336-009-RP01

Flood Risk Assessment

Proposed BESS - Fyrish

DOCUMENT STATUS	DATE	BY	CHECKED	APPROVED
1st Issue	05-12-2024	Tayler Evans Graduate Engineer	Beverley Hunter Assistant Engineer	James Calvert Director
2nd Issue	14-02-2025	Tayler Evans Graduate Engineer	Bradley Pack Engineer	James Calvert Director
3rd Issue	17-02-2025	Tayler Evans Graduate Engineer	Bradley Pack Engineer	James Calvert Director

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1 Introduction

Haydn Evans Consulting Ltd (HEC) has been commissioned by Field Fyrish Ltd (hereafter referred to as the Client) to carry out a Flood Risk Assessment (FRA) to support a planning application for the construction and operation of a Battery Energy Storage System (BESS) of up to 200 megawatts (MW) with associated infrastructure (including cable route to substation), access and ancillary works on land 650m south of Fyrish Substation, Alness, IV17 0XH .

1.1 Limitation

This document has been prepared for the sole use of the Client. The copyright of this report is vested in HEC and the Client. HEC accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties that rely upon the report do so at their own risk.

The FRA should be read in conjunction with the Drainage Impact Assessment (DIA) which has been prepared for this site; HEC document reference 336-009-RP2.

1.2 Site Proposal

The Proposed Development would have a total development footprint of approximately 4.6 hectares (ha) across the 53.5 ha site.

Battery Energy Storage System (BESS) of up to 200 MW with associated infrastructure (including cable route to substation), access and ancillary works (including landscaping and biodiversity enhancement).

The Proposed Development principally comprises a BESS that will import and export electricity from the adjacent, existing Fyrish Substation located to the north of the development area.

It includes:

- Battery Storage Units
- AC Twin Skids which include a MV transformer and two PCS (inverter) units
- Transmission Owner Substation
- Substation building; including office, welfare and SCADA
- High voltage transformers
- Auxiliary transformers
- Underground 132 kV grid connection cable
- Site-wide supporting infrastructure including cabling, access tracks, fencing, attenuation basins, and landscaping measures.

Whilst the exact specifications are subject to detailed design, the principal components described form the basis of the planning application to allow environmental assessments and mitigation to be appropriately scoped.

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2 Location & Existing Conditions

2.1 Site Location

The site is located to the south-west of Alness, on approximate Ordnance Survey (OS) grid reference 262817,869390 (see red line boundary on Figure 1).

