HydroGlen

Supporting Environmental Information Report

Appendix F: Flood Risk & Drainage Assessment

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Hydroglen - Glensaugh

Flood Risk & Drainage Statement

December 2023

107358

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1 Introduction

1.1 Project Brief

1.1.1 Pell Frischmann has been appointed by ITP Energised to undertake a Flood Risk and Drainage Statement (FRDS) to support a full/detailed and outline planning application for the construction of a Hydrogen Plant, Solar farm & Wind Turbine associated with the Hydroglen project being promoted by the James Hutton Institute at Glensaugh Research Station, Aberdeenshire.

1.1.2 The purpose of this FRDS is to review available information and assess the flood risk posed to the site and proposed development from a range of sources, now and in the future. The FRDS has been carried out in accordance with the requirements of the National Planning Framework 4 (NPF4), in the respect of flood risk and coastal change.

1.1.3 To complete the Flood Risk Assessment, the following key stages of work have been undertaken:

- Collation of desk-based information and review of publicly available flood risk information including Scottish Environment Protection Agency (SEPA) mapping and local data, policy, and guidance.
- A desktop review of other data that has been available such as topographical surveys, utility plans and proposed development layout options.
- Consult relevant stakeholders to obtain further information on local risk and issues.
- Provision advice on appropriate flood risk mitigation measures for the proposed development.

1.2 Sources of Information

1.2.1 A review of relevant information and guidance from a range of sources has been undertaken and includes the flowing key documents:

- National Planning Framework 4 (NPF4), February 2023
- Scottish Environment Protection Agency (SEPA) Flood Maps
- British Geological Survey Geology Viewer, 2023
- British Geological Survey GeoIndex, 2023
- Aberdeenshire Local Development Plan, January 2023
- North East Local Plan District – Local Flood Risk Management Plan 2022-2028

2 Background & Site Context

2.1 Site Location & Existing Use

2.1.1 The site is located to the northwest of Auchenblae, Aberdeenshire. A site location plan is included for reference as **Figure 2.1.**

