Black Burn (ID: 23237), according to SEPA Water Classification Hub[35] has been classified under the Water Framework Directive (WFD) as having 'Moderate ecological potential'. It is situated approximately 390 m east of the Site at its closest point in the River Ythan catchment of the Scotland river basin district. The main stem is approximately 21 km in length. The water body has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.
- Burn of Greens (unclassified by SEPA), the Burn of Greens is located in the west of the Site and is crossed by a proposed access track. It is a tributary of Little Water / Black Burn, and flows in a south-easterly direction, discharging approximately 1.6 km downstream from the Site into to the Little Water / Black Burn.

33 NatureScot (2021) Sitelink [online] Available: https://sitelink.nature.scot/map [accessed July 2024]
34 Scotland's Environment Main river and coastal catchments (2019). [online] Available at: https://map.environment.gov.scot/sewebmap/ [accessed July 2024]
35 SEPA Water Classification Hub (2020). [online] Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/ [accessed July 2024]
36 Ordnance Survey. Online Mapping (2022) [online] Available at: https://osmaps.ordnancesurvey.co.uk/ [accessed July 2024]

12.3.5 Within the Site, there are several minor watercourses adjacent to field boundaries, which eventually discharge into the Burn of Greens, or the Little Water / Black Burn. The minor watercourses are heavily modified / artificial drainage ditches, associated with the Site's existing use for pastoral and arable farming. There are also likely to be buried field drains which discharge into the ditches. The hydrological regime of the Proposed Development would be modified on account of these factors.

Geology and Soils

Bedrock Geology

12.3.6 According to British Geological Survey (BGS) Bedrock Geology 1:50,000 scale mapping[37], the bedrock formation underlying the Study Area is Macduff Formation – (micaceous psammite, semipelite and pelite).

Superficial Geology

12.3.7 BGS Superficial Deposits 1:50,000 scale mapping[37] indicates the Study Area is dominated Devensian till (diamicton) with small areas of peat. There are areas within the Study Area where no superficial deposits are mapped, and thin soils lay directly over the bedrock.

Made Ground

12.3.8 Artificial ground (also referred to as "Made Ground") is shown on BGS mapping to be absent across the Site and the surrounding area. Localised areas of Made Ground are however anticipated to be present in areas of the Site associated with historical land use such as tracks, farm buildings, the dam (and associated infilled mill pond) and the mill complex.

Structural Features

12.3.9 BGS Linear Features 1:50,000 scale mapping[37] indicates that the Site crosses two metamorphic zones (cordiertite and andalusite).

Soils

12.3.10 The James Hutton Institute National Soil Map of Scotland[38] indicates that the majority of the Study Area is underlain by humus – iron podzols and peaty gleyed podzols.

12.3.11 The NatureScot Carbon and Peatland Map[39] indicates that the Study Area is underlain by:

- Class 0 mineral soils (Peatland habitats are not typically found on such soils). These soils underlie the majority of the Study Area;
- Class 4 (an area unlikely to be associated with peatland habitats or wet and acidic type. Area unlikely to include carbon-rich soils). These soils are located at the east part of the Study Area; and
- Small pockets of Class 5 soils (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). These soils are located in the east and north west of the Study Area.

12.3.12 Ground investigation (GI) borehole log and trial pit information, was provided by a third party (Fairhurst) which can be found in **Volume 4, Appendix 12.5 Ground Investigation Report.** This report indicates the presence of peaty soils to be very limited within the Site, with 'peaty topsoil' recorded in one location (BH18) and a 'brown gravelly sandy peaty clay' in one location (BH13) out of 46 borehole locations.

[37] BGS (2021) Geology of Britain viewer (classic). [online]. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.200831406.129307875.1654083545-959159431.1654083545 [accessed July 2024]
[38] James Hutton Institute (2021) Scotland's Soils [online]. Available at: http://map.environment.gov.scot/Soil_maps/?layer=1 [Accessed July 2024]
[39] SNH (2016) Carbon and Peatland Map [online]. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 [Accessed July 2024]

Historical Land Use

12.3.13 A review of historical Ordnance Survey (OS) maps has been undertaken to identify potential sources of historical contamination, former land uses and potential sensitive receptors. Earliest available mapping from 1871 (Aberdeenshire 1:2,500) shows that the Study Area appears to be undeveloped farmland. A farm track is shown running east to west in the south-east of the Site. A mill compound, labelled as "Mains of Greens" is shown in the far south-east of the Site, consisting of several structures and a mill dam with a mill pond and sluice. The mill dam is shown in 1901 (Aberdeenshire 1:2,500) but is not shown on mapping from 1959 (Ordnance Survey Plan 1:10,000), therefore the mill pond is likely to have been infilled. The majority of the buildings remain and are still labelled Mains of Greens. 1968 mapping (Ordnance Survey Plan 1:2,500) shows a sheep wash to the north of the buildings labelled as Mains of Greens, in the south-east of the Site. A small building is also shown in the location of the historical mill dam. The building is not shown on mapping from 1996 (Large-Scale National Grid Data 1:2,500). No significant changes are shown through to Historical Aerial Photography published in 2003 and the most recent mapping (1:10,000) dated 2022, aside from the development of a property approximately 100 m to the to the west of Mains of Greens, is labelled as Parkside of Greens.

12.3.14 Earliest available mapping from 1871 (Aberdeenshire 1:2,500) shows that the area surrounding the Site appears to consist primarily of undeveloped farmland. Several small settlements are shown to the south, west, north-west, and north-east of the Study Area. Mapping also shows a spring and a well to the south-west of the Study Area. 1968 (Ordnance Survey Plan 1:2,500) mapping shows a drain running north-west to south-east along the southern boundary of the Site, in the place of the spring and well. Mapping from 1901 (Aberdeenshire 1:2,500) shows two pumps to the west and south-west of the Site, and a well to the south-west. The well is no longer shown on 1968 (Ordnance Survey Plan 1:2,500) mapping. No further changes are shown through to Historical Aerial Photography published in 2003 and the most recent mapping (1:10,000) dated 2022.

Contaminated Land

12.3.15 There are no records of contaminated land, as defined under Part 2A of the Environmental Protection Act[40], within the Site.

12.3.16 Historical land uses in the south-east of the Site, including a sheep wash, a timber / threshing mill, and a dam, may present potential sources of contamination.

Previous Reports feeding into Baseline

12.3.17 The Applicant provided the following reports for review:

- Fairhurst. LT379 – Green 400kV Substation, Geo-Environmental Desk Study Report. Dated 23 February 2024 (**Volume 4, Appendix 12.4: Geo-Environmental Desk Study Report**).
- BAM Ritchies, ASTI Substation – LT379 – New Deer 2. Ground Investigation Report. Dated 1st February 2024. Ref: RGN.330G (**Volume 4, Appendix 12.5, Ground Investigation Report**), and;
- TonyGee Consulting Engineers, New Deer 2 400kV Substation Geotechnical Interpretive Report. Dated 26th March 2024. Ref: S123039-TG-XX-XX-RP-GI-0001 (**Volume 4, Appendix 12.6: Geotechnical Interpretive Report**).

Pertinent information provided by these 3rd party reports have been included in the baseline summary.

Summary of Geoenvironmental Desk Study

The scope of works outlined within the geoenvironmental desk study includes;

- A review and summary of desk-based information on Site history, geology, and hydrology;
- A review and summary of the historical and environmental setting of the Site;

[40] Part 2A of UK Government Environmental Protection Act, 1990.

- A summary of the anticipated and encountered ground conditions;
- Identification of contamination sources, pathways and receptors at the Site;
- Development of a preliminary Conceptual Site Model;
- Assessment and evaluation of the risks to Site receptors via a qualitative environmental risk assessment;
- Identification of potential geotechnical constraints to the Proposed Development; and,
- Identification of any further studies or investigations required to enable a detailed design.

Summary of Factual Ground Investigation Report

- The investigation comprised 31 dynamic sampling / rotary cored boreholes, 15 resonance (sonic) sampling / rotary cored boreholes, 55 trial pits and seven hand pits.
- Monitoring standpipes were installed in 16 boreholes to allow monitoring of groundwater levels and gas concentrations.
- Six rounds of gas and groundwater monitoring were proposed, beginning November 2023 and ongoing at the time of report publication.
- Geotechnical laboratory soil testing was conducted on soil samples taken from exploratory hole locations including; soil classifications tests, soil chemical tests, soil compaction tests, and soil strength tests.
- Soil samples were not scheduled for environmental analysis.
- Water contaminant testing was conducted on 10 groundwater samples.
- Rock and aggregate testing was carried out on selected sections of rock core.