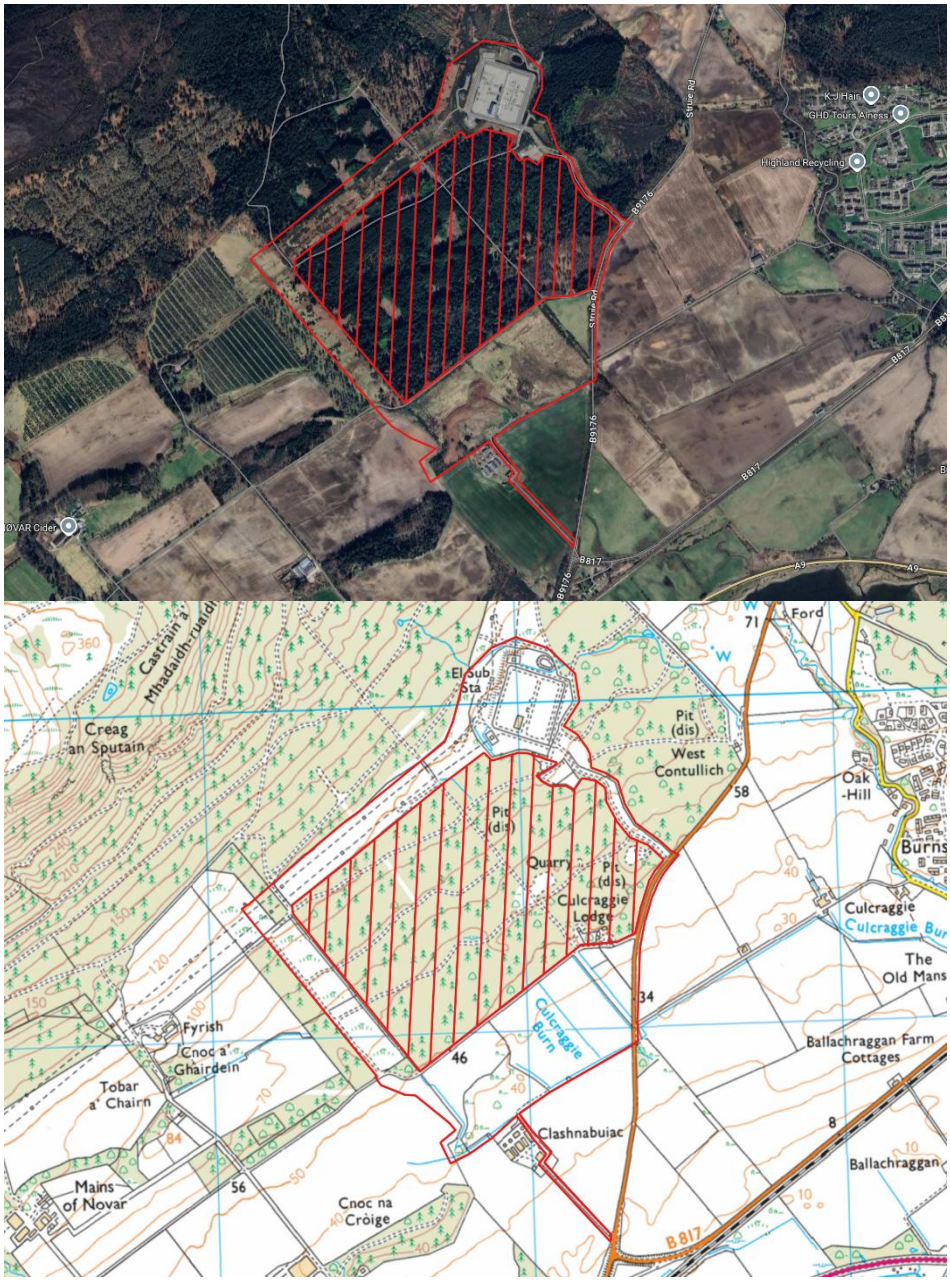

Figure 1: Site location maps

The site is predominantly surrounded by greenfield land; a single dwelling and a farm comprising several barns are located along the southern boundary.

A new access off the B9176 is proposed as part of the development, to be used for all construction and maintenance traffic, the existing access will be maintained as an emergency access to site.

2.2 Existing Topography

A topographic survey has been produced for the site. The survey shows ground levels to generally fall from north-west, towards the south-east. Ground levels in the north-west are circa 46 metres Above Ordnance Datum (mAOD), falling to circa 29mAOD in the south-east. There are varying levels across the site as shown on the topographic survey, where there are mound features which, from the site visit and review of aerial mapping, appear to be natural.

2.3 Existing Sewer Assets

The combined utilities report does not show any Scottish Water (SW) foul or surface sewers within the vicinity of the site (see Appendix A).

2.4 Existing Potable Water Assets

The utilities search within Appendix A shows three existing water mains crossing the development site. One of which is noted to be abandoned and the other two live.

2.5 Existing Drainage Regime

There is no formal drainage system located on site therefore it is assumed the surface water runs-off would flow overland following the topography to the Culcraggie Burn or infiltrate into the underlying soils.

2.6 Ground Conditions

British Geological Survey (BGS) mapping confirms the site to have a bedrock geology of Raddery Sandstone Formation (Sandstone) (see Figure 2).

The superficial deposits for the site are shown to comprise of Glaciofluvial Deposits (Gravel, sand, and silt). The southern half of the access road is shown to have superficial deposits of Raised Marine Devensian (Gravel, sand, and silt) (see Figure 3).

