336-007-RP01

Flood Risk Assessment

Proposed BESS - Knocknagael, Inverness

DOCUMENT STATUS	DATE	BY	APPROVED
First issue 0	26 June 2024	Bev Hunter Assistant Engineer	James Calvert BEng (Hons) CEng MICE

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Contents

1 Introduction

Haydn Evans Consulting Ltd (HEC) has been commissioned by Field (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 200 MW Battery Energy Storage System (BESS) with associated infrastructure, access and ancillary works on land 500 m south-east of Essich Farm Cottages, Inverness.

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The FRA should be read in conjunction with the Drainage Impact Assessment (DIA) which has been prepared for this site; HEC document reference 336-007-RP2 dated 26 June 2024.

1.1 Site Proposal

The proposed development has a total development footprint of approximately 6 hectares (ha) across the 42.4 ha site.

The Proposed Development principally comprises a BESS that will charge and discharge electricity from the adjacent, existing Knocknagael substation. It includes two battery compounds comprising battery storage units arranged into rows, medium-voltage (MV) skids and associated ancillary equipment, a substation compound which accommodates high-voltage grid transformers, switchgear and a control building, as well as site-wide supporting infrastructure including underground 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.

2 Location & Existing Conditions

2.1 Site Location

The site is located approximately 5 kilometres (km) to the south of Inverness City Centre, centred on approximate Ordnance Survey (OS) grid reference 264876, 839233 (see red line on Figure 1).

Figure 1: Site location map

The site is generally surrounded by greenfield land. Essich Road bounds the site to the west, Biorraid Road to east with Essich Electricity Distribution Site beyond. The junction of Essich Road and Biorraid Road is immediately to the north of the site; Essich Farm Cottage is located opposite.

Essich Burn lies to the west of Essich Road, flowing in a northerly direction.

2.2 Existing Topography

A topographical survey has been produced for the site (see Appendix A). The survey shows ground levels to fall from south-east to north-west. Ground levels in the south-east are circa 195 metres Above Ordnance Datum (mAOD), falling to circa 155 metres (mAOD) in the north-west. Ground levels are variable across the site.

The survey shows vegetation around the perimeter of the site.

2.3 Existing Sewer/Water Assets

Scottish Water (SW) sewer records for the site have been obtained (see Appendix B). The records show no foul or surface water sewers in the vicinity of the site.

The utilities search has confirmed no Private Water Supplies are present at the site.

2.4 Existing Drainage Regime

There is no formal drainage regime for this site, surface water is likely to flow overland following the ground topography. Various ditches/depressions adjacent to the surrounding roads are shown on the topographical survey, which would intercept any overland flow from the site and prevent it from flowing over the road; these would also collect surface water run-off from the roads themselves. The topographical survey shows a pipe from the Essich Road ditch (to the west of the site), under the road, with the outfall on the opposite side where surface water would convey towards Essich Burn.

2.5 Ground Conditions

British Geological Survey (BGS) mapping confirms the site to have a bedrock geology of Inshes Flagstone Formation (Sandstone) (see Figure 2). Superficial deposits of Hummocky (moundy) Glacial Deposits are shown to be present across the most-part of the site, with Till, Devensian (Diamicton) located along the western boundary (see Figure 3).

Online mapping shows the site to be in an area with a 'low' groundwater vulnerability.

The Phase 2 Ground Investigation Report conducted on behalf of Field states that: 'Details on the hydrogeological classification of the Hummock Glacial Deposits were not given by SEPA mapping tools. The Inshes Flagstone Formation was characterised as a moderately productive aquifer, locally yielding small amounts of groundwater.'

Figure 2: BGS Geology Map of Bedrock geology

Figure 3: BGS Geology Map of Superficial Deposits

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 is 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.

4 Flood Risk Assessment

4.1 Introduction

The main sources of flooding that 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 because of the capacity of rivers being exceeded by the river flow.

Due to the location of the site (inland), the site is not at risk of tidal flooding.

There are no Main Rivers in the immediate vicinity of the site boundary. The Scottish Environment Protection Agency (SEPA) website confirms the site location is not in an area at likelihood of flooding and is therefore classified as being at less than 0.1% annual risk of flooding from rivers and seas (see Figure 4).