Summary of Interpretive Ground Investigation Report

- Topsoil was recorded across the Site with a thickness ranging between 0.1-0.6 m, with an average thickness of 0.28 m.
- Glacial deposits were recorded in 39 exploratory holes comprising a mix of clay, silt, gravel, and sand. Thickness of glacial deposits ranged from 0.25-2.7 m, with an average thickness of 0.95 m. Boreholes with no glacial deposits comprised topsoil underlain by weathered rock.
- Bedrock encountered was of the MacDuff Formation, comprising extremely weak to strong Pelite, extremely weak to medium strong Semi-Pelite and extremely weak to strong Psammite. Rockhead was encountered between 0.25 – 9.7 mbgl with an average depth to rockhead of 2.5 mbgl.
- No chemical laboratory analysis was conducted on soil samples taken from exploratory hole locations.
- Laboratory analysis was conducted on 10 groundwater samples.
- Laboratory analysis of groundwater samples reported that concentrations of all organic contaminants (PAHs, total phenols, and petroleum hydrocarbons) were below their respective laboratory detection limits.
- Laboratory analysis revealed that several inorganic contaminants (cadmium, copper, mercury, nickel, zinc) were present at concentrations exceeding Environmental / Water Quality Standards, however the report concluded that the reported concentrations are potentially reflective of natural concentrations within groundwater rather than associated with a potential contaminative source.
- A ground gas risk assessment was not included within the geotechnical interpretative report, however is it noted that methane concentrations were recorded at 0% in all monitoring wells. Carbon dioxide was recorded above 0% in all monitoring wells with a maximum concentration of 77% recorded in BH01, the maximum concentration of carbon dioxide in the remaining wells was recorded to be 7.1%.

12.3.18 As environmental soil sampling and laboratory testing was not conducted during the BAM Ritchies ground investigation, the chemical status of soils within the Site is currently unknown. Made Ground was not encountered during the ground investigation undertaken by BAM Ritchies, however the exploratory holes did not target the principal areas where Made Ground is most anticipated such as the south eastern area (former mill, dam, potentially infilled mill pond, sluices and sheep wash).

Unexploded Ordnance

12.3.19 The geo-environmental desk study completed by Fairhurst (**Volume 4, Appendix 12.4 Geo-Environmental Desk Study Report**) indicates that there is a low risk of unexploded ordnance (UXO) on Site and no further investigation into UXO is considered necessary.

Groundwater

12.3.20 The main groundwater body underlying the Site is; Ellon (ID: 150454)[35] which was classified by SEPA, under the WFD, as having an overall status of 'Good' in 2020. A very small part to the east of the Site and within the Study Area is underlain by New Byth (ID: 150454)[35] which has been classified by SEPA as having an overall WFD status of 'Good' in 2020.

12.3.21 According to BGS GeoIndex Onshore Hydrogeology 1:625,000 mapping[41], the Study Area is underlain by Southern Highland Group, low productivity aquifer, which typically maintain small amounts of groundwater near the surface weathered zone and secondary fractures. Groundwater vulnerability to pollution is predominantly Class 4a and 5[42], which are defined as "Vulnerable to those pollutants not readily adsorbed or transformed" and "Vulnerable to most pollutants, with rapid impact in many scenarios", respectively. Due to the high degree of heterogeneity in the aquifer associated, the flow being constrained to the upper weathered zone (and thereby controlled by topography) as well as fractures, connectivity of the aquifer at the Site with the wider Ellon and New Byth groundwater bodies will be limited.

12.3.22 Intrusive Site Investigation has also been undertaken by a third party (Fairhurst) the outcomes of which can be found in **Volume 4, Appendix 12.6: Geotechnical Interpretative Report.** The report identified a typical water table depth of approximately 0.6 m to 3.3 m below ground level (bgl) with an average depth of 2.3 m bgl within the Site. It was noted that there were no noticeable trends with depth observed regarding groundwater strikes. However, the locations of the exploratory holes where groundwater strikes occurred are typically found in the east side of the Site. It should also be noted that limited groundwater strikes do occur in other areas of the Site.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

12.3.23 SEPA's guidance on assessing the impacts of developments on GWDTE (SEPA, 2024)[23] requires assessment of GWDTE located within 250 m of excavations greater than 1 m and within 100 m of excavations less than 1 m.

12.3.24 NVC Surveys were undertaken on 7 May 2023 by the WSP Ecology Team (see **Volume 3**, **Figure 9.1.2: Targeted National Vegetation Classification**).

Importance of Potential GWDTE Communities

12.3.25 Two small areas of MG10a - *Holcus lanatus – Juncus effusus* rush-pasture NVC community have been identified within the Study Area (250 m of the Site) that are indicative of supporting GWDTE (SEPA, 2024). These NVC communities are located within the Site to the southeast and abut Burn of Greens and its tributary.

12.3.26 MG10 *Holcus lanatus-Juncus effusus* rush-pasture[43] 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. This community is widespread in lowland Britain, and it also occurs at low altitudes in most upland areas.

Conceptual Model for GWDTE

41 BGS GeoIndex Onshore Viewer for Hydrogeological map of Scotland (2020). [online] Available at: http://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSHydroMap&_ga=2.59199725.1532853921.1644263485-96331536.1635767367 [Accessed July 2024]

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

43 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 [Accessed July 2024]

12.3.27 The Hydrogeology 1:625,000 mapping[41] indicates that the aquifer underneath the Site has low productivity and is therefore unlikely to be the primary source for these habitats.

12.3.28 Groundwater monitoring results found in **Volume 4, Appendix 12.6: Geotechnical Interpretative Report** provided by a third party (TonyGee) indicate two boreholes within 100 m from the MG10 communities:

- borehole BH36, recorded groundwater depth ranged from 0.31 – 0.8 m bgl. This borehole has also been recorded as dry in September 2023; and
- borehole BH42, recorded groundwater depth ranged from 0.00 – 0.4 m bgl.

12.3.29 The results suggest waterlogging of the area which would be primarily a result of inefficient drainage from overland flow and rainfall. MG10 communities are associated with poorly drained pasture; however, nourishment is likely to be predominantly from overland flow and direct precipitation.

12.3.30 Given the presence of the watercourse, topography and land use, both areas are unlikely to be groundwater dependent and the surface vegetation is more likely derived from poor drainage from overflowing Burn of Greens. These habitats are likely to be primarily fed by the watercourse, rainfall and surface water runoff, and are considered of low importance as per the table on Page 3, SEPA (2024).

Water Supplies

Private Water Supplies

12.3.31 The Aberdeenshire Council register of PWS indicates there are 17 potential PWS within 1 km of the Site (as shown in **Volume 3, Figure 12.1: Hydrological Features**). A site walkover was undertaken by WSP engineers on 19 September 2023 which confirmed the presence of an additional PWS within the Site which is not recorded in the Aberdeenshire Council's PWS data.

12.3.32 The list of PWS was screened to determine the potential to be impacted based on the source-pathway-receptor (S-P-R) framework this method is expanded upon within **Volume 4, Appendix 12.1: PWSRA**. The screening has been undertaken using baseline conceptual information presented in this chapter, including considerations of hydrology and hydrogeology. The screening also took into account further information obtained via direct consultation with PWS users (via questionnaires), as well as further site walkover surveys undertaken on 12 and 13 June 2024.

12.3.33 The screening identified 18 PWS within 1 km of the SIte; seven of which require more detailed assessment. These PWS are summarised in **Table 12-5**.

Table 12-5 Private Water Supplies

PWS ID	PWS Name	British National Grid Reference (Easting / Northing)	Source Type	Use of Supply	PWS / Property distance from nearest Infrastructure (approximate) *	Further Assessment Required?
1	Borderside	383177, 846650	Groundwater-Well	Unknown	Property, ~120 m south	Yes
2	Inchgreen Cottage	383044, 846492	Groundwater-Well	Unknown	Property, ~ 320 m south	No
3	Inchgreen Farm	383029, 846414	Groundwater-Well	Domestic and livestock	Well, ~ 400 m south	No
4	Latchfold Croft	383353, 846402	Unknown	Unknown	Property, ~330 m southwest	Yes

PWS ID	PWS Name	British National Grid Reference (Easting / Northing)	Source Type	Use of Supply	PWS / Property distance from nearest Infrastructure (approximate) *	Further Assessment Required?
5	Meadowside	404003, 847152	Unknown	Unknown	Property, ~940 m southwest	No
6	Mains Of Greens Bungalow	382563, 846840	Unknown	Unknown	Property, ~ 180 m southwest	Yes
7	Mill of Allathan	383529, 847454	Unknown	Unknown	Property, ~ 770 m northeast	No
8	Ivy Cottage	404123, 845417	n / a (Property served by Scottish Water Mains supply)	n / a (Property served by Scottish Water Mains supply)	Property, ~ 750 m south	No
9	Parkhill	382565, 846162	Unknown	Unknown	Property, ~property 700 m south	No
10	Mill Of Greens	383853, 845920	Groundwater-Well	Unknown	Property, ~ 1 km southeast	No
11	Greenfield	(1) 382038, 846636; (2) 381898, 846771; and (3) 381879, 846782	Groundwater-Well x 3	Unknown	Well 1, ~265 m southwest; well 2, ~275 m southwest; and well 3, ~280 m southwest	No
12	Oldtown	382849, 847164	Groundwater-Well	Unknown	Well, ~50 m east	Yes
13	Newton Of Northburn	382689, 847555	Unknown	Unknown	Property, ~20 m north	Yes
14	Mains Of Greens	382599, 846859	Unknown	Unknown	Property, ~140 m southwest	Yes
15	Netherlea	383388, 845786	Groundwater-Spring	Unknown	Property, ~1 km southeast	No
16	Northburn	381119, 847812	Unknown	Unknown	Property, ~470 m northwest	No
17	Tall Trees	381588, 846437	Borehole	Domestic, livestock	Brorehole, ~680 m southwest	No
18	Unregistered property	381534, 847532	Underground water collection tank	Unknown	Adjacent to infrastructure	Yes

*Where source locations cannot be confirmed it is assumed these are within the vicinity of the property and this is used as a proxy location.