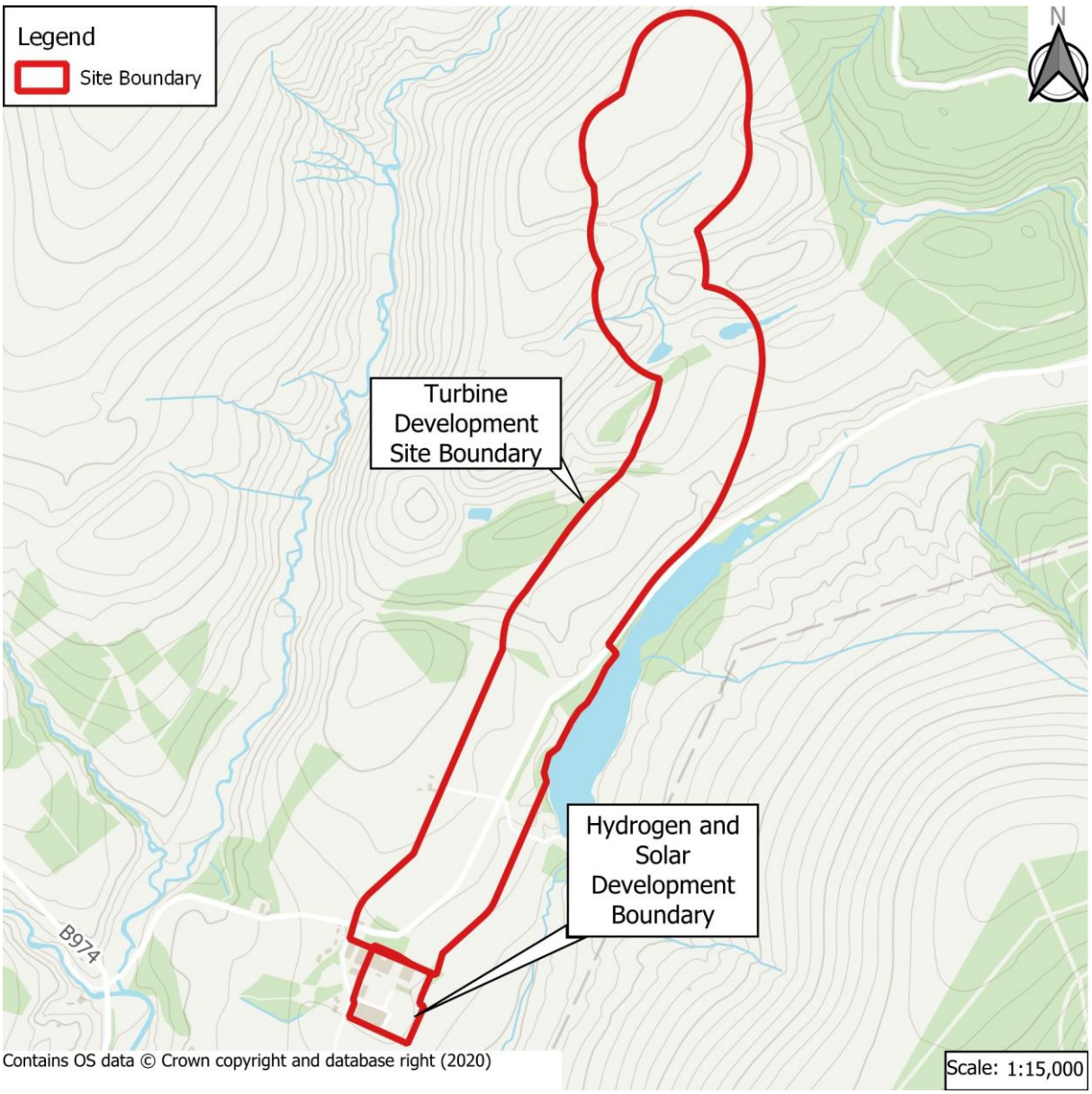

Figure 2.1 Site Location Plan

2.1.2 The proposed Hydrogen and Solar development, the southern of the two application boundaries is bound to the north by C7K Glen Road, beyond which is agricultural land. East and south of the southern boundary is formed by agricultural land.

2.1.3 Within the proposed Hydrogen and Solar Development boundary there are existing farm buildings and hardstanding areas.

2.1.4 The proposed turbine development, the northern application boundary is bound to the east by C7K Glen Road. The northern, southern and western boundary is bounded by agricultural land.

2.2 Local Watercourses

2.2.1 A review of the OS OpenRivers dataset shows that the Slack Burn & Birnie Burn are located to the northwest of the proposed developments. Both of these ultimately discharge into the Devilly Burn which is located to the west and along the southern boundary and runs north to south. The Glen Burn, which runs parallel to the eastern boundary of the site also connects into the Devilly Burn to the south of the site.

2.2.2 **Figure 2.2** shows the locations of local watercourses in relation to the proposed site. It should be noted that smaller un-named watercourses exist within and around the site.