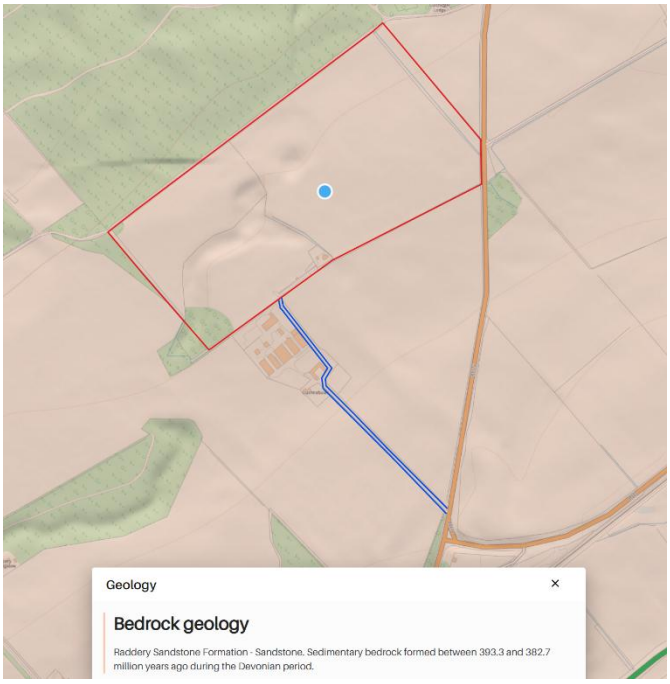

Figure 2: BGS Mapping – Bedrock geology

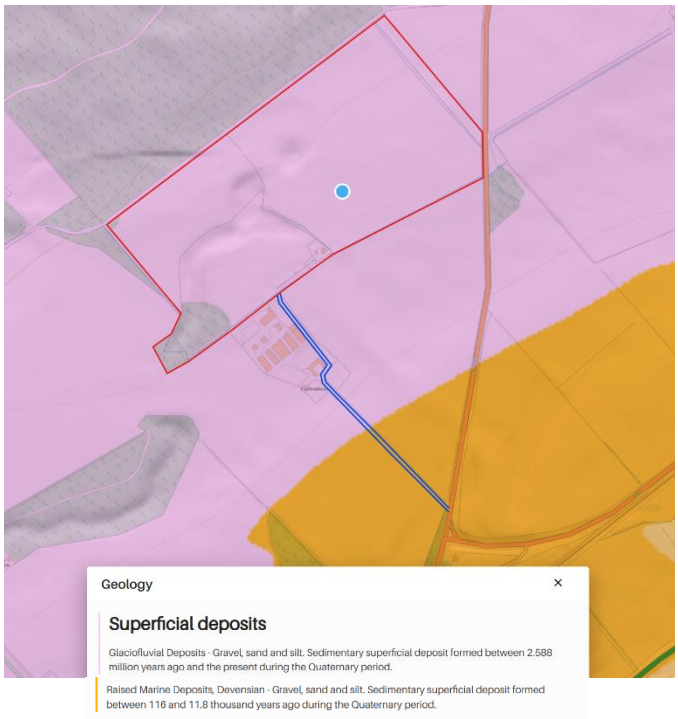

Figure 3: BGS Mapping – Superficial deposits

The Phase 2 Ground Investigation Report, prepared by Curtins on behalf of Field (Ref: 086360-CUR-XX-XX-T-GE-00001), provides a comprehensive summary of the findings from the trial pits, detailing the ground conditions observed during the investigation.

Stratum		Depth to Top m bgl (m AOD*)		Thickness Encountered (m)		Typical Description / Comments
		Min	Max	Min	Max	
Topsoil		Ground Level (45.84)	Ground Level (31.86)	0.10	0.60	Encountered at all locations except TP11 and TP29. Brown gravelly slightly clayey silty fine to coarse SAND with occasional rootlets.
Made Ground		Ground Level	Ground Level	0.50 (Note base not proven)	0.90 (Note base not proven)	TP11 and TP29 only. Topsoil and re-worked granular Glaciofluvial Deposits. Service present at 0.50m bgl in TP11 and water pipe encountered at 0.90m bgl in TP29.
Peat		0.10 (35.10)	0.10 (35.00)	0.30	0.90	Only encountered in TP04 and TP06. Black spongey pseudo-fibrous PEAT.
Glaciofluvial Deposits	Granular	0.10 (45.64)	1.00 (31.66)	0.30 (Note thickness only proven in BH02)	14.75 (Note thickness only proven in BH02)	Generally encountered as light brown / grey clayey gravelly SAND and silty SAND and GRAVEL, with rare pockets of clay and silt. The gravel component is described as being angular to subrounded of various lithologies. Cobbles and boulders of various lithologies were also noted.
	Cohesive	1.00 (41.75)	4.00 (30.63)	1.30 (Note thickness only proven in BH07)	1.80 (Note thickness only proven in BH07)	Occurs as cohesive layer / lense within granular Glaciofluvial Deposits in BH07 (1.50m thick), TP25, TP26 and TP28 only. The thickness of the clay was not proven in TP25, TP26 and TP28 but is at least 1.30m to 1.80m thick. Hard digging noted in TP26 from 2.5m bgl. Stiff to very stiff grey slightly sandy slightly gravelly CLAY.
Raddery Sandstone Formation		13.50 (26.76)	-	4.50	Base of unit not proven.	Encountered in BH02 only. Possible 'Residual Soil' between 13.50m – 14.70m bgl where soil described as reddish brown slightly gravelly SAND. Gravel is fine to medium subangular sandstone. Below this weathered and weak red sandstone was present underlain by light brownish grey CONGLOMERATE to the base of the borehole.

Figure 4: Summary of Ground Conditions

The site investigation report states that the majority of the site has a low risk of flooding from groundwater with the southern corner being at a moderate risk. This corner of the site is predominantly occupied by a peat bog. These findings are supported by observations during the site walkover where it was noted that the ground conditions where *'marshy and boggy'* allowing the assumption that groundwater is at a high level for the proposed development land.

Exploratory Hole Ref.	Depth to Groundwater (m bgl)	Depth to Groundwater (m AOD)	Notes
BH01	7.1	35.26	
BH02	2.8	37.46	
BH03	2.5	38.17	
BH04	2.4	37.73	
BH05	7.0	35.00	
BH06	5.5	36.74	
BH07	2.0	32.63	
TP01	1.6	37.33	
TP02	1.7	35.95	
TP13	1.0	36.05	
TP14	0.3	36.12	
TP17	2.5	38.37	
TP18	2.2	39.32	
TP20	1.5	40.60	
TP28	2.2	31.74	
TP31	0.3	31.61	
TP32	1.3		
TP33	1.2	32.22	Water encountered at 0.4, 0.8 and 1.2 m bgl

Figure 5: Groundwater Strikes recorded during the Ground Investigation Works

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3 Planning Policy Context

3.1 National Planning Framework 4 (NPF4 Adopted 2023)

The National Planning Framework 4 (NPF4, 2023) includes government policy for developments and meeting the challenges of climate change and flood risk.