12.3.34 Further assessment of these PWS is presented in **Volume 4, Appendix 12.1: PWSRA**. This follows SEPA's guidance (SEPA, 2024)[24] on assessing the impacts of any potential infrastructure involving development on a sensitive receptor, and / or excavations greater than 1 m within 250 m of sensitive receptor, or within 100 m of excavations less than 1 m. A bespoke assessment is required if any of these requirements are met. **Volume 4, Appendix 12.1: PWSRA** has therefore been completed with reference to this guidance.

Registered Abstractions

12.3.35 Based on the SW abstractions dataset, there are no SW abstractions within 1 km of the Site.

12.3.36 Based on the register of CAR authorisations provided by SEPA, there are five registered activities within 1 km of the Site and are noted in **Table 12-6** and illustrated in **Volume 3, Figure 12.1: Hydrological Features**.

Table 12-6 Details of CAR licences within 1 km of the Site

CAR licences	British National Grid Reference (Easting / Northing)	Site Address	Authorisation Activity	Distance from Proposed Infrastructure (approximate)	Further Assessment required?
CAR / R / 1013991	384234, 847163	Nether Corbshill, New Deer, Turriff	Agriculture (other than irrigation)	~1 km northeast	No Based on SEPA response groundwater abstraction is located 280 m west of the property and > 1 km from the Site.
CAR / R / 1187765	382809, 846187	Parkhill Lodge, Greens, New Deer, Turriff	Unknown	~650 m south	Yes The authorisation activity is unknown, therefore further investigation is necessary.
CAR / R / 1197127	382795, 846146	Beech Cottage Turriff	Unknown	~690 m south	Yes The authorisation activity is unknown, therefore further investigation is necessary.
CAR / R / 1187170	382777, 847882	Northburn Farmhouse, Cuminestown, Turriff	Unknown	~350 m north	Yes The authorisation activity is unknown, therefore further investigation is necessary.
CAR / R / 1187785	381189, 846847	Middletack Cottage, Cuminestown, Turriff	Unknown	~530 m southwest	Yes The authorisation activity is unknown, therefore further investigation is necessary.

12.3.37 Further clarifications were requested from SEPA on 9 July 2024 for CAR licences listed in **Table 12-6** and a response was received on 25th July 2024. SEPA provided the details of the CAR licence for CAR / R / 1013991 (see **Table 12-6**). SEPA was unable to locate copies of CAR / R / 1187765, CAR / R / 1197127, CAR / R / 1187170 and CAR / R / 1187785; these have been lost due to the criminal cyber-attack SEPA experienced in December 2020.

12.3.38 According to the Scottish Government's website[44], Burn Turriff catchment is located 520 m west and upslope from the Site. This is designated by SEPA under the WFD as a Drinking Water Protected Area (DWPA) for surface water; however, there is no plausible hydrological connection with the Site. The Site is also located within a SEPA DWPA for groundwater.

12.3.39 Information regarding public registered assets will be sought from SW at the detailed design stage.

Flooding

12.3.40 The Study Area contains areas of high risk of river flooding and surface water flooding, based on SEPA's indicative flood risk mapping[45]. The areas subject to a high likelihood of flooding from water bodies within 1 km of the Site are displayed in **Table 12-7**. It is important to note that SEPA's Flood Maps do not account for watercourses with catchment areas below 3 km^2.

Table 12-7 Likelihood of flooding from rivers and surface water within 1 km of the Site

Type of Flooding	Likelihood	Description and comments
River	High	Little Water / Black Burn - situated 390 m east of the Site. Burn of Greens - adjacent to the east of the Site and is crossed by a Proposed Access track.
Surface Water	High	There are two small pockets of surface water flooding in the northwest part of the Site, and multiple small pockets to the west of the Site.

12.3.44 SEPA's Future Flood Maps[45] indicate areas adjacent to Little Water / Black Burn and Burn of Greens within the Study Area, will be at an increased risk of river flooding by the 2080s.

12.3.45 Hydraulic modelling, as detailed within the Flood Risk Assessment presented in **Volume 4, Appendix 12.3: FRA**, indicates that out-of-bank flooding will occur along the banks of the Burn of Greens in a 1 in 200 year plus climate change flood event. The Proposed Development will be located outwith the areas shown to be at risk of flooding with the exception of locations where the proposed access track crosses the Burn of Greens and an unnamed ditch.

12.3.46 Localised increases in flood level and extent associated with the proposed watercourse crossing on the Burn of Greens will not result in flood risk to the Proposed Development, up to the critical '1-in-200 year plus climate change' scenario. No increase in fluvial flood risk is predicted outwith the Site.

12.3.47 Risk of flooding as a result of infrastructure failure, overland flows, sewer flooding, and groundwater flooding are all considered to be low.

Fisheries

12.3.48 The Site is located in the upper River Ythan catchment, close to the boundary with the adjacent River Deveron catchment. The Ythan District Salmon Fishery Board is a statutory body responsible for the protection and enhancement of Atlantic salmon and sea trout in the Ythan District[46].

[44] Scottish Government (2014). Drinking water protected areas - Scotland River basin district [online]. Available at: Scottish Government (2014). Drinking water protected areas - Scotland river basin district [online]. Available at: https://www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/ [Accessed July 2024]

[45] SEPA Interactive Flood Risk Mapping (2023) [online]. Available at: https://www.sepa.org.uk/environment/water/flooding/flood-maps/ [Accessed July 2024]

[46] River Ythan District Salmon Fishery Board website. Available at: https://riverythan.org/board-trust/ythan-district-salmon-fishery-board.html [Accessed July 2024]

Future Baseline

12.3.49 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.

12.3.50 In the absence of the Proposed Development, it is likely that conditions at the Site would remain as they are reported within this chapter and no significant change to the current baseline would be predicted in relation to potential contamination sources associated with historical land use (primarily the south-east area of the Site). However, assuming no remediation takes place it is possible that potential contamination sources, if present, will remain and may pose a risk to identified receptors.

12.4 Issues Scoped Out

12.4.1 There are no nationally and internationally important designated sites relevant to hydrology, hydrogeology, geology and soils within 1 km of the Site. Therefore, an assessment of impacts on such sites has been scoped out.

12.4.2 The information within the GI report (**Volume 4, Appendix 12.5: Ground Investigation Report**), BGS Superficial Deposits geology mapping, James Hutton Institute National Soil Map of Scotland, and NatureScot Carbon and Peatland mapping indicate presence of peat soils to be very limited within the Site. Considering the current arable land use; significant effects are not anticipated. Impacts related to disturbance, compaction and loss of peat have therefore been scoped out.

12.4.3 Extensive potential contamination sources are unlikely to be present within the Site due to it largely comprising undeveloped agricultural land. Historical land uses have been noted in south-east corner associated with the farm / complex of buildings labelled as Mains of Greens, comprising a former mill, with associated dam, potentially infilled mill pond and sluices. Latterly a sheep wash has also been recorded in this area. It is anticipated that any contaminants (including ground gas) reported during future ground investigation or during the construction phase would be mitigated in line with the proposed use. This negates the requirement for consideration of potential impacts to human health receptors (future Site users, maintenance workers, adjacent sensitive Site users), water environment receptors and services / infrastructure during the operational phase of the Proposed Development.

12.4.4 It is acknowledged that the Burn Turriff catchment, which is designated as a SEPA DWPA for surface water under the WFD, is located 520 m west and upslope from the Site; however, there is no plausible hydrological connection with the Site. The Site is located within a SEPA DWPA for groundwater. With the assumption that construction good practice and standard mitigation measures as outlined in GEMPs 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.

12.4.5 There are no other registered abstractions or discharges under SW abstractions or DWPAs and assessment of these is also therefore not required.

12.4.6 Following the outcomes of **Volume 4, Appendix 12.1 PWSRA**, The Inchgreen Cottage (ID: 2), Inchgreen Farm (ID: 3), Meadowside (ID: 5), Mill of Allathan (ID: 7), Ivy Cottage (ID: 8), Parkhill (ID: 9), Mill Of Greens (10), Greenfield (ID: 11), Netherlea (ID: 15), Northburn (ID: 16) and Tall Trees (ID:17) PWS are not at risk from the construction and operation of the Proposed Development and have been therefore been scoped out. Impacts are not considered to be likely due to the intervening distance and position upgradient from any development infrastructure.