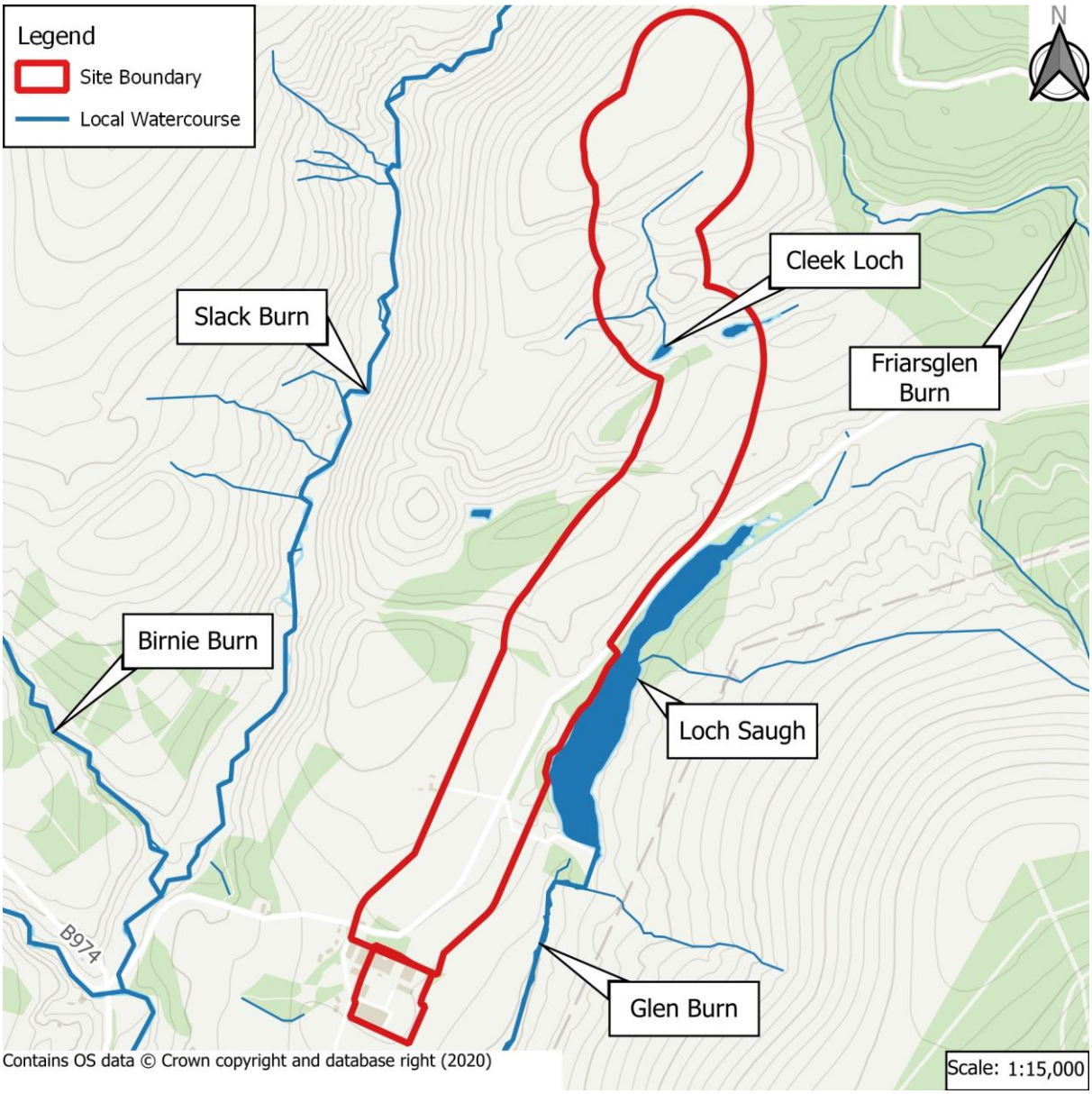

Figure 2.2 Local Watercourses

2.3 Topography

2.3.1 The proposed hydrogen and solar development site generally falls from the west (the highest point) to east with maximum elevations of approximately 173.0m AOD, falling to a minimum elevation of approximately 169.0m AOD in the east.

2.3.2 The proposed turbine development generally falls from west (the highest point) to east with maximum elevations of approximately 350m AOD, falling to a minimum elevation of approximately 200m AOD at the C7K Glen Road.

2.3.3 LiDAR data, provided by Scottish Remote Sensing Portal, covering the wider area shown in **Figure 2.3** shows levels rising north of site and falling to the south of site.