Figure 4: SEPA Flood Map – River Flooding

The closest area at risk of flooding from rivers appears to be associated with the watercourse 'Big Burn' which is located approximately 550m east of the site at its closest point. This watercourse is at a lower level than the site and therefore should not pose a risk to the site.

The site is not located on a flood plain and therefore there is no reduction in flood plain capacity.

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 5) shows the site and majority of the surrounding area to be at a very low risk of flooding from surface water.

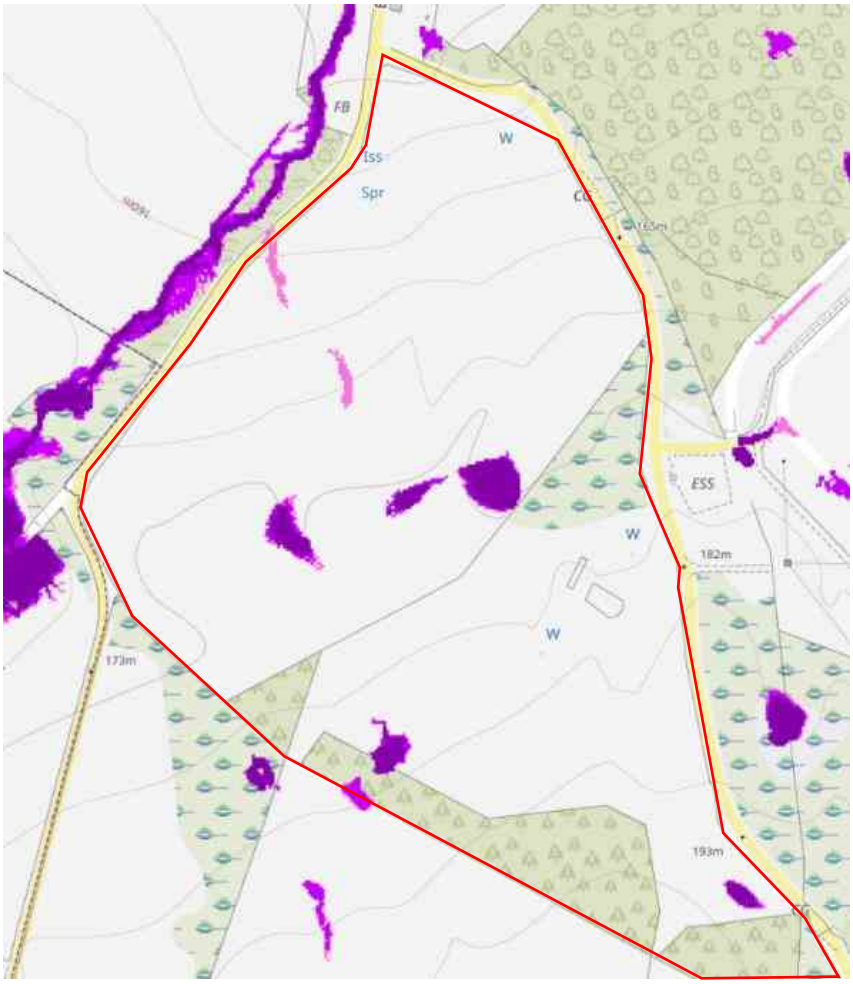


Figure 5: SEPA Surface Water Flooding map

OS mapping contours show surrounding ground levels to fall from south-east to north-west; this means that surface water could be shed across the site from the south-east. The upstream catchment from the site comprises greenfield land and is shown to include areas of tree plantations and marshy ground; the rate and volume of surface water likely to be shed towards the site from this direction is considered to be minimal and the topography does not create a valley line to channel flow towards the site. The levels across the site undulate and therefore surface water could pond in the lower areas; this is shown and confirmed on the SEPA Surface Water Flooding maps.

The proposed surface water drainage strategy for the site is provided in the HEC DIA report (reference 336-007-RP2). 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 area shown to be most at risk within the vicinity of the site appears to be associated with Essich Burn located to the west of the site; this area is at a lower level than the site and overland flow would be shed away from the site from this location. Refer to Figure 5 above.