12.5 Sensitive Receptors

12.5.1 Receptor sensitivity has been determined using the criteria provided in **Table 12-2**. The Site covers a large area and therefore sensitivity classification may vary spatially. To adopt a conservative approach, the receptor sensitivity will be based on the most sensitive ranking.

12.5.2 **Table 12-8** below presents the sensitivity of the identified receptors, which has been based on the baseline surveys and available desk-based information:

Table 12-8 Sensitive receptors

Receptor	Sensitivity	Justification
Surface Water	Medium	There are no major watercourses within the Site (shown on a 1:50k OS map), with the minor watercourses / drainage ditches that are present being highly modified. Watercourses in the wider Study Area are identified as being of 'Poor' status under WFD. Notwithstanding, to accommodate for the predicted improvement in WFD status of 'Good' by 2027, surface water features within the Site are considered to be of medium sensitivity.
Geology	Low	The Macduff Formation geology is typical of the wider area with no designated sites of geological interest located within the Site which could be impacted.
Soils (non-peat or peatland)	Low	Soils are not of notable quality or habitat. The majority of the Site comprises agricultural land with limited potential to present potential sources of contamination. The exception being the south eastern area which has historically been occupied by a mill, dam and associated infilled mill pond, sheep wash and farm buildings which may present potential sources of contamination.
Groundwater	Low	Due to Southern Highland Group aquifers low productivity, and its(?) likely limited vertical and lateral extent, groundwater is considered to be of Low sensitivity. The relative importance of groundwater to surface water baseflow or private water supplies is recognised by those sensitivity classifications.
GWDTE	Low	Hydrological assessment of potential GWDTE communities within the vicinity of the Site, as identified through consideration of the prevailing hydrogeology and NVC survey results, has shown these habitats are unlikely to be groundwater dependent.
SEPA Abstractions	High	Potential SEPA authorised abstractions (CAR / R / 1187765, CAR / R / 1197127, CAR / R / 1187170, CAR / R / 1187785) due to the fact that the authorisation activity is unknown, so are identified as Highly sensitive.
Private Water Supplies	High	**Volume 4, Appendix 12.1 PWSRA** has identified that the following PWS could be impacted by the Proposed Development: • Borderside (ID: 1); • Latchfold Croft (ID: 4); • Mains Of Greens Bungalow (ID: 6);

Receptor	Sensitivity	Justification
		• Oldtown (ID: 12); • Newton Of Northburn (ID: 13); • Mains Of Greens (ID: 14); and • Unregistered Property (PWS ID: 18). The above PWS are of High sensitivity. It has been confirmed that the abstraction for Oldtown is used for domestic purposes. For the rest of the above list, the PWS details are unknown; however, it is also assumed that all of them are used for domestic purposes (**Table 12-2**).
Flooding	Medium	Risk of flooding as a result of infrastructure failure, overland flows, sewer flooding, and groundwater flooding are all considered to be low. The Site is located outwith the areas shown to be at risk of flooding with the exception of the locations where the proposed access road crosses the Burn of Greens and an unnamed ditch.
Fisheries	Medium	The River Ythan is a locally important fishery, and therefore considered to be of medium sensitivity.
Human Health (Construction workers during development works)	High	Historical land use in the south-east of the Site presents a potential source of contamination. During construction works, human health is considered High sensitivity, given the potential for direct exposure to potential sources of contamination, if present, is high. The actual effect on human health is wide ranging and determined by the hazardous nature of the potential contaminants present.
Human Health (Site users during end use operation)	Low	The end use operation is considered Low sensitivity as the opportunity for exposure to potential sources of contamination, if present, is low.
Human Health – general public (adjacent residential properties and general pedestrian users of the surrounding road network).	High to Low	The general public (although limited) are considered high sensitivity during the construction works given the potential for disturbance of potential contamination sources, albeit in a limited area of the site. During operation the general public are considered low sensitivity.

12.6 Assessment of Effects, Mitigation and Residual Effects

Project Characteristics

12.6.1 The construction phase of the Proposed Development would involve a number of different elements. **Volume 2, Chapter 3: Project Description** provides further detail; however, with regards to hydrology, hydrogeology, geology and soils, the principal activities are as follows:

- construction of temporary and permanent access routes;
- excavation and construction of the permanent structures;
- creation of temporary construction compound and laydown areas;
- installation of drainage features around permanent infrastructure;
- storage of fuels and oils;
- batching of concrete;
- temporary welfare facilities and site utilities;
- temporary topsoil and subsoil storage; and
- temporary drainage during construction.

12.6.2 Following commissioning of the Proposed Development, all temporary construction areas would be landscaped or reinstated. The landscaping and reinstatement would form part of the contract obligations for the successful Principal Contractor and would include the removal of all temporary access routes.

12.6.3 During the operational phase of the Proposed Development, activities with particular relevance to this assessment are:

- modification of groundwater levels and flow;
- surface water drainage, including treatment and discharge of surface water drainage; and
- foul drainage, including treatment and discharge.

12.6.4 The Proposed Development requires crossings of an existing watercourse channel (Burn of Greens), shown on OS 1:50,000 mapping that would be subject to CAR licensing. There is likely to be a combination of smaller or ephemeral surface channels and sub-surface field drainage within the Site, which may be more apparent during prolonged wet weather, and these would require appropriate management by the Principal Contractor.

12.6.5 OS 1:10,000 scale mapping and aerial imagery indicate several small unnamed watercourses and drainage channels, crossed by the Proposed Development; the closest of which being located central and south of the Site. The identified unnamed tributaries (drainage ditches) flowing from northwest to southeast are to be realigned during the construction of the Proposed Development and maintained as an open channel. Requirements for authorisation under CAR would be secured by the appointed Principal Contractor.

Mitigation by Design

12.6.6 A drainage strategy has been prepared by Fairhurst for the Proposed Development. It includes drainage and Sustainable Drainage System (SuDS). SuDS mimic natural drainage processes to reduce the effect on the quality and quantity of runoff from developments and provide benefit to amenity and biodiversity. The SuDS have been integrated within the landscape proposals to enhance amenity, biodiversity, and habitat, whilst protecting and / or enhancing water quality. The drainage strategy will be designed in accordance with current best practice to provide adequate capacity to not allow flooding out of the network for the 1 in 30 year storm event and flood water generated up to the critical 1 in 200 year, plus 37% climate change storm event, shall be constrained within the areas on site as not to cause damage to buildings, essential services, adjoining developments and services.

12.6.7 The **DIA** (**Volume 4, Appendix 12.2**) and **FRA (Volume 4, Appendix 12.3**) provide details on how effects associated with drainage would be managed through permanent sustainable drainage design, which would incorporate multiple water quality treatments prior to discharge.

12.6.8 The proposed permanent surface water drainage has been designed in accordance with Aberdeenshire Council, SEPA and SSEN guidance. Greenfield run-off rates and attenuation volumes to be stored up to and including the 1 in 200-year return event storm. This has contributed to the SuDS design throughout the scheme allowing for the sizing of the attenuation basins of up to 33,800 m^3 storage capacity run-off from the substation platform (excluding earthworks), and for associated access roads within the site. Filter drains and swales /

ditches shall convey surface water from the platform and the access roads to the SuDS basins, and discharge treated surface water run-off into the proposed channels across the site in eight locations.

12.6.9 The temporary surface water design has also been considered. This consists of conveyance ditches around the temporary construction 'laydown area' platforms, which then discharge to settlement lagoons. The settlement lagoons have been designed to allow the settlement of suspended solids prior to discharge to the natural environment, for up to the 1 in 10-year storm event.

12.6.10 The existing north and south drainage channels have been incorporated into the design around the platform. The channel realignments of the existing channels have been designed to accommodate the location of the proposed substation platform and associated access tracks and work areas. This has been designed with current best practice and shall include sinuosity where possible.

12.6.11 Groundwater has been observed to be shallow at the proposed substation platform and throughout the Site. Due to the shallow groundwater depths, careful management will be required to ensure excavation stability during construction and operation. Changes to existing groundwater and surface water control measures such as drains and pumps should be carefully planned.

12.6.12 Further details on the proposed site drainage are presented in **Volume 2, Chapter 3: Project Description**, as well as in **Volume 4, Appendix 12.2: Drainage Impact Assessment (DIA)**.

Good Practice Measures

12.6.13 A number of good practice measures are detailed in **Volume 2**, **Chapter 16: Schedule of Environmental Mitigation** including the Construction Environmental Management Plan (CEMP) (which will be provided by the Principal Contractor) and the Applicant's GEMPs (provided in **Volume 4, Appendix 3.1)**. As outlined in **Volume 2**, **Chapter 3: Project Description**, implementation of the CEMP would be managed on-site by a suitably qualified and experienced Environmental Clerk of Works, with support from other environmental professionals, as required. A summary of those good practice measures most relevant to hydrology, hydrogeology and geology of the Proposed Development is provided below.