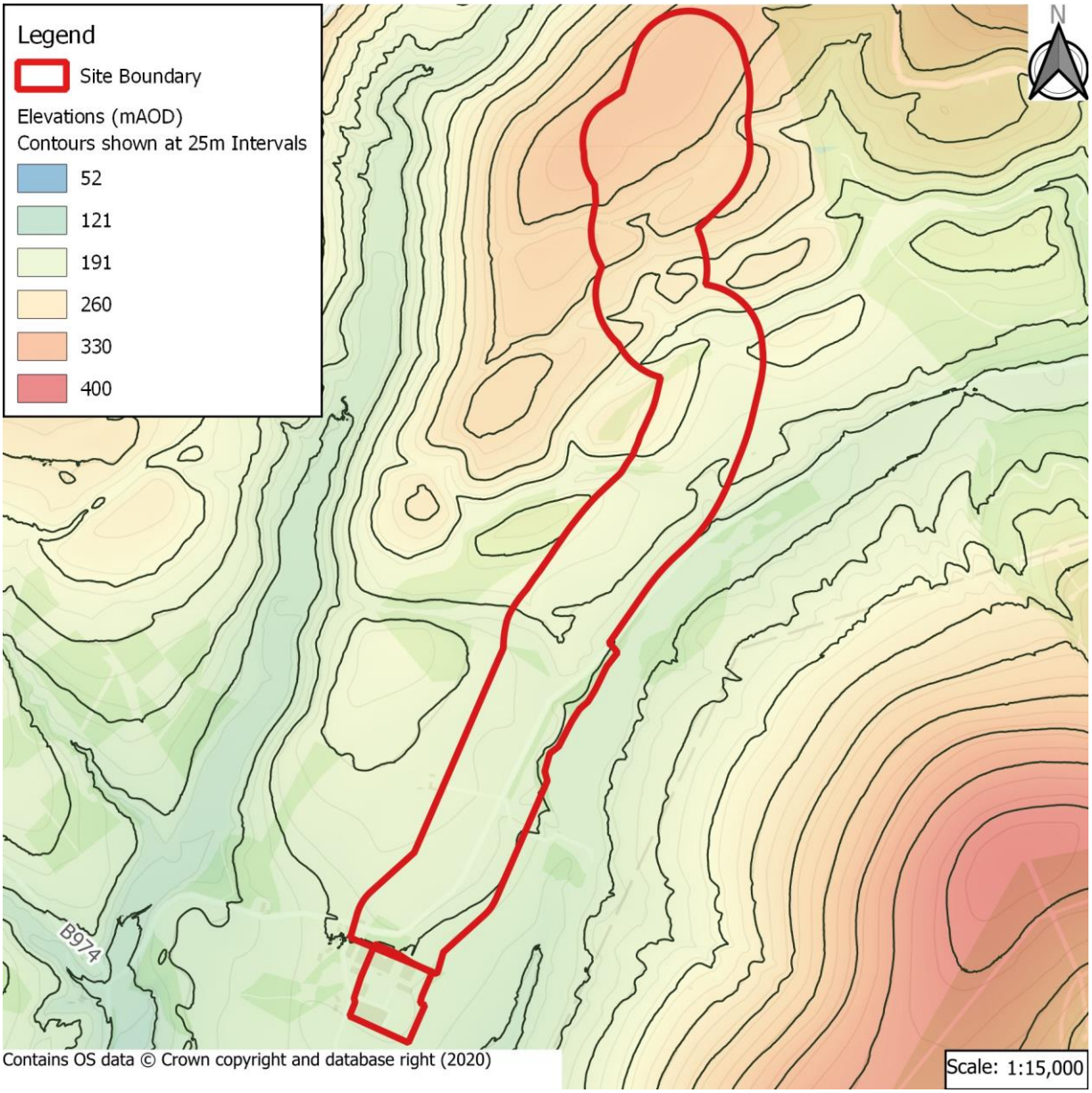

Figure 2.3 LiDAR Elevation Data

2.4 Geology

2.4.1 British Geological Survey (BGS) mapping suggests the proposed hydrogen and solar site is underlain by one superficial geology, Banchory Till, – Diamicton, this is found to cover the full site area. This suggests a moderate permeability within the superficial strata.

2.4.2 As for the proposed turbine development BGS suggests the site is underlain by various superficial geology, these ranging from Banchory Till, Drumlithie sand and gravel, Lochton sand and gravel and Mill of Forest Till Formation.

2.4.3 The proposed hydrogen and solar development site is shown to be wholly underlain by a bedrock geology comprising Arbthnott-gavrock Group – Conglomerate. This suggests a low permeability potential into the bedrock strata due to the generally poor permeable nature of the underlying geology. The turbine has numerous bedrock geology which can be seen in the below figures.

2.4.4 **Figure 2.4** and **Figure 2.5** show the superficial and bedrock geology for reference respectively.