The Policy 22 guidance states *"Development proposals at risk of flooding or in a flood risk area will only be supported if they are for essential infrastructure, water compatible uses, redevelopment of an existing building or site for an equal or less vulnerable use, or redevelopment of previously used sites in built up areas."*

The protection offered by an existing formal flood protection scheme or one under construction can be considered when determining flood risk. All risks of flooding are understood and addressed; there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes; the development remains safe and operational during floods; flood resistant and resilient materials and construction methods are used; and future adaptations can be made to accommodate the effects of climate change.

Development proposals will not increase the risk of surface water flooding, manage all rain and surface water through sustainable urban drainage systems (SUDS), and seek to minimise the area of impermeable surface. These proposals will be supported if connecting to public water mains; however, if not feasible the applicant will need to demonstrate that water for consumption is sourced from a sustainable source. Proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported."

3.2 Scottish Environment Protection Agency (SEPA)

SEPA is an independent advisor on flood risk, providing flood risk advice for certain consultations. SEPA document '*Technical Flood Risk Guidance for Stakeholders'* outlines the information required to be submitted a part of a FRA.

3.3 Highland-wide Local Development Plan (HwLDP, Adopted 2023)

On 5 April 2012 the Highland-wide Local Development Plan was adopted by the Council and was constituted as the local development plan in law. The Plan sets out a vision statement and spatial strategy for the area, taking on board the outcomes of consultation undertaken during preparation of the plan. Policy 64 and Section 5.6 are relevant to this assessment and reads as follows:

Policy 64 Flood Risk

Development proposals should avoid areas susceptible to flooding and promote sustainable flood management.

Development proposals within or bordering medium to high flood risk areas, will need to demonstrate compliance with Scottish Planning Policy (SPP) through the submission of suitable information which may take the form of a Flood Risk Assessment.

Development proposals outwith indicative medium to high flood risk areas may be acceptable. However, where:

- better local flood risk information is available and suggests a higher risk;
- a sensitive land use (as specified in the risk framework of Scottish Planning Policy) is proposed, and/or;
- the development borders the coast and therefore may be at risk from climate change;

a Flood Risk Assessment or other suitable information which demonstrates compliance with SPP will be required.

Developments may also be possible where they are in accord with the flood prevention or management measures as specified within a local (development) plan allocation or a development brief. Any developments, particularly those on the flood plain, should not compromise the objectives of the EU Water Framework Directive.

Where flood management measures are required, natural methods such as restoration of floodplains, wetlands and water bodies should be incorporated, or adequate justification should be provided as to why they are impracticable.

Section 5.6 of the HwLDP states 'In line with SPP all new development need to be free from unacceptable flood risk for all flood events up to the 1 in 200 year return period (including an allowance for climate change).'

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4 Flood Risk Assessment

4.1 Introduction

The main sources of flooding have been assessed as part of this report, in line with the NPPF, as follows:

- Tidal and Fluvial;
- Pluvial;
- Groundwater;
- Sewers; and
- Reservoirs and other artificial sources.

4.2 Tidal and Fluvial

Tidal, or coastal flooding from the sea, is the inundation of land along the coast usually caused by high tides or storm surge. Fluvial, or river flooding, occurs when the water level in a river, lake or stream rises and overflows onto neighbouring land as a result of the capacity of rivers being exceeded by the river flow.

The are no Main Rivers in the immediate vicinity of the site.

The closest mapped river, the Culcraggie Burn, is located along the southern boundary of the site; this river is not shown to provide a risk of flooding on the SEPA mapping (see Figure 7). The nearest flood risk associated with a river is approximately 650m south of the site. This watercourse is at a lower ground level than the site and therefore does not pose a flood risk to the site.

The Cromarty Firth Sea is located 980m south of the site; this sea is not shown to provide a risk on SEPA mapping (see Figure 6). Due to the inland location and elevation of the site above sea level, the site is not at risk of tidal flooding.

The SEPA mapping confirms the site location is therefore classified as being at less than 0.1% annual risk of flooding from rivers and seas (see Figure 6 and 7).