12.6.14 Measures set out in **Volume 2, Chapter 16: Schedule of Mitigation** will be implemented during the construction of the Proposed Development, detailing best practice construction management measures, including measures to manage risks associated with construction of the Proposed Development to the environment and human health, such as those associated with pollution and resource use.

12.6.15 The adoption of the applicable GEMPs will reduce the probability of an incident occurring and also reduce the magnitude of any incident due to a combination of good site environmental management procedures, staff training, contingency equipment and emergency plans.

12.6.16 The GEMPs (see **Volume 4, Appendix 3.1**) applicable to this chapter are:

- Working in or Near Water;
- Working in Sensitive Habitats;
- Watercourse Crossings;
- Contaminated Land;
- Dust Management;
- Waste Management;
- Private Water Supplies;
- Soil Management;
- Oil Storage and Refuelling;
- Working with Concrete; and
- Bad Weather.

12.6.17 A CEMP will be reported and implemented by the Principal Contractor and will outline measures to ensure that the works minimise the risk to soils, geology, groundwater, surface water, contaminated land and PWS. An outline CEMP is provided in **Volume 4**, **Appendix 3.3** of this EIAR.

12.6.18 It is expected that the following will be included within the CEMP and would ensure the works are undertaken in accordance with good practice guidance[47]:

- during construction there would be heavy plant and machinery required and as a result it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in any Guidance for Pollution Prevention (GPP1);
- any above ground on-site fuel and chemical storage would be bunded (GPP 2);
- emergency spill response kits would be maintained during the construction works (GPP 21);
- a vehicle management system would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision (GPP21);
- suitable access routes would be chosen which minimise the potential requirement for either new temporary access tracks or for tracking across open land which could contribute to the generation of suspended solids;
- a speed limit would be used to reduce the likelihood and significance of any collisions;
- plant nappies would be placed under stationary vehicles which could potentially leak fuel / oils;
- any temporary construction / storage compounds required would be located remote from any sensitive surface water receptors and will be constructed to manage surface water run-off in accordance with best practice;
- any water contaminated with silt or chemicals would not be discharged directly or indirectly to a watercourse without prior treatment;
- the requirement for the use of appropriate Personal Protective Equipment (PPE), particularly when handling soils and working in areas of historical land use;
- water for temporary site welfare facilities would either be brought to site, or a local surface water or groundwater abstraction would be identified. Any water abstraction would be made in accordance with SEPA General Binding Rules, or an authorisation would be obtained from SEPA in accordance with the Controlled Activity Regulations (CAR); and
- foul water would either be collected in a tank and collected for offsite disposal at an appropriately licensed facility or discharged to a septic tank or soakaway in accordance with CAR.

12.6.19 Implementation of mitigation measures outlined in the GEMP, and the CEMP will be managed on-site by a suitably qualified and experienced Environmental Clerk of Works (EnvCoW), with support from other environmental professionals, as required. The EnvCoW would have authority to stop any works that are or have potential to impair soils, geology, or the water environment. Additional surface water quality and groundwater monitoring strategies for the pre-construction, construction and post-construction phases should also be established.

12.6.20 PWS and abstractions will require further investigation by the Principal Contractor prior to construction to verify the infrastructure location, supply type, properties supplied and their uses. Consultation will be required with property owners as part of this process and further unregistered supplies may need to be established through consultation. If applicable, measures to mitigate for temporary interruption of water supply, or permanent alternative supply to be agreed prior to works commencing. If required, water quality and / or quantity monitoring of PWS before, during and after construction, will be implemented. The Principal Contractor will be required to consider all construction activities and satisfy themselves that they are aware of all PWS and

[47] NetRegs. Guidance for Pollution Prevention (GPP) documents [Online]. Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ Guidance for Pollution Prevention (GPP) documents | NetRegs | Environmental guidance for your business in Northern Ireland & Scotland [Accessed July 2024]

associated network infrastructure in the local area that may be at risk of adverse effects as a result of the Proposed Development. Should any PWS be identified which require protection, specific mitigation will be developed and agreed with SEPA.

12.6.21 Further consultation with SW is required prior to construction to identify any SW assets which require protection. Should any such assets be identified, specific mitigation measures will be developed and will be agreed with Scottish Water. Pre-application consultation with SEPA will be required to identify potential CAR authorised activities associated within the Proposed Development in accordance with SEPA controlled activity regulations[15] and the CAR Practical Guide[15]. Specifically, this will include (but not limited to) the proposed watercourse diversion.

12.6.22 In relation to watercourse crossings, all structures will be designed and constructed following good practice techniques and would be of sufficient capacity to receive 1 in 200 years storm flows with an allowance for increased flows due to climate change. Key measures identified to minimise alterations to surface water drainage patterns include:

- 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; and
- minimising the size and duration of in-channel works.

12.6.23 The application of SuDS to reduce the increase of flood risk to downstream areas may be required. Development tends to increase impermeable areas such as roofs, roads, car parking areas etc. The aim of SuDS is to emulate natural drainage systems to return post-development flows to pre-development levels. Further details have been considered by Fairhurst in **Volume 4, Appendix 12.2: DIA.**

Assessment of Likely Significant Effects

12.6.24 The following assessment of effects takes into account mitigation by design and good practice measures including those contained within the CEMP and GEMPs are implemented. In light of this, the following impacts have the potential to result in significant effects to the soils, geology, local hydrology (surface water) and hydrogeology (groundwater):

- pollution incidents;
- erosion and sedimentation;
- loss and compaction of soils;
- modification of groundwater levels and flows;
- impacts on GWDTE;
- modification of surface water flow and runoff; and
- potential impacts on PWS.

12.6.25 An assessment of these impacts with reference to **Table 12-2**, **Table 12-3**, **Table 12-4** and **Table 12-8** are presented in the following sections.

Construction Phase

12.6.26 During the construction phase, there is the potential for the following short-term impacts on the hydrology, hydrogeology, geology and soils environment, in the absence of additional mitigation measures to what has already been discussed in this chapter.

Pollution Incidents

12.6.27 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. With chemicals and oil being stored and used on-site there is the potential for an incident. Potential sources of suspended sediments include the earthworks and excavations associated with the Proposed Development.

12.6.28 Any pollution incident occurring on site could have a detrimental effect on the water quality of the nearby surface waters (including the Little Water / Black Burn and Burn of Greens), groundwater (Ellon and New Byth groundwater bodies and Southern Highland Group) and / or soil, thereby also affecting ecology (see **Volume 2**, **Chapter 9: Ecology, Nature Conservation and Ornithology**).

12.6.29 Common causes of environmental harm associated with working in or near watercourses include:

- silt, e.g. disturbance of riverbed or bank, dewatering and pumping of excavations, run-off from exposed ground, plant washing, roads and river crossings;
- cement and concrete – which is very alkaline and corrosive and can cause serious pollution;
- chemicals and solvents – oil storage, refuelling, trade materials etc; and
- waste materials (including special waste), e.g. oily wastes, spent acids and solvents.

12.6.30 Taking into account the design mitigation and construction good practice, specifically the *Working in or Near Water*, *Watercourse Crossings*, *Private Water Supplies*, *Soil Management*, *Oil Storage and Refuelling*, and *Bad Weather* GEMPs, the effects have been assessed as follows:

- The magnitude of the impact of a pollution incident upon surface waters (Little Water / Black Burn and Burn of Greens) (Medium sensitivity) is Moderate, and the probability is Low, which results in an overall **Minor Adverse** and **Not Significant** effect.
- The magnitude of the impact of a pollution incident on soils (Low sensitivity) is Minor and of Low probability to occur, resulting in a **Negligible** effect.
- The magnitude of the impact of a pollution incident upon groundwater (Ellon and New Byth groundwater bodies and Southern Highland Group) (Low sensitivity) is Moderate and the probability is Low, which results in an overall **Minor Adverse** and **Not significant** effect.
- The magnitude of impact of a pollution incident on SEPA groundwater DWPAs (High sensitivity) is Moderate and of Low probability to occur, which results in an overall **Minor Adverse** and **Not significant** effect.
- The magnitude of impact of a pollution incident on River Farrar fisheries (Medium sensitivity) is Minor and of Low probability to occur, resulting in a **Negligible** effect .

Erosion and sedimentation

12.6.31 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;
- watercourse realignment activities take place (north and south of the substation);
- watercourse crossing activities (proposed permanent access track to the east of the substation which crosses the Burn of Greens); and
- where higher velocity surface water flows may occur due to local slopes and drainage design.

12.6.32 Surface water passing through small surface drains, efficiently draining the new infrastructure, could exhibit higher localised flows, increasing the potential for bank erosion.

12.6.33 Sediment transport in watercourses can result in high Total Suspended Solids (TSS) and turbidity levels which affect the ecology, particularly fish stocks, by reducing the light and oxygen levels in the water. Sediment deposition can further affect 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.

12.6.34 In the case of pollution incident effects, good practice site environmental management measures and the dilution factor involved would be expected to reduce any potential sedimentation effect downstream.

