336-005-RP2

Drainage Impact Assessment

Proposed BESS – Beauly, Inverness

DOCUMENT STATUS	DATE	BY	CHECKED	APPROVED
THIRD ISSUE	17-12-2024	James Calvert Director		James Calvert Director

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Contents

1 Introduction

Haydn Evans Consulting Ltd (HEC) has been commissioned by Field Beauly Ltd (hereafter referred to as the Client) to carry out a Drainage Impact Assessment (DIA) to support a planning application for the construction and operation of a Battery Energy Storage System (BESS) of up to 100 MW with associated infrastructure, access and ancillary works at Dunballoch Farm, Beauly, Inverness IV4 7AY.

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 DIA should be read in conjunction with the Flood Risk Assessment (FRA) which has been prepared for this site; HEC document reference 336-005-RP1

1.2 Site Proposal

The Proposed Development would have a built compound that has a development footprint of approximately 1.5hectares (ha) across the 18.51 ha site.

The Proposed Development consists of a Battery Energy Storage System (BESS) of up to 100 MW with associated infrastructure, earthworks, drainage, accesses and ancillary works (including landscaping and biodiversity enhancement).

2 Location & Existing Conditions

2.1 Site Location

The site is located to the south east of Beauly and to the west of Inverness, on approximate Ordnance Survey (OS) grid reference 57.465504, -4.460484 (see red line boundary on Figure 1).

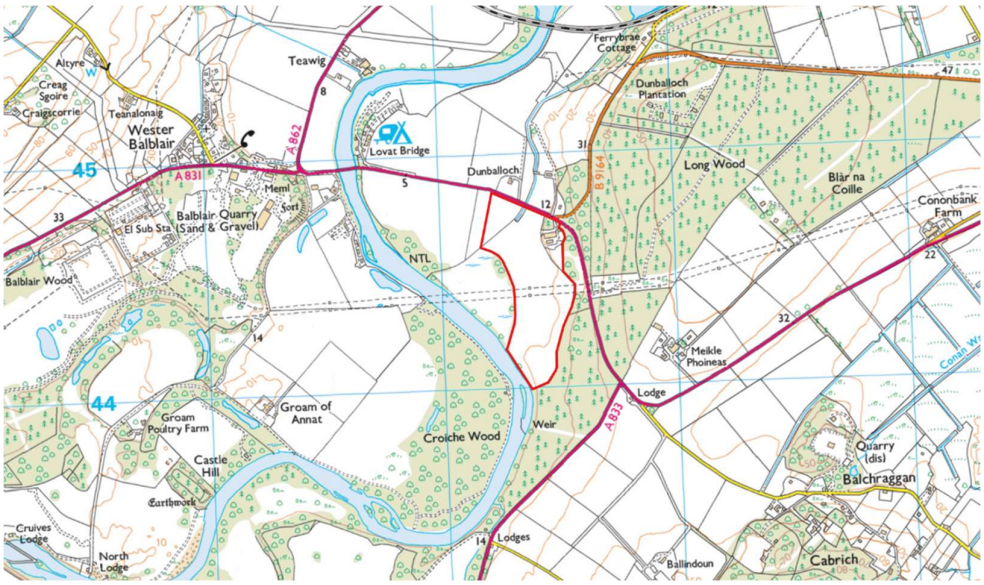


Figure 1: Site location map

The site is surrounded by greenfield land on the north, east, and west boundaries. The southern boundary runs along and is adjacent to the River Beauly. An access track is located along the north-eastern boundary of the site. Access from the A862 is from the north, via the existing tracks in this direction. The site is required to have a temporary construction access during the development, this will be constructed with semi-permeable materials mitigating any further drainage measures.

2.2 Existing Topography

A topographic survey has been produced for the site (included within Appendix A). The survey shows ground levels to fall from east to west. Ground levels in the east are circa 12.735 metres Above Ordnance Datum (mAOD), falling to circa 5.237 mAOD in the west.

2.3 Existing Sewer Assets

A combined utilities plan has been produced for the site and this does not show any assets belonging to Scottish Water (SW), included within Appendix A.

2.4 Existing Drainage Regime

There is no formal drainage system located on site and therefore surface water run-off would flow overland following the topography of the site or infiltrate into the underlying soils. There are no water supplies shown on the utility plans.

2.5 Ground Conditions

British Geological Survey (BGS) mapping confirms the site to have a bedrock geology of Braemore Mudstone Formation being a combination of mudstone, sandstone, and limestone

(see Figure 2). The superficial deposits for the site are shown to be Raised Marine Beach Deposits of Holocene Age being a combination of sand and gravel (see Figure 3). There is a small section of the site where the superficial deposits are unknown.