Figure 6: SEPA Flood Map – Coastal Flooding

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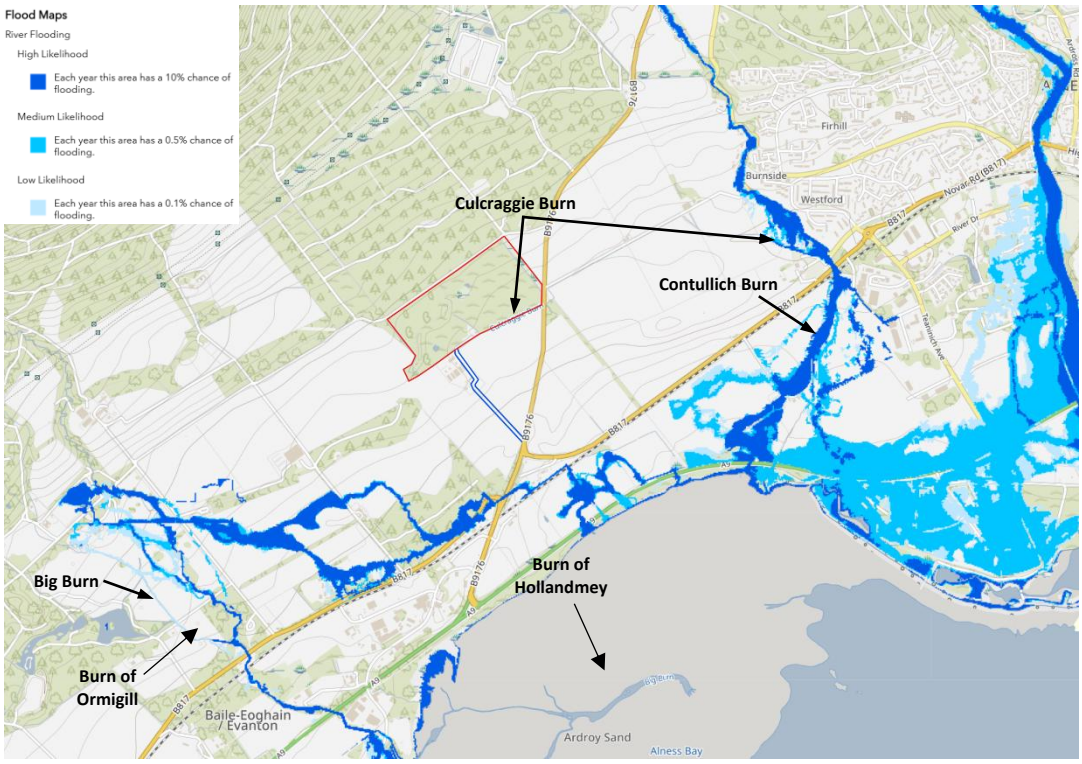

Figure 7 - SEPA Flood Map - River Flooding

The site is at low risk of flooding from tidal and fluvial sources.

4.3 Pluvial

Pluvial, or surface water flooding, occurs when heavy rainfall creates a flood independent of an overflowing water body. Pluvial flooding can occur in any location and is usually a result of intense rainfall saturating an urban drainage system, rainfall run-off on elevated terrain or where natural ground has been paved. Surface water run-off can be channelled either by natural features such as valley lines or by artificial features such as highways, to low points in the topography. If surface water is not able to flow away from topographical low points, then pluvial flooding can occur.

The SEPA Surface Water Flooding map (see Figure 8) shows localised areas on the site and surrounding areas to be at a low to high likelihood of flooding from surface water.

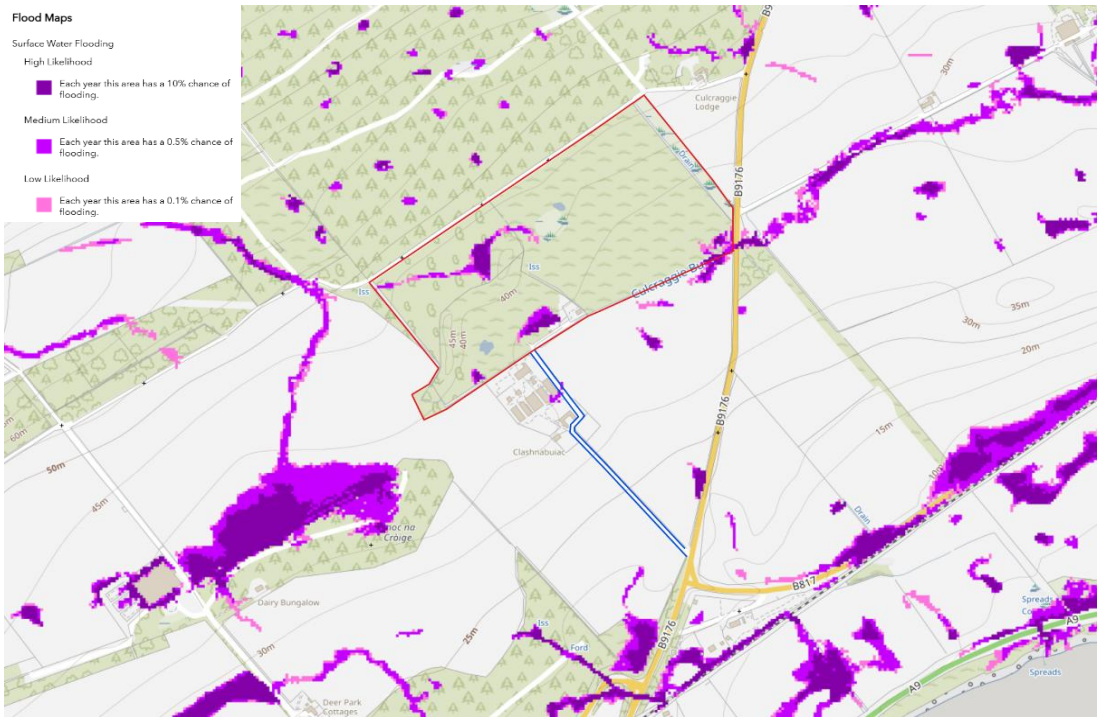

Figure 8: SEPA Flood Map - Surface Water Flooding

The localised nature of the flood risk shown on the SEPA mapping suggests that there are areas on the site which are local low points and from which water cannot freely drain away. The topographical survey has been reviewed to confirm the accuracy of the SEPA mapping and it shows that the low points identified to flood are present locally.