12.6.35 Considering construction good practice and implementation of measures detailed in the Applicant's GEMPs, specifically the *Soil Management* GEMP, the effects have been assessed as follows:

- The magnitude of impact of erosion or loss of soils (Low sensitivity) is Minor, and the probability is Low, which results in a **Negligible** effect.

- The magnitude of impact of sedimentation of surface waters (Little Water / Black Burn and Burn of Greens) (Medium sensitivity) is Moderate and the probability is Medium, which results in an overall **Minor Adverse** and **Not significant** effect.
- The magnitude of impact of sedimentation of surface waters on Ythan fisheries (Medium sensitivity) is Minor and of Low probability to occur, which results in a **Negligible** effect.

12.6.36 Pollution control during excavation and dewatering shall accord with the good practice mitigation associated with pollution incidents and erosion and sedimentation.

Loss and compaction of soils

12.6.37 Soil compaction as a result of construction works within the Site may damage the vegetation and result in a reduction in soil permeability and rainfall infiltration, thereby increasing the potential for longer-term erosion from surface water runoff. This would be most likely caused by tracking of heavy plant machinery.

12.6.38 Stockpiled and unvegetated / exposed areas of soils are also at risk of desiccation and erosion by wind and water, also potentially causing soil loss.

12.6.39 Considering construction good practice and implementation of measures detailed in the Applicant's GEMPs, specifically the *Soil Management* GEMP, the effects have been assessed as follows:

- The magnitude of impact upon soils (Low sensitivity) is Moderate and the probability of effect of soil loss is Medium which results in an overall **Minor Adverse** and **Not significant** effect.
- The magnitude of impact upon soils (Low sensitivity) is Moderate and the probability of effect of compaction of soil Medium, which results in an overall **Minor Adverse** and **Not significant** effect.

Modification of groundwater levels and flows

12.6.40 Ground investigation has identified that groundwater is typically within 0.6 m to 3.3 m bgl. Therefore, excavations could disrupt groundwater systems resulting in the lowering of groundwater levels in the immediate vicinity of the excavations and alterations to flow paths during dewatering activities and once permanent cut slopes are established.

12.6.41 Earthworks associated with the Proposed Development would likely result in minor changes to the local subsurface and groundwater flows.

12.6.42 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. As described in **Section 12.3,** NVC communities within the Study Area, identified as potentially groundwater dependent, are unlikely to be dependent on groundwater.

12.6.43 Any required discharge licence for dewatering would be obtained prior to excavation commencing.

12.6.44 Considering construction good practice and implementation of measures detailed in the Applicant's GEMPs, specifically the W*orking in Sensitive Habitats*, *Watercourse crossing* and in **Volume 4, Appendix 12.2: DIA** the effects have been assessed as follows:

- The magnitude of impact on groundwater levels and flows upon groundwater (Ellon and New Byth groundwater bodies and Southern Highland Group) (Low sensitivity) is Minor and the probability is Medium, which results in a **Negligible** effect
- The magnitude of impact on GWDTE (Low sensitivity) is Moderate and the probability is High, which results in an overall **Minor Adverse** and **Not significant** effect.

12.6.45 **Volume 4, Appendix 12.1 PWSRA**, describes the qualitative and quantitative risks to PWS as a result of the construction and operation of the Proposed Development. In order to safeguard PWS, additional mitigation is proposed including the preparation of a PWS Monitoring and Method Statement as well as other contingency arrangements, including the provision of permanent alternative supplies (connection to Scottish Water Mains supply) in some instances. The implication of this additional mitigation reduces the significance of the effect on PWS and is summarised in **Section 0 Assessment of Effects, Mitigation and Residual Effects**.

Modification of Surface Water Drainage Patterns

12.6.46 Surface flows could be impeded by construction activity in or adjacent to stream channels, poor choice of watercourse crossing locations 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. There are a number of flood-sensitive locations, such as the Greens Burn and Little Water / Black Burn, as discussed in the Baseline Conditions.

12.6.47 The Proposed Development would restrict the infiltration of rainfall into the soil and underlying superficial deposits through the introduction of impermeable areas. This results in localised increased volumes of surface runoff and could exacerbate flood risk downstream. New permanent impermeable areas may result in the interception of diffuse overland flow, which could disrupt the natural drainage regime of the Site by concentrating flows and influencing drainage in soils.

12.6.48 Burn of Greens will be crossed by an access track and may result in the interception of diffuse overland flow, which could disrupt the natural drainage regime of the Site by concentrating flows and influencing drainage in soils.

12.6.49 The construction good practise and GEMPs and the adoption of measures within the **DIA (Volume 4, Appendix 12.2)** would reduce the impact of modification to surface water drainage patterns, with proposed artificial drainage installed only where necessary and wherever practical, being installed in advance of ground being cleared of vegetation. All structures would be designed and constructed following good practice techniques and would be of sufficient capacity to receive storm flows with an allowance for increased flows due to climate change. Key measures identified to minimise alterations to surface water drainage patterns include:

- 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;
- any alteration to the drainage regime will involve consideration of existing groundwater levels and ponding in the local area;
- any alteration to the drainage regime will be designed to be sympathetic to local watercourse features, including bed and bank materials and gradients;
- minimising the size and duration of in-channel works; and
- appropriate design of realignment and crossing structures to ensure sufficient capacity to convey 1 in 200 year plus climate change allowance storm flows.

12.6.50 The design of the realigned unnamed minor watercourses within the Site would accord with the recommendations of **Volume 4, Appendix 12.2 DIA**. The channel realignments of the existing ditches have been designed to accommodate the location of the proposed substation platform and associated access tracks and work areas. This has been designed with current best practice and shall include sinuosity, where possible, and aim to keep natural gradients as close to the existing channel.

12.6.51 Subject to appropriate surface water drainage design, the Proposed Development will comply with Energy Networks Association Engineering Technical Report 138 (ENA ETR 138) and NPF4[5].

12.6.52 Considering construction good practice and implementation of measures detailed in the Applicant's GEMPs and the adoption of measures within the **DIA (Volume 4, Appendix 12.2)**, the effect is assessed as follows:

- The magnitude of impact on surface water drainage patterns, with specific reference to crossing the Burn of Greens and the realignment of the field drains (Medium sensitivity) is Moderate and the probability is Low, which results in an overall **Minor Adverse** and **Not significant** effect.
- The magnitude of impact of a short-term increase in flood risk on third parties and nearby developments (Medium sensitivity) is Minor and the probability of effect is Low, which results in a **Negligible** effect.
- The magnitude of impact of a short-term increase in flood risk on floodplains and construction workers (Medium sensitivity) is considered Minor (as there may be works undertaken in areas of flood risk) and the probability of effect is Low, which results in a **Negligible** effect.

Public / Private Water Supplies

12.6.53 Consultation with property owners to verify the location, type, and use of PWS identified by desk study has been done as part of this assessment, and can be seen fully in **Volume 4, Appendix 12.1: PWSRA**. The Principal Contractor will be required to consider all construction activities. They should also satisfy themselves that they are aware of all PWS and associated network infrastructure (in the local area), that may be at risk of adverse effects as a result of the Proposed Development.

12.6.54 As indicated in **Volume 4, Appendix 12.1: PWSRA**, standard good practice mitigation should be included within a CEMP which will be prepared by the Principal Contractor prior to construction. In addition to this mitigation, a Private Water Supply Management Plan (PWSMP) will need to be prepared (prior to construction) and will detail all relevant mitigation, pre-construction measures, management measures, monitoring requirements and contingency plans relevant to PWS and considered within this chapter and **Volume 4, Appendix 12.1: PWSRA**.

12.6.55 Considering construction good practice and implementation of measures detailed in the Applicant's GEMPs, specifically the *Working in or Near Watercourses* and *Private Water Supplies* GEMPs, the effects have been assessed as follows:

- The magnitude of the impact of pollution on Borderside (ID: 1) PWS, Mains of Greens Bungalow (ID: 6) and Mains of Greens (ID: 14) (High sensitivity) is Moderate and of Medium probability of occurring, resulting in a **Moderate Adverse** and **Significant** effect.
- The magnitude of the impact of pollution on Oldtown (ID: 12), Newton of Northburn (ID: 13) and Unregistered Property (ID:18) PWS (High sensitivity) is Major and of High probability of occurring, resulting in a **Major Adverse** and **Significant** effect.
- The magnitude of the impact of pollution on Latchfold PWS (High sensitivity) is Minor and of Low probability of occurring, resulting in **Negligible** effect.
- The magnitude of the impact of pollution effect on potential SEPA authorised water abstractions (CAR / R / 1187765, CAR / R / 1197127, CAR / R / 1187170, CAR / R / 1187785) (High sensitivity) is Minor with a low probability of occurring, resulting in **Minor Adverse** and **Not Significant** effect.

12.6.56 **Volume 4, Appendix 12.1 PWSRA** describes the risks to the quality and quantity of water supporting PWS as a result of the construction and operation of the development. To safeguard PWS, additional mitigation is proposed including the preparation of a PWS Monitoring and Method Statement as well as other contingency arrangements, including the provision of permanent alternative supplies. The implication of this additional mitigation reduces the significance of the effect on PWS and is summarised in **Section 0 Assessment of Effects, Mitigation and Residual Effects**.