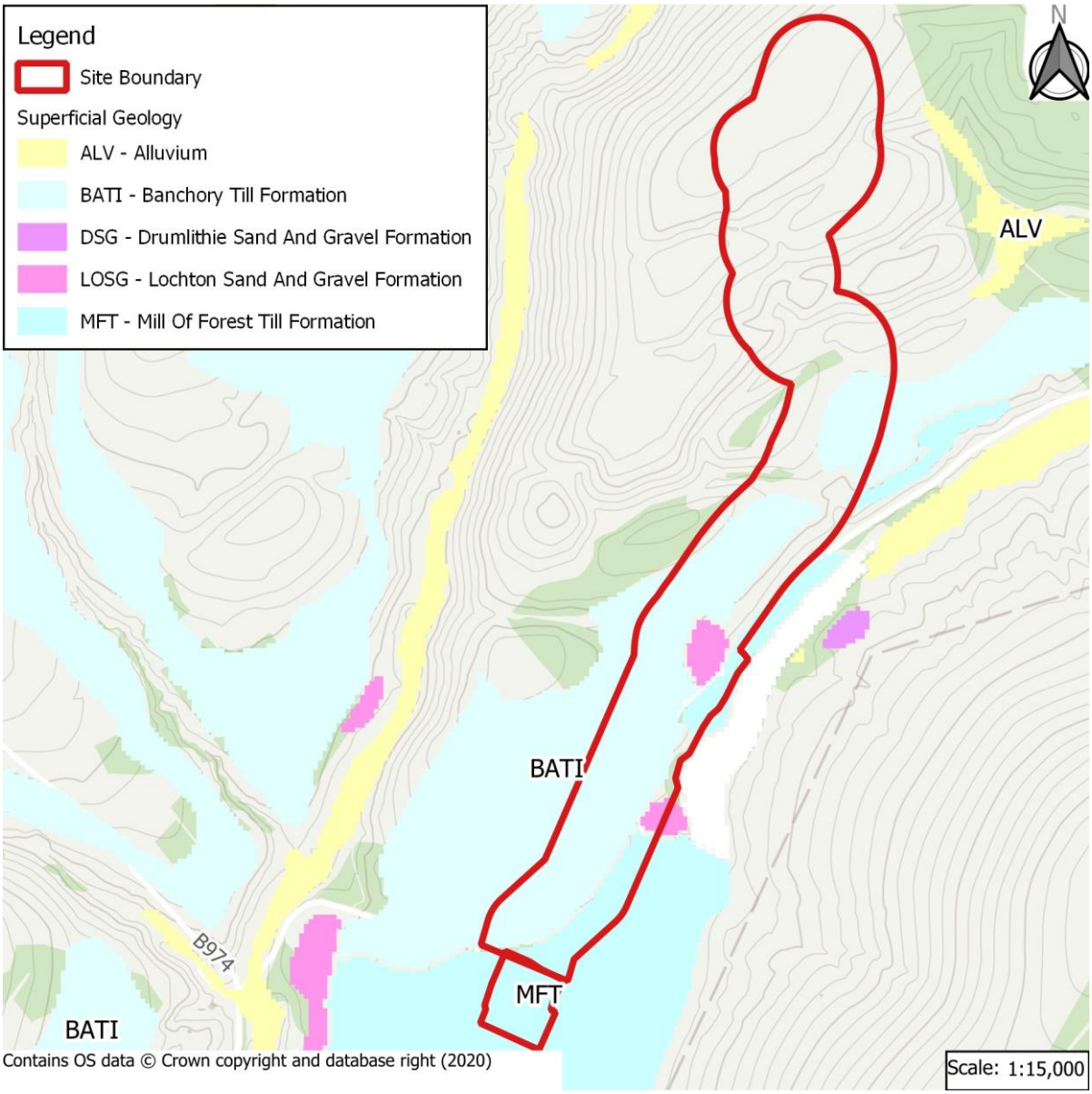

Figure 2.4 Superficial Geology

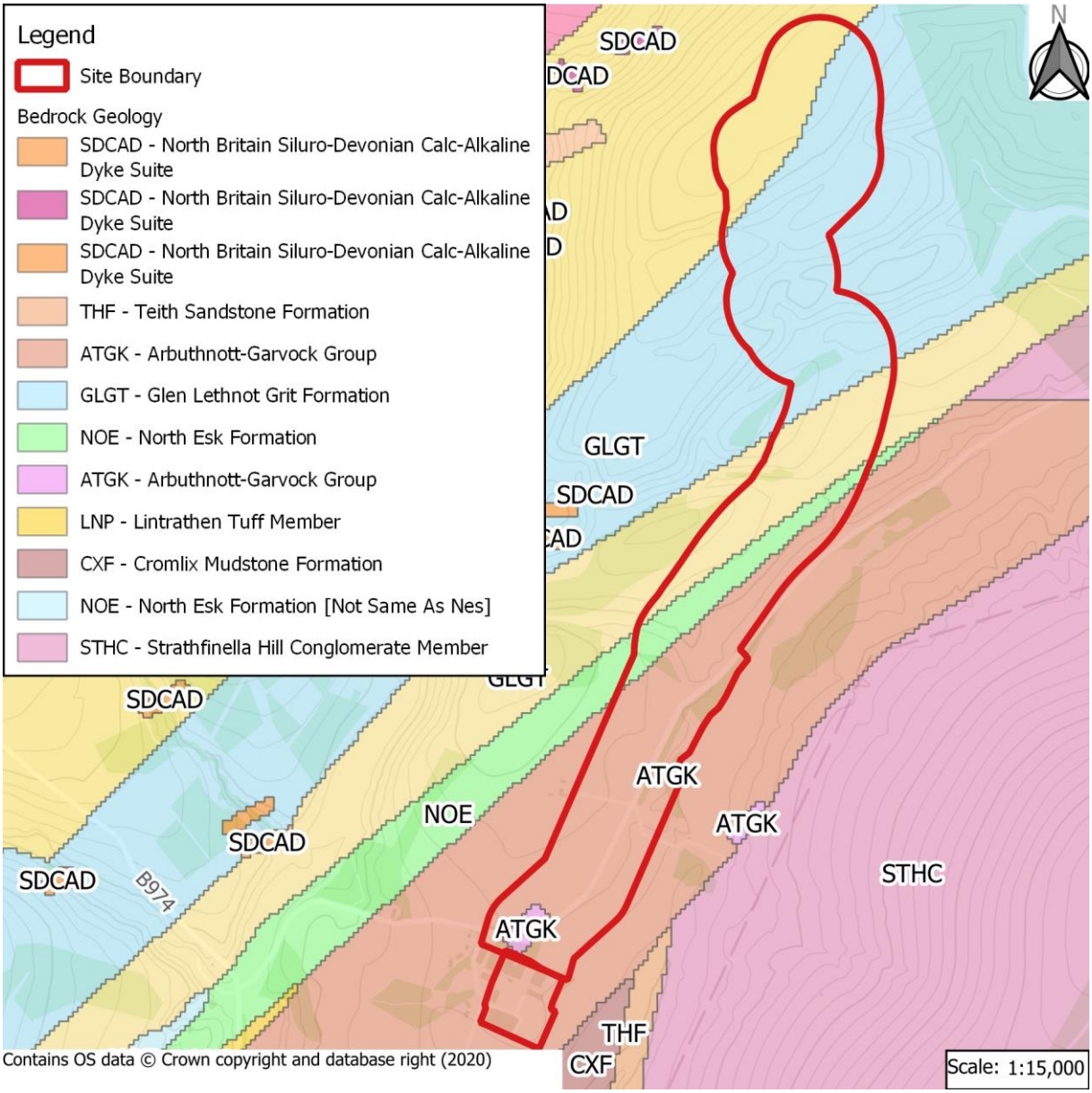

Figure 2.5 Bedrock Geology

2.4.5 There are no boreholes within the site boundary. The nearest borehole found is to the east of site approximately 5km from the centre of the site (borehole reference: NO77NW12) drilled in 1989 to a depth of 3.8m bgl. Groundwater was not reported as being struck during the investigation.

2.5 Development Proposals

The James Hutton Institute (JHI) is seeking to obtain planning permission to develop a proposed renewable energy development, comprising a single wind turbine (with associated infrastructure including cabling and access road route), small scale solar array and hydrogen plant with associated Battery Energy Storage System (BESS) (the 'Proposed Development' or 'HydroGlen' project) located on the Glensaugh Estate at Glensaugh, Laurencekirk, Aberdeenshire, AB30 1HB (the 'Site').

The Proposed Development is a green hydrogen demonstrator project funded by the Scottish Government's Just Transition Fund and comprises of the two following separate planning applications:

- Wind turbine and associated infrastructure including cabling and access route (the 'Proposed Turbine Development'); and

- Hydrogen plant, solar, BESS and electric vehicle charging development (the 'Proposed Hydrogen and Solar Development').

Although two separate planning applications, the Proposed Development comprises one singular renewable energy development assessed within this FRDS. The energy created by the proposed wind turbine and solar PV array will be utilised to power the hydrogen plant which will support the power requirements of both the Glensaugh farm and its community of associated households through 100% renewable energy.

The Proposed Development comprises the following distinct elements:

- The Proposed Turbine Development:
  - A single wind turbine with an anticipated installed capacity of up to 1 MW, a proposed hub height of 50 m and maximum tip height up to 76 m with associated access track and cable;