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 site is in a low groundwater vulnerability area and therefore groundwater expression at the surface is unlikely.

In addition to this, the Phase 2 Ground Investigation Report states that *'Four groundwater strikes were recorded during the investigation, these were characterised as perched water and not representative of a sensitive resource.'*

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

4.5 Sewers

Scottish Water sewer mapping shows there is not any risk of flooding due to sewers as there are none in the near vicinity of the site.

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, large ponds, reservoirs etc.) within the immediate vicinity of the site that appear likely to pose a risk to the site.

The flood risk from the failure of a reservoir has been reviewed, the site not in an area at risk of flooding from reservoirs.

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

5 Summary and Conclusion

HEC has been commissioned by Field to carry out a 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 500 m south-east of Essich Farm Cottages, Inverness.

The site is at a low risk of flooding from all sources and meets the requirements of the NPF4 in terms of appropriate development.

The proposals for the Site do not increase on or off-site flood risk and should therefore be found acceptable.

Appendix A – Existing & Proposed Site

Field drawing BTGBKNO01-002.1 – Site Location

Highland Surveyors Ltd drawing 24016-01 - Topographical Survey

Field drawing BTGBKNO01-001.1 – Indicative Site Layout Plan

1 Location Plan
Scale 1:1000 @ A0

Notes

1. All dimensions are shown in mm unless noted otherwise.
2. Do not scale from this drawing.
3. Planning boundary area = 42.375Ha

Legend

Planning boundary

3	28.03.2024	Annotations added	JH	AP
2	18.01.2024	Planning boundary amended	JH	AP
1	25.10.2023	Drawing amended to show location plan	JH	RS
0	01.11.2022	Option Plan - For Information	WL	RS
REV	DATE	DESCRIPTION	BY	CHK'D