Potential Effect on Construction Workers from Potential Contamination

12.6.57 Construction workers would be exposed to any contaminants (including ground gas) that are present in the likely Made Ground, or that are present in the ground after migrating from contaminant sources, during any earthworks that include disturbing or clearing the Made Ground. There is potential for exposure to asbestos or other contaminants during the disturbance of Made Ground (if present). Construction workers could be affected by the inhalation of dusts, gases or vapours, dermal contact with soil and groundwater, and ingestion of soil and dust. However, the length of direct exposure would be limited to the duration of Site works in which they are

directly involved. Health effects from encountering potential sources of contamination, dependent on the nature of contamination encountered the potential effects, could range between short to long-term.

12.6.58 In consideration of the implementation Good Practice measures, in particular the requirement to work in accordance with GEMPs and a CEMP, the magnitude of the impact of exposure of construction workers (High sensitivity) is Moderate and has a Low probability of occurring, resulting in a **Minor Adverse** and **Not Significant** effect.

Potential Effect on Adjacent Site Users from Potential Contamination

12.6.59 Adjacent Site users include occupiers of surrounding properties and general users of the surrounding area.

12.6.60 Excavation of potentially contaminated soils including soil movements and processing could pose a health risk to the general public in the immediate vicinity of the Site. There is the potential for the inhalation of contaminated dusts and particulate matter generated by excavation or Site clearance that includes disturbing or clearing the likely Made Ground. The potential risk to adjacent Site users would be dependent on the type and nature of contamination (if present), and the characteristics of receptor and duration of exposure. If these receptors are exposed to contaminants above threshold concentrations, there is potential for both temporary and permanent health problems to arise.

12.6.61 In consideration of the implementation Good Practice measures, in particular the requirement to work in accordance with GEMPs and a CEMP, the magnitude of the impact to adjacent site users (High sensitivity) is Moderate and has a Low probability of occurring, resulting in a **Minor Adverse** and **Not Significant** effect.

Potential Effect on Water Environment Receptors from Potential Contamination

12.6.62 During construction, the exposure and / or displacement of soils / Made Ground has the potential to mobilise soil-bound contaminants / sediment via soil erosion / overland flow migration pathways, resulting in impacts on underlying aquifers and surface water features, and lead to an increase in the vertical leaching of contaminants from soils to underlying groundwater. This potential effect is most likely to relate to the south-east of the Site, where Made Gound is more likely to be present.

12.6.63 In consideration of the implementation Good Practice measures, in particular the requirement to work in accordance with GEMPs and a CEMP, the magnitude of impact on groundwater in the underlying superficial and bedrock aquifer (Low sensitivity) and surface water features (medium sensitivity) is Moderate and the probability is considered to be Low, which results in a **Minor Adverse and Not Significant** effect on groundwater and surface water features from potential contamination sources.

Operation Phase

12.6.64 During the operation phase, it is expected the impacts on surface water quality, including pollution incidents as well as erosion and sedimentation would be considerably reduced by the absence of construction and completion of reinstatement. Therefore, it is not expected that the operational phase would cause any significant impact on the existing surface water quality baseline as a result of operational pollution incidents including erosion and sedimentation.

12.6.65 However, there is the potential for the following long-term impacts on the hydrology, hydrogeology, geology, and soils environment, in the absence of additional mitigation measures.

Modification of groundwater levels and flows

12.6.66 The final design of the Proposed Development will incorporate suitable groundwater control in accordance with CIRIA C750 (2016) to manage groundwater ingress. The discharge of this groundwater shall be incorporated into the permanent sustainable drainage design.

12.6.67 Considering construction good practice and implementation of measures detailed in the Applicant's GEMPs and the adoption of measures within the **DIA (Volume 4, Appendix 12.3)**, the operational effects have been assessed as follows:

- The magnitude of impact on groundwater levels and flows (Low sensitivity) is Moderate and Medium probability, which results in a **Minor Adverse** and **Not Significant** effect.

12.6.68 Long-term dewatering may result in long-term adverse impacts on water quantity for nearby PWS.

Modification of Surface Water Drainage Patterns

12.6.69 No additional changes to overland drainage and surface water flows are anticipated during the operational phase. All permanent drainage infrastructure would remain in place during the Proposed Development's operation in accordance with the final drainage strategy. A monitoring and maintenance programme would be put in place for the drainage infrastructure, to include regular visual inspection of drainage, unnamed watercourses and sustainable drainage features, including an on-going maintenance strategy. The plan would be adopted by the Site's operator to ensure sustainable drainage features continue working effectively.

12.6.70 The existing north and south field drainage channels have been incorporated into the design around the platform. The channel realignments of the existing ditches have been designed to accommodate the location of the proposed substation platform and associated access tracks and work areas. This has been designed with current best practice and shall include sinuosity where possible and aim to keep natural gradients as close to the existing channel.

12.6.71 Taking into account design mitigation, GEMPs and the adoption of measures within the **DIA** (**Volume 4, Appendix 12.2)**, the effect is assessed as follows:

- The magnitude of impact on surface water drainage patterns, with specific reference to crossing Burn of Greens and the realignment of the field drains (Medium sensitivity) is Moderate and the probability is considered to be Low, which results in a **Minor Adverse** and **Not significant** effect.
- The magnitude of impact of a long-term increase in flood risk on third parties and nearby developments (Medium sensitivity) is Minor and the probability of effect is considered to be Low, which results in a **Negligible** effect.
- The magnitude of impact of a short-term increase in flood risk on floodplains (Medium sensitivity) is considered Minor (as there may be works undertaken in areas of flood risk) and the probability of effect is considered to be Low, which results in a **Negligible** effect.

Private Water Supplies

12.6.72 During the operational phase, it is anticipated that the effects on the PWS will be in line with the construction phase. This is due to the significant earth and ground works affecting water yield for the PWS. The Principal Contractor must ensure that all operational activities are assessed to confirm the Proposed Development poses no risk of adverse effects to all PWS and associated infrastructure.

Mitigation

12.6.73 Pre-construction surveys and discussions with SEPA are required to identify any authorised abstractions 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.

10.1.1 Based on the register of CAR authorisations provided by SEPA, there are five registered activities within 1 km of the Site (as noted in **Table 12-6)**. Further investigation by the Principal Contractor is required prior to construction to verify the authorisation activity, the infrastructure location, and its use. This will reduce the risk of potential impacts to this abstraction.

12.6.74 **Table 12-9** outlines specific mitigation measures required to be undertaken prior to construction.

Table 12-9 Schedule of Mitigation

Reference	Title	Description
HG1	PWS & licensed abstractions consultation	SEPA abstractions will require further investigation by the Principal Contractor prior to construction to verify the authorisation activity, the infrastructure location, and its use. Potential further unregistered supplies may also need to be established through consultation with local property owners and SEPA. If applicable, measures to mitigate for temporary interruption of water supply, or permanent alternative supply to be agreed prior to works commencing. If applicable, water quality and/or quantity monitoring of water supply before, during and after construction should be implemented. The Principal Contractor will be required to consider all construction activities and satisfy themselves that they are aware of all PWS, registered activities and abstractions in the local area that may be at risk of adverse effects as a result of the Proposed Development. Should any PWS and abstraction be identified which require protection, specific mitigation will be developed and agreed with SEPA.
HG2	Identification of SW assets	Consultation with SW is required prior to construction by Principal Contractor to verify that there are no SW assets which require protection. Should any such assets be identified, specific mitigation measures will be developed and agreed with SW.
HG3	Flood risk mitigation	The risk of fluvial flooding should be mitigated by the inclusion of a 600 mm freeboard to sensitive equipment and buildings. The substation platform is to be set at 129.5 mAOD, which is over 20 m higher than the modelled flood levels in Burn of Greens. Residual risk of flooding should be mitigated by profiling ground levels to route flood water around and away from sensitive infrastructure.
HG4	Identification of PWS infrastructure	To protect PWS during the construction phase, the Principal Contractor will undertake investigations to locate PWS assets prior to commencing any activities. These investigations will prioritise non-intrusive methods, such as cable avoidance technology (CAT) scanners, ground-penetrating radar (GPR), and other geophysical surveys, to accurately locate and assess PWS infrastructure. Where necessary, systematic trial pit surveys will be conducted by hand to minimise disruption.
HG5	Protection of PWS infrastructure	Following further investigation, it may be confirmed that there is the potential for the PWS infrastructure to be impacted through planned construction works. Should this be the case, an assigned contractor will prepare specific construction or working methods to ensure the continuity of the PWS. These methods include refining the engineering design and a general arrangement drawing for crossing pipework.
HG6	Provision of alternative PWS	There is a high probability of detrimental impact to the PWS at the properties of Borderside (ID: 1), Oldtown (ID: 12), Newton of Northburn (ID: 13), and unregistered property (ID: 18). If the Proposed Development is granted planning permission, and further investigation by the Principal Contractor prior to construction deems that the supply cannot be protected through mitigation, then prior to the commencement of construction, the owners of PWS which will be affected would be provided with a suitable alternative supply. The Applicant will cover the costs of providing alternative supplies.
HG7	Provision of a PWS Monitoring Plan & PWS Monitoring Method Statement	A PWS Monitoring Plan (PWSMP) and PWS Monitoring Method Statement will be prepared by the Principal Contractor prior to construction. This will detail 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 PWSMP will be provided to the PWS user, prior to construction and will contain contact information for the Construction Site Manager (or similar). PWS users will be informed of any planned works that may affect their supply.