OS mapping contours show surrounding ground levels to generally fall from north-west, towards the south-east; surface water run-off could be shed towards the site from the north-west. Due to the greenfield nature of the land in this location, with heavily vegetated areas, it is considered unlikely that a significant volume of surface water would be shed towards the site except perhaps in extreme rainfall events. Mitigation techniques are provided in the surface water drainage strategy to deal with the possibility of flows towards the site from the north-west.

The areas at risk of flooding as shown on the SEPA mapping fall within the proposed development area are at a lower level within the site. Areas that will be developed will see the removal of the local low points and the incorporation of a surface water drainage system for the site. This will remove the risk of flooding in these areas.

The proposed surface water drainage strategy for the site is provided in the HEC Drainage Impact Assessment (DIA) report (reference 336-009-RP2) which accompanies the application. The DIA report provides information on how the proposals for the site mimic the existing drainage regime for the site and restrict run-off to greenfield run-off rates; this mitigates the potential for any surface water flooding to occur at the site and reduces the risk of surface water flooding to off-site receptors.

The site is at a low risk of flooding from this source.

4.4 Groundwater

Groundwater flooding generally occurs when water levels below the ground rise during wet winter months; these levels usually fall again in the summer months as water flows out into rivers.

As discussed in Section 2.5, the groundwater vulnerability for the site varies depending on the different bedrock geologies. It is shown via the trail pit testing that groundwater was encountered within the Glaciofluvial Deposits. The Phase 2 Ground Investigation (ref: 086360-CUR-XX-XX-T-GE-00001), states '*The majority of the site is identified to have a low risk of flooding from ground water. The southern corner of the site is identified to be at moderate risk of flooding from groundwater.*' The southern corner is reported to be occupied by peat bog and the groundwater levels have been recorded to be locally deeper than over areas of the site. The proposed development is not built upon this peat bog area and is at a higher ground level therefore the risk is mitigated.

The site is at low to moderate risk of groundwater flooding.

4.5 Sewers

Scottish Water (SW) sewer records for the site have been obtained (see Appendix A) showing there are no sewers within the vicinity of the site. Therefore, there is no risk associated with flooding from this source.

The site is at a low risk of flooding from sewers.

4.6 Reservoirs & Artificial Sources

A review of OS mapping shows that there are no significant water bodies (lakes, lochs, large ponds, reservoirs etc.) within the immediate vicinity of the site that appear likely to pose a risk to the site. There are no significant water bodies upstream of the site which could pose a flood risk to the site.

The site is at low risk of flooding from these sources.

5 Summary and Conclusion

HEC has been commissioned by Field to carry out an FRA to support a planning application for the construction and operation of a 200 MW Battery Energy Storage System (BESS) with associated infrastructure, access and ancillary works on land adjacent to B9176, Fyrish, Alness.

The site is at low risk of tidal and fluvial flooding meeting the requirements of the NPF4 in terms of appropriate development.

Pluvial flooding is shown on the SEPA mapping to affect two areas of the site which are local low points. One of these is outside of the proposed development area within a peat bog, it is at a lower level on the site than the proposed developable area. The other falls within the developable area and drainage of this will be picked up as part of the surface water drainage scheme for the site.

Groundwater flooding is generally low across the site except for the southern corner where it is recorded as a moderate risk. This is the area of peat bog which lies at a lower level of the site and is outside of the developable area. This risk is therefore mitigated through design.

The proposals for the site do not increase on or off-site flood risk and are therefore considered to be acceptable in relation to flood risk.