Field
Fora Montacute Yards,
186 Shoreditch High Street,
London,
E1 6HU

PROJECT
Knocknagael

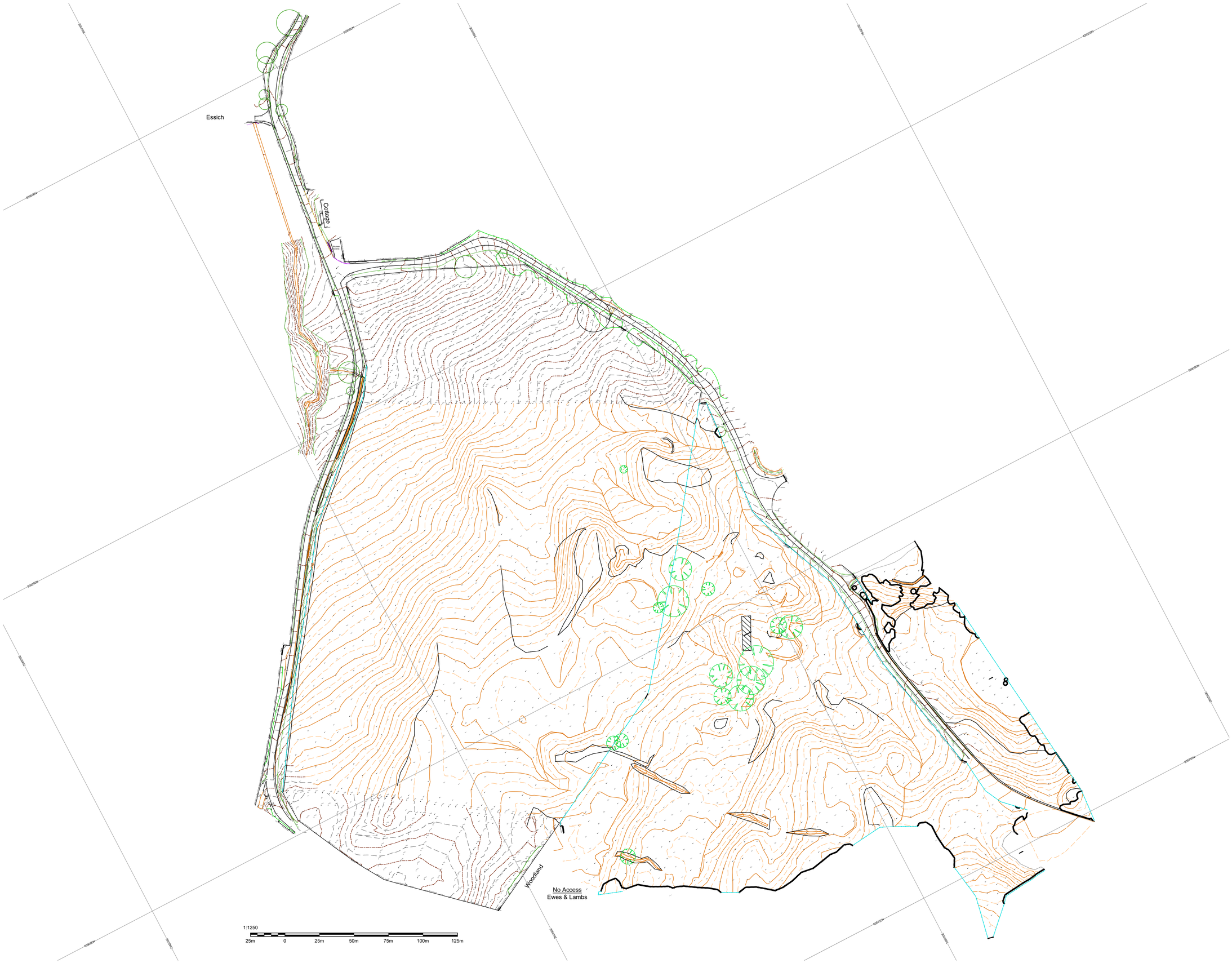
TITLE
Site Location Plan

DISCIPLINE
PLANNING

DRAWING STATUS
FOR PLANNING

SCALE	DATE	DRAWN BY	CHECKED BY	APPROVED BY
1:1000 @ A0	25.10.2023	JH	RS	RS

PROJECT NO.	DRAWING NO.	REV.
BTGBKNO01	002.1	3



FIGURED DIMENSIONS ONLY TO BE USED

Notes

i) All survey levels are related to Ordnance Survey using GPS.

ii) Whilst every effort to locate all major service covers (ie.manhole positions) it should be noted that this may not be possible in all cases due to ground conditions or local obstructions.

Issue	Revision	Initial	Date
	First Issue		

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Client:
Field

Project:
Proposed Development
Knocknagael
Essich

Drawing Title:
Topographic Survey

Status:
For Information

Scale:	1 : 1250 @ A1	Date:	01/06/2024
By:	SCD	Checked:	IKF
Approved:	SCD		

Dwg. No.	Rev.
24016-01	-

1 Indicative Site Layout Plan
Scale 1:1000 @ A0

Notes

1. All dimensions are shown in metres unless noted otherwise.
2. Do not scale from this drawing.
3. This drawing is indicative only and the site layout is likely to change as more information becomes available.

Legend

- Planning Boundary
- Access Track - Unbound Finish
- Access Track - Asphalt Finish
- Attenuation Basin
- Palisade Fence
- 4m Acoustic Fence
- 3m Acoustic Fence
- Stock Proof Fence
- Indicative Underground Cable Route
- Site Landscaping and Planting
- Existing Trees to Remain

1:10	0	100mm 200mm 300mm 400mm 500mm 600mm 700mm 800mm 900mm		1m
1:20		0.5m 1m 1.5m		2m
1:25		0.5mm 1m 1.5m 2m		2.5m
1:50		1m 2m 3m 4m		5m
1:100	1m	2m 3m 4m 5m 6m 7m 8m 9m		10m
1:200		5m 10m 15m		20m
1:250		5m 10m 15m 20m		25m
1:500		10m 20m 30m 40m		50m
1:1000	0	10m 20m 30m 40m 50m 60m 70m 80m 90m		100m

REV	DATE	DESCRIPTION	BY	CHK'D
3	27.06.2024	Landscaping and planting area amended	JH	AP
2	20.06.2024	Drainage and landscaping amended. Annotations added.	JH	AP
1	30.05.2024	Site layout amended	JH	JM
0	28.03.2024	Site Layout Plan - Original	JH	AP