Reference	Title	Description
HG8	Further ground investigation requirements	Prior to works being undertaken further ground investigation should be completed with a particular focus in the areas of historical land use. Further ground investigation would include the laboratory analysis of soil and groundwater samples for identified potential contaminants of concern (including asbestos), and groundwater and gas monitoring.
HG9	Requirements for a Generic Quantitative Risk Assessment (GQRA)	A Generic Quantitative Risk Assessment (GQRA) would be undertaken to further assess potential contamination sources associated with the area of historical land use in the south eastern corner. Further assessment would be completed prior to construction to assess the requirement for any potential remediation measures ahead of construction. This assessment would lead to updating the initial conceptual site and model and refine the understanding of potential source pathway receptor linkages in line with LCRM guidance. Further assessment would also include ground gas risk assessment to focus on areas of occupied structures, if proposed. Should the GQRA identify contaminant linkages, a Remediation Options Appraisal and Remediation Strategy will be produced to specify remediation measures required. The Remediation Options Appraisal would consider the available options for each contaminant linkage and would establish the most effective and sustainable approach. The Remediation Strategy would set out measures to break the pollutant linkages, where identified. The measures could include for examples the removal of contaminated soil or the placement of a barrier between the contaminant source and the receptor, amongst others. This further ground investigation and GQRA would be secured by way of condition of planning. In the event that a Remediation Strategy is required, validation of remedial measures will also be required, and will be reported in a Verification Report.
HG10	Earthworks and reuse of materials	Information obtained via further ground investigation could also be used to assess the suitability of materials for potential reuse as part of the Proposed Development. Reuse of site won material would be required to be undertaken in accordance with a Materials Management Plan (MMP), prepared in line with the requirements of CL:AIRE guidance 'The Definition of Waste: Development Industry Code of Practice'.

Residual Effects

PWS

12.6.75 Considering the good practice measures and GEMPs, potentially significant residual effects on PWS have been identified.

12.6.76 Based on **Volume 4, Appendix 12.1 PWSRA**, additional mitigation measures have been provided for PWS at:

- Borderside (ID:1);
- Mains of Greens Bungalow (ID: 6);
- Oldtown (ID: 12);
- Newton of Northburn (ID: 13);
- Mains of Greens (ID: 14); and
- Unregistered property (PWS ID:18)

and these should be agreed upon with owner / occupier and SEPA prior to works commencing.

12.6.77 An alternative new mains connection supply has been recommended for PWS at unregistered property (ID:18), with this mitigation in place the resident will receive a new supply. The residual effect on the current supply is therefore **No Change** and will remain **Major Adverse** and **Significant.**

12.6.78 It is understood that SSEN Transmission will purchase properties and the buildings associated with Mains of Greens Bungalow (ID: 6) and Mains of Greens (ID: 14) and these buildings will will be demolished. The residual effect on the current supply is therefore **No Change** and will remain **Moderate Adverse** and **Significant** however it should noted that the receptor will no longer exist when all properties supplied be removed**.**

12.6.79 For Borderside (ID: 1), Oldtown (ID: 12) and Newton of Northburn (ID: 13) Assuming:

- the implementation of good practice measures provides good quality and quantity monitoring results on the PWS abstraction; or
- the implementation of contingency measures in the event of an unforeseen impact on the existing PWS arising from the construction and operational impact of the Proposed Development; or
- the implementation of a suitable alternative supply

the consequential residual effect is reduced to **Negligible**.

12.6.80 The Applicant will cover the costs of providing alternative supplies, ceasing the use of PWS abstractions.

Flood Risk

12.6.81 Based on the **FRA** (**Volume 4, Appendix 12.3**), localised increases in flood level and extent associated with the proposed watercourse crossing on the Burn of Greens, will not result in flood risk to the Proposed Development, up to the critical '1-in-200 year plus climate change' scenario. No increase in fluvial flood risk is predicted outwith the Site boundary. The residual risk of fluvial flooding should be mitigated by the inclusion of a 600 mm freeboard to sensitive equipment and buildings. The substation platform is to be set at 129.5 m AOD, which is over 20 m higher than the modelled flood levels in Burn of Greens.

12.6.82 Risk of flooding as a result of infrastructure failure, overland flows, sewer flooding, and groundwater flooding are all considered to be low. Residual risk of flooding should be mitigated by profiling ground levels to route flood water around and away from sensitive infrastructure.

Contaminated Land

12.6.83 Through the outlined mitigation measures, there would be **Negligible** residual effects in relation to contaminated land. Should contamination associated with the historical land uses (former mill, dam, potentially infilled mill pond, sluices and sheep wash) be encountered during further intrusive ground investigation, or unexpected contamination be encountered during construction, remediation will be a likely requirement as outlined in the mitigation measures.

12.7 Cumulative Effects

12.7.1 **Volume 2, Chapter 14: Cumulative Effects** identifies other developments to be included in the assessment of cumulative effects, listed below. As stated in **Volume 2, Chapter 5: EIA Methodology**, developments marked with an asterisk are a Stage 1 cumulative development.

- National Development for Electrical Transmission Infrastructure Comprising Transition Joint Bays, Underground Cable Circuits Within a Cable Corridor, Substation and Ancillary Works (Aberdeenshire Council ref: ENQ / 2023 / 0739), Passes through the Site;
- Installation of Underground Cable (Aberdeenshire Council ref: ENQ / 2022 / 1845), located 1.4 km southeast of the Site;
- National for Formation of Onshore Landfall Point, Laying of Underground Cable and Erection of Substation (Aberdeenshire Council ref: APP / 2023 / 1454), located 2.3 km southeast of the Site;
- Erection of a Synchronous Compensator to Provide Grid Stability Services and Associated Works (Aberdeenshire Council ref: ENQ / 2021 / 1180), located 1.6 km south of the Site;

- Formation of Forestry Private Way (Aberdeenshire Council ref: PP / 2023 / 2102), located 4.9 km southwest of the Site;
- Formation of Footpaths (Aberdeenshire Council ref: APP / 2022 / 2571), located 4.8 km southwest of the Site;
- Formation of Footpath (Aberdeenshire Council ref: APP / 2021 / 2773), located 1.3 km north of the Site;
- Formation of Footpath (Aberdeenshire Council ref: APP / 2022 / 0034), located 1.4 km northwest of the Site;
- Installation of Footpath and Associated Post and Wire Fencing (Aberdeenshire Council ref: APP / 2022 / 0076), located 4.1 km northwest of the Site;
- Smiddybank BESS (Aberdeenshire Council ref: ECU00005004), located 4.9 km east of the Site;
- Monquhitter BESS (Aberdeenshire Council ref: ECU00005129), located 1.9 km north of the Site;
- Beauly to Blackhillock to New Deer to Peterhead 400kV OHL (Aberdeenshire Council ref: ECU00005165), passes through the Site*; and
- Greens UGC Connection, permitted development, passes through Site*.

12.7.2 The above developments need to be considered as having potential for cumulative effects with the Proposed Development in the event that these other developments present potentially significant effects to the receiving hydrology, hydrogeology and geology environment. Given that the significant residual effects that have been identified will be addressed, and assuming effective 'source' controls for each individual development and good practice methodology, the construction phase of any site would therefore result in Negligible residual impacts and no cumulative effects. Furthermore, the differing construction programming and activities that would be anticipated to occur across various developments reduces the probability that water quality and flow issues would be coincident across the catchments.

12.7.3 None of the committed schemes are considered to have the potential to result in significant cumulative effects relating to Ground Conditions or associated contamination as it is assumed that all sites would follow the same industry best practice and guidance outlined in the sections above. In addition to their own site-specific mitigation of potential identified effects as outlined in legislation. The construction phase of any site therefore would result in **Negligible** residual impacts and no cumulative effects.

12.8 Summary and Conclusions

12.8.1 The following sensitive hydrology, hydrogeology, geology and soils receptors associated within 1 km of the Site have been identified:

- surface water bodies, including the Burn of Greens and Little Water / Black Burn;
- groundwater bodies (Ellon and New Byth Groundwater Bodies and Southern Highland Group);
- water abstractions including PWS;
- fisheries; and
- human health (construction workers, future Site users and adjacent Site users).

12.8.2 The assessment considered how the Proposed Development would affect the above sensitive receptors. Through successful application of a CEMPs and GEMPs, as well as the good practice measures and additional mitigation identified, the assessment has concluded that the Proposed Development would not result in any significant residual effects on the hydrology, hydrogeology, geology and soils.