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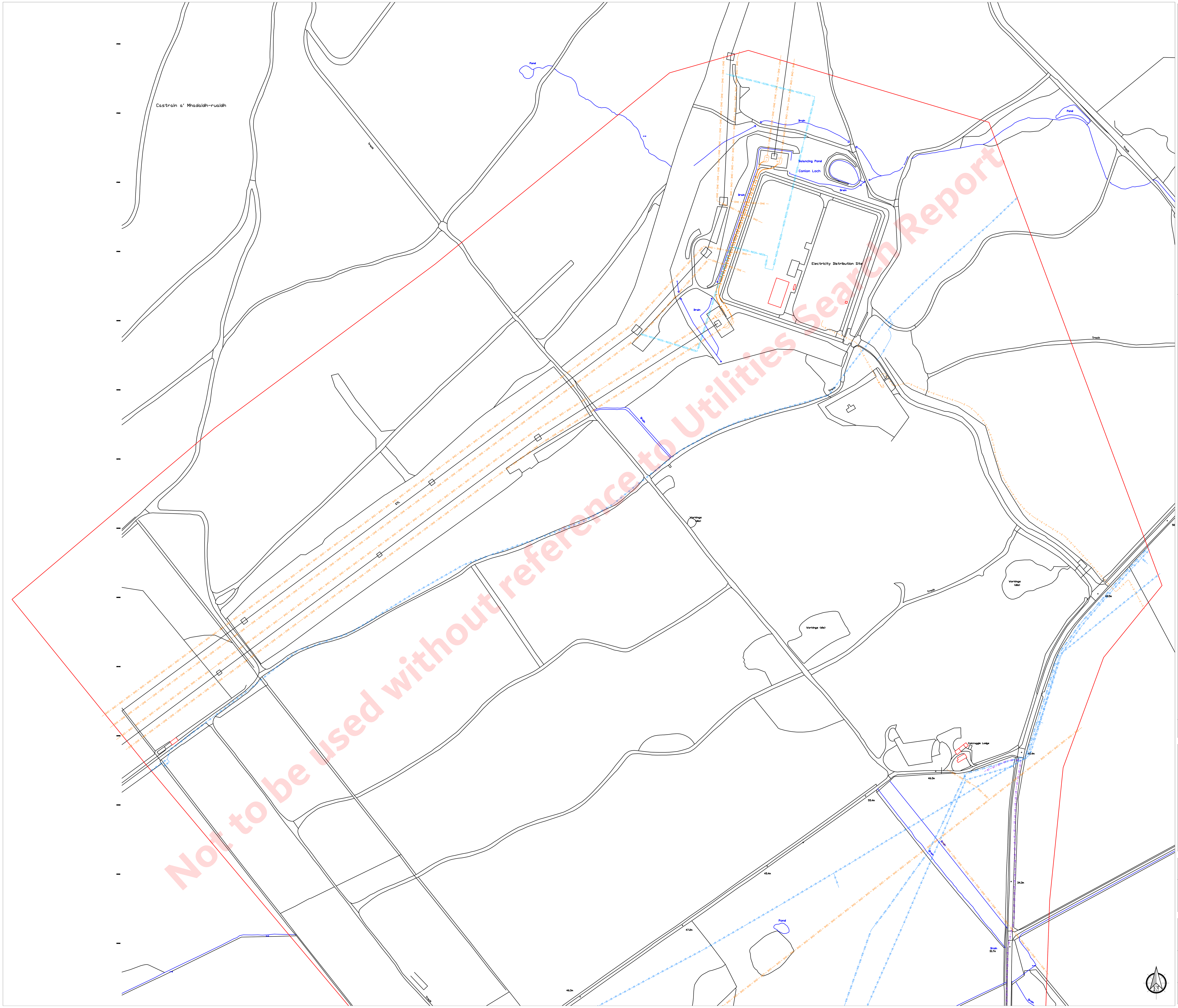
Appendix A – Utilities Search

Underground Utilities Search Page 1 of 2 – Site ref: BTGBFYR01 – Cornerstone Projects Ltd

Underground Utilities Search Page 2 of 2 – Site ref: BTGBFYR01 – Cornerstone Projects Ltd



NOTES:

1. Do not scale from this drawing.
2. Utility connections to individual properties / buildings are often not shown on the utility plans but it should be assumed that such live utility connections exist. Connections to street lighting and other road furniture / signage may also not be shown but should be considered to exist until proven otherwise.
3. Any utility apparatus shown outside the search boundary may be incomplete.
4. The location of all underground utility plant and apparatus shown on this AutoCAD drawing (and any pdf prints of the same) is based on the original utility plans contained within the Utility Search Report (USR) which must be referred to prior to any work. This drawing is intended to be indicative only and must not be relied on to provide confirmation of the type, location, status, presence or absence of any utility apparatus. This CAD drawing should not be used in isolation but in conjunction with the USR. Further guidance notes and individual utility information not shown on this drawing will also be contained within the USR.
5. The actual type, location, status, presence or absence of all utility apparatus must be determined and confirmed on site using the procedure detailed in HSE HS(G) 47 and BSI PAS 128:2014. For example, on site surveys such as GPR and EML surveys, trial holes and hand digging should be used as appropriate.
6. The size and type of each utility is not denoted on this drawing and the line colours may not reflect the colours used on the original utility plans. Please refer to the USR for these details.
7. The utility plans this drawing is based on are only valid for three months from the date of issue of the USR unless otherwise noted in the USR.
8. If Cornerstone Projects purchased the (Ordnance Survey OS) mapping then it is licensed for one year from the date of this drawing and should be destroyed after this date. We are not liable for any errors or lack of accuracy in the OS mapping.
9. Cornerstone Projects Ltd will not accept any liability for errors, omission or inaccuracies in the information shown on this drawing.
10. Please refer to the Terms & Conditions on our website for further information regarding this drawing and the USR.