Field
Fora Montacute Yards,
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PROJECT
Knocknagael

TITLE
Indicative Site Layout Plan

DISCIPLINE
PLANNING

DRAWING STATUS
FOR PLANNING

SCALE	DATE	DRAWN BY	CHECKED BY	APPROVED BY
1:1000 @ A0	28.03.2024	JH	AP	JM

PROJECT NO.	DRAWING NO.	REV.
BTGBKNO01	001.1	03

Appendix B - Scottish Water

BTGBKNO01 SEWER


Essich
Essich Burn
Pond
142.5m
Stone
Essich Rd
Drain
145.5m
Essich Farm Cottage
Corrour Wade's Military Road
Essich Rd
149.3m
155.2m
Well
FB
Issues
Spring
Cattle Grid
165.3m
Balancing Pond
Track
Sinks
Track
164.6m
Pond
P Const Bdy
Ward Bdy
170.5m
Sinks
176.5m
El Sub Sta
Electricity Distribution Site
Stone
Well
182.1m
Spreads
Pond
Well
186.3m
Achvraid
172.6m
Ward Bdy
P Const Bdy
FB
193.1m
Stone
Issues
Pond
Ward Bdy
P Const Bdy
CF
P Const & Ward Bdy
Cattle Grid
Track
Track
Drain
191.1m
Achvraid House
187.5m
P Const & Ward Bdy
194.3m
Pond
ETL
Issues
Wade's Military Road
BTGBKNO01 SEWER
N
SCALE 1:1,323
Scottish Water

Scottish Water Asset

Waste Water Network

Fittings

Access (Lateral)
- Abandoned
- Combined (C)
- Foul (F)
- Proposed
- Surface Water (S)

Chamber
- Abandoned
- CSO
- Combined
- Foul
- Dual Manhole - Foul
- Dual Manhole - Surface
- Isolated
- Natural Water
- Not Applicable
- Other
- Planned
- Proposed
- Surface Water
- Trade Effluent
- Treated Effluent
- Unknown
- Unknown_

Combined Sewer Overflow
- CSO-COMB SEW O/FL

Balancing Pond

Basin

Bifurcation Chamber
- Abandoned
- Combined (C)
- Foul (F)
- Isolated
- Planned
- Proposed
- Surface Water (S)
- Unknown

Sewerage Air Valve
- Combined (C)
- Isolated
- Abandoned
- CSO (O)
- Foul (F)
- Other
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown

Buchan Trap
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Isolated
- Natural Water (W)
- Other
- Proposed
- Surface Water (S)
- Treated Effluent (E)
- Unknown(Z)

Capped End
- Abandoned
- Accepted
- Adopted
- In Use
- Isolated
- Not Applicable
- Planned
- Proposed
- Removed
- Unknown

Hatchbox
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Isolated
- Natural Water (W)
- Other
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown

Hydraulic Control Chamber
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Planned
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown

Inlet
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Other
- Proposed
- Surface Water (S)
- Treated Effluent (E)
- Unknown

Rodding Eye
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Isolated
- Natural Water (W)
- Other
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown(Z)

Non-return Valve
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown

Lamphole
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Proposed
- Surface Water (S)
- Treated Effluent (E)
- Unknown

Outfall
- Planned
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Isolated
- Natural Water (W)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown
- Unknown_

Pond

Trench

Sluice Valve
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Isolated
- Natural Water (W)
- Other
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)

Unknown End
- Abandoned
- Unknown End

Washout
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Other
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Unknown

Wetland

Vent Column

Pipes

Gravity Pipe
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Gravity Pipe General

Gravity Pipe
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Gravity Pipe General

Connection (Lateral)
- Abandoned
- Combined (C)
- Foul (F)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Connection (Lateral) General

Rising Main
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Rising Main General

Rising Main
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Proposed
- Surface Water (S)
- Trade Effluent (T)
- Treated Effluent (E)
- Rising Main General

Syphon
- Abandoned
- CSO (O)
- Combined (C)
- Foul (F)
- Natural Water (W)
- Surface Water (S)
- Treated Effluent (E)