- The Proposed Hydrogen and Solar Development
  - A green hydrogen production facility with electrolyser, fuel cell (expected capacity 100-200 kW, subject to final design) including a hydrogen storage facility and associated Battery Energy Storage System (BESS) facility;
  - A small-scale mix of ground and roof mounted solar array with a maximum installed capacity of 210 kW; and
  - On-site electric vehicle charging facilities.

3 Policy Context

3.1 National Planning Framework

3.1.1 The National Planning Framework 4 (NPF4) was published in February 2023. NPF4 is the national spatial strategy for Scotland. It sets out spatial principles, regional priorities, national developments and national planning policy.

3.1.2 'Flood Risk and Water Management' forms a key part of the NPF4, with the policy intent "To strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding.".

3.1.3 Policy 22 of NPF4 ensures that future flood risk is not exacerbated by development, and facilities the delivery of sustainable flood risk management solution. It provides direction on the type of developments that may be supported in area at flood risk, providing certain criteria are met by the applicant.

3.1.4 NPF4 is also supported by a Planning Background Paper in Flood Risk (note, that the current Planning Background Paper is currently being reviewed in light of the recent publication of NPF4). This references the policy hierarchy approach to flood risk management of; avoid, protect, prepare, accept. It also provides a framework for the planning system to manage flood risk in a sustainable way.

3.2 Local Plan Policies

3.2.1 The Aberdeenshire Local Plan was adopted in January 2023 and sets out how land within the district can be used and developed, providing policies which the council use to determine application and regeneration activities.

3.2.2 The plan aims to oversee how the council will manage future growth, encourage sustainable development, and ensure changes are appropriate to local need now, and in the future.