LEGEND:

WATER	W
WATER ABANDONED	WA
WATER PROPOSED	WP
BT	BT
ELECTRICITY	E
ELECTRICITY OVERHEAD	OHE
NEOS NETWORKS	NEOS
SEARCH BOUNDARY	

REV:	DESCRIPTION:	BY:	DATE:

CORNERSTONE PROJECTS LTD
91 Market Street, Hoylake, Wirral, CH47 5AA
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enquiries@cornerstoneprojects.co.uk
www.cornerstoneprojects.co.uk
VAT REG NO. 8514941 19
COMPANY NO. 5132353

UNDERGROUND UTILITIES SEARCH

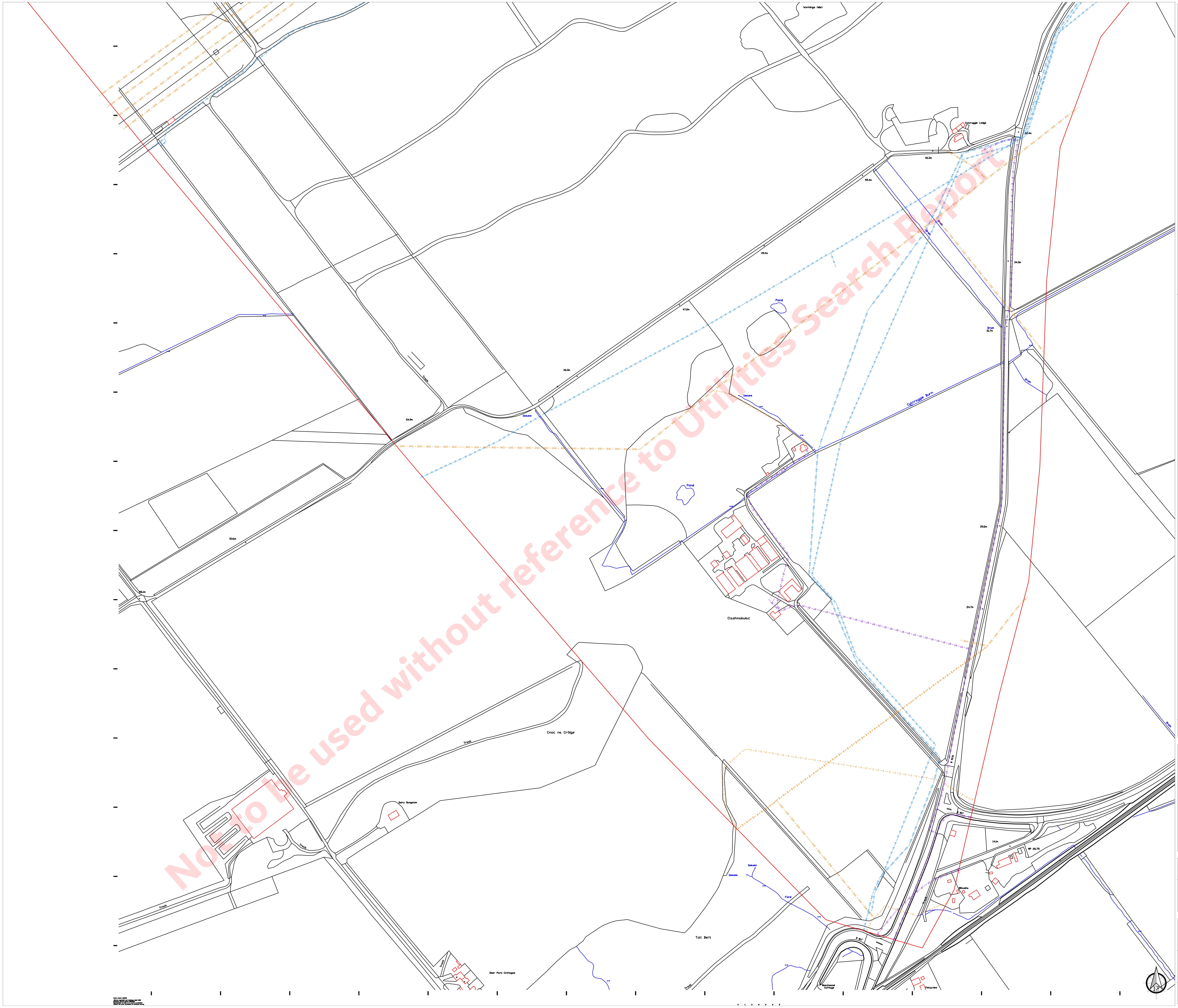
CLIENT NAME: Virmati Energy

SITE NAME: Fyrish BESS

SITE REFERENCE: BTGBFYR01

SHEET NO: 1 OF 2

SCALE:	DATE:	DRAWN:	CHECKED:
1:2500	13/06/2024	FC	JS



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LEGEND:

WATER	W W W W
WATER ABANDONED	WA WA WA
WATER PROPOSED	WP WP WP
BT	BT BT BT
ELECTRICITY	E E E
ELECTRICITY OVERHEAD	OHE OHE
NEOS NETWORKS	NEOS NEOS NEOS
SEARCH BOUNDARY	

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COMPANY NO. 5132353

UNDERGROUND UTILITIES SEARCH

CLIENT NAME: Virmati Energy

SITE NAME: Fyrish BESS

SITE REFERENCE:	SHEET NO:
BTGBFYR01	2 OF 2

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