3.2.3 More generally, the Local Plan lists policies that influence the design and principles of all development within the district. Other important documents also relate to Aberdeenshire. The plan to be in line with the plans of other organisations, including our neighbouring Planning Authorities, and national and regional strategies such as: Those relevant to this FRDS are as follows:

- The North East Flood Risk Management Plan
- The Tay Estuary and Montrose Flood Risk Management Plan

4 Assessment of Flood Risk

4.1 Desk-Based Information

4.1.1 NPF4 Policy 22 states that all potential sources of flood risk must be understood and addressed. Flooding can occur from a variety of sources individually, or in combination and can result from both natural and artificial processes.

4.1.2 Table 4.1 provides an initial desk-based review of the level of flood risk from all sources, which are then assessed in further details where the risk is considered significant and merits further investigation.

Table 4.1 Desk-Based Assessment of Flood Risk

Sources of Flood Risk	Degree of Risk			Comments
	Significant	Moderate	Low	
Fluvial			X	Low risk posed
Coastal & Tidal			X	The site is removed from the extent of tidal flooding, now and in the future
Groundwater			X	Low risk posed
Surface Water			X	Low risk posed
Sewers			X	Existing sewers are likely located within the existing site; however, these are private, and any flooding data is not available.
Canals			X	None nearby
Reservoirs & Waterbodies			X	Low risk posed

4.2 Fluvial Flood Risk

4.2.1 SEPA has produced a range of resources covering Scottish Flood Hazard and Risk Information, which identifies areas at risk of flooding from Main Rivers.

4.2.2 The mapping shows that the site is outside the areas at fluvial risk, which is considered to be land assessed as having less than a 0.1% annual probability of flooding from rivers. Therefore, the risk of flooding from fluvial flooding is considered to be low.

4.3 Coastal & Tidal

4.3.1 The site is well removed from any coastal flooding, both now and in the future. SEPA's Flood Maps shows the coastal flooding extents. As such, the site is unlikely to be affected by tidal influences.

4.4 Groundwater

4.4.1 Groundwater flooding occurs when the water table rises above ground elevations. It is most likely to happen in low lying areas underlain by permeable geology. This may be regional scale chalk or sandstone aquifers, or localised deposits of sands and gravel underlain by less permeable strata such as that in a river valley.

4.4.2 Previously mentioned there are no borehole logs located on the site and the nearest borehole is located 5km, meaning the data from the borehole would be unreliable.

4.4.3 The Local Flood Risk Management Plan does not provide any mapping or information relating to groundwater within this area.

4.4.4 Therefore, the risk of flooding from groundwater is considered to be relatively low, although specific mitigation is recommended to address any elevated risk in areas of higher groundwater.

4.5 Surface Water (Pluvial)

4.5.1 The risk of flooding from surface water has been mapped by the SEPA on a strategic scale to understand areas that may be susceptible to ponding of surface water during periods of extreme rainfall.

4.5.2 The mapping indicates that all of the site is at low risk of flooding from surface water. With a small area to the south of the site in medium to high risk, however, this small build-up is most likely caused by topographical depressions in the ground.

4.5.3 Therefore, the risk of flooding from surface water is considered to be low.

4.6 Sewers

4.6.1 Flooding from sewers typically results from the network capacity being exceeded or because of a blockage to key elements. Flooding usually occurs by way of surcharging manholes, gullies or other features that allow water from sewers to reach the surface, resulting in overland flows that can affect nearby properties.

4.6.2 Existing drainage plans have been provided for the proposed hydrogen and solar development, however no historical flooding data is available. Due to the topography of the surrounding land, it is considered unlikely that any surcharging of the network would affect the proposed development area. It is recommended that all existing sewers are cleaned to ensure any blockages do not occur.

4.6.3 Extract of the existing drainage plans are included for reference within **Appendix A**.

4.6.4 There are no known sewers within the proposed turbine development boundary.

4.6.5 Therefore, the site is considered to be at low risk from flooding from surcharging of the local network.

4.7 Canals

4.7.1 There no canals present that pose a risk to the site and so the risk from this source is considered to be negligible.

4.8 Reservoirs

4.8.1 Loch Saugh is located to the northeast of the site, SEPA flood maps show that the Loch is unlikely to affect the site in terms of flood risk.

4.8.2 Therefore, the site is considered to be at low risk from flooding from reservoirs and waterbodies.

5 Potential Flood Risk Mitigation

5.1 Sequential Arrangement

5.1.1 Energy generation and storage uses such as the one proposed are considered to comprise 'essential infrastructure' in accordance with SEPA's Land Use Vulnerability Classification. Essential infrastructure is generally permitted within most flood risk categories.

5.1.2 However, in line with the policy hierarchy of NPF4, development should be encouraged towards areas of lowest flood risk and aim to avoid flood prone areas where possible.

5.1.3 Therefore, it is recommended that any installation battery storage is positioned within the areas at lowest flood risk.

5.1.4 Where this is not possible, locating the installation within the floodplain would need to be justified to demonstrate why it cannot be in areas of lower flood risk, and additional mitigation would be required, as discussed below.

5.2 Development Levels

5.2.1 Due to the elevated level of the proposed wind turbine this has not been assessed in detail within the FRDS as it is considered low risk of flooding.

5.3 Surface Water Drainage Strategy

5.3.1 To manage any potential increase in flood risk caused by the introduction of new impermeable areas, a surface water drainage strategy will need to be prepared based on sustainable drainage principles. This would need to demonstrate that any increase in runoff caused by the proposed development is controlled on site, before being discharged to the local environment.

Existing Site

5.3.2 As previously mentioned, there are historical drainage plans for the hydrogen and solar site. It is believed that the existing on site drainage discharges into a local burn. It is proposed that the area of the site that remains hardstanding drains as per the current situation. The proposed solar and turbine development are located on an area of greenfield this would be subject to a natural regime of runoff and infiltration, where ground conditions permit. Any development proposals should seek to mimic this arrangement in line with local and national policy, providing a betterment to runoff rates and water quality where possible.

5.3.3 As the solar and turbine sites are previously undeveloped, an equivalent greenfield runoff rate should be calculated. The calculations should estimate an equivalent greenfield QBAR runoff rate, this should be used as a limiting discharge rate applied to the net developable area.

Drainage Hierarchy

5.3.4 Prevailing local and national guidance suggests that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable;

- Water reuse, where a need is identified;
- Into the ground (infiltration), where ground conditions permit;
- To a surface water body;
- To a surface water sewer, highway drain, or another drainage system;
- To a combined sewer.

5.3.5 The aim of this approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.

5.3.6 Geological mapping published by the BGS indicates that the superficial geology within the majority of the Site A and B are poor at infiltrating, with a bedrock geology comprising poor infiltration layer as well. This suggests a very limited potential for infiltration, depending on the local conditions.

5.3.7 Due to the absence of site-specific infiltration testing, it is assumed that discharge of surface water via infiltration will not be feasible. Full soakaway testing carried out to the BRE 365 Digest specification should be carried out to confirm the above.

5.3.8 However, at this stage it is therefore proposed to discharge into local watercourses.

Surface Water Attenuation

5.3.9 To balance the additional runoff generated by any new hardstanding, attenuation features will be required to accommodate a volume of water before it can be discharged into the local burns at the previously discussed rate. The volume of attenuation required will depend on the final impermeable area proposed, but priority should be given to above-ground features such as basins, ponds and swales for providing this volume.

SuDS Features

5.3.10 The proposed strategy is based on sustainable drainage principles, employing SuDS features to manage surface water runoff across the site.

5.3.11 A wide variety of other SuDS features can also be implemented across the development as the design progresses and this could include, but is not limited to;

- Swales
- Rainwater harvesting systems
- Rainwater gardens
- Permeable paving
- Filter drains
- Detention basins

6 Conclusions & Recommendations

6.1.1 This Flood Risk & Drainage Statement has been written in support of a planning application for the development for the construction of hydrogen plant and a solar farm associated with the Hydroglen project being promoted by the James Hutton Institute at Glensugh Research Station, Aberdeenshire.

6.1.2 To summarise the findings of the FRDS:

- Both sites are at very low risk of flooding from rivers.
- It is assumed that the site is underlain by private sewers as there is no information available on these it is therefore assumed to be a low risk of flooding from sewers.
- SEPA mapping places the site outside of any modelled extent of flooding from reservoirs or large waterbodies.
- As stated in the development levels the wind turbine wasn't included within the assessment due its proposed elevated level.
- Surface water runoff from the site is likely to be managed via a restricted outfall from the site to the existing drainage network on site which ultimately discharges into local watercourse.
- As the proposed hydrogen development is replacing existing infrastructure the existing drainage should be re-used where suitable.
- The proposed solar and turbine development are to discharge into local watercourses at a runoff rate equivalent to the existing greenfield rate.
- Suitable attenuation and SuDS features to be incorporated into the drainage design where applicable.

6.1.3 Recommendations are made in respect of appropriate consideration of finished floor levels and external level design to manage the residual risk of overland flows by conveying water away from Battery Storage and towards positively drained area.

Appendix A - Existing Drainage Layout