Figure 2: BGS Geology Map of Bedrock geology

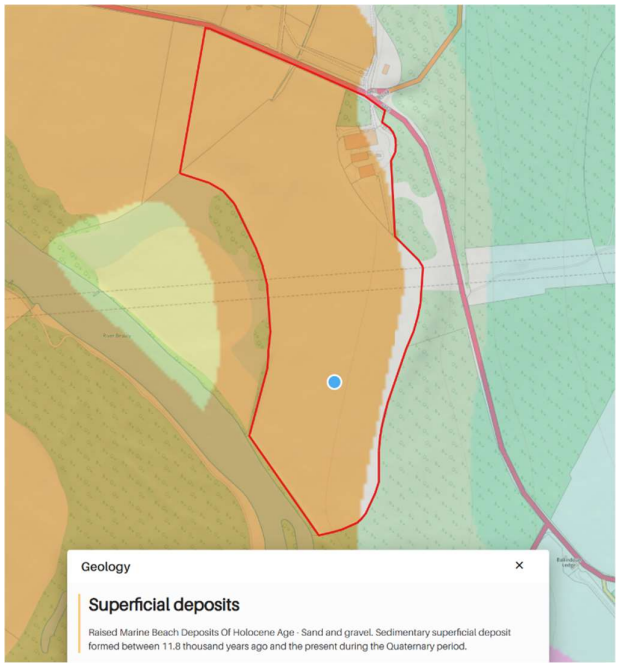


Figure 3: BGS Geology Map of Superficial deposits

Online mapping shows the site to be in an area with a 'low' groundwater vulnerability, this is also confirmed in the Geoenvironmental and Geotechnical Desk Study (see Appendix C) within the borehole logs from BGS show groundwater to be greater than 3m below ground level.

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. Policy 22 states that development proposals should:

- Not increase the risk of surface water flooding to others, or itself be at risk;
- Manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue-green infrastructure. All proposals should presume no surface water connection to the combined sewer; and
- Seek to minimise the area of impermeable surface.

3.2 Highland-wide Local Development Plan (HwLDP, Adopted 2012)

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 66 is relevant to this assessment and reads as follows:

Policy 66 Surface Water Drainage

All proposed development must be drained by Sustainable Drainage Systems (SuDS) designed in accordance with The SuDS Manual (CIRIA C697) and, where appropriate, the Sewers for Scotland Manual 2nd Edition. Planning applications should be submitted with information in accordance with Planning Advice Note 69: Planning and Building Standards Advice on Flooding paragraphs 23 and 24. Each drainage scheme design must be accompanied by particulars of proposals for ensuring long-term maintenance of the scheme.

4 Surface Water Drainage

4.1 Proposed Surface Water Drainage Strategy

The surface water drainage strategy has been designed based on the requirements of CIRIA 753 (C753) dated March 2015 and the Water Assessment and Drainage Assessment Guide produced by the Sustainable Urban Drainage Scottish Working Party (SUDSWP).

The surface water drainage strategy is focused on the proposed development areas.

Surface water drainage for the remainder of the site area within the red line boundary will drain as existing, infiltrating into the below soils or flowing overland.

4.1.1 SuDS Hierarchy

Surface water drainage should be managed in a way that replicates the natural drainage processes for the site as closely as possible. The proposals should follow the hierarchy outlined in C753 and should be disposed of to a receptor in the order of preference described below:

1. Into the ground;
2. To a surface water body e.g. watercourse;
3. To a surface water, highway drain, or another drainage system;
4. To a combined sewer.

4.1.2 SuDS Selection

Into the Ground

The Geoenvironmental and Geotechnical Desk study states 'The two historical ground investigation boreholes, detailed in Section 2.4, which are located 156m and 183m south of the Site, encountered groundwater at depths of 7.30m and 3.30m below ground level (bgl), respectively.' The depth of the groundwater being greater than 3m below ground level allows for 1m clearance from the base of attenuation (1.5m deep) is achieved within the strategy.

A ground investigation was conducted at Dunballoch Farm on behalf of the Client by Highland Geotechnical Services. It was confirmed via three trial pits that no groundwater was encountered (see Appendix C). Within the investigation, soil permeability testing was also undertaken and the raw results provided. Haydn Evans converted the raw results into infiltration rates, using the BRE365 method, for use within the drainage calculations (see Appendix B).

4.2 Surface water drainage strategy

The surface water generated by the compound will flow overland to a clay lined ditch which will direct the surface water to the infiltration basin through pipes and a manhole fitted with a penstock valve.

The drainage strategy will discharge the surface water into the below ground soils at a rate of 0.08280 m/hr. The surface water drainage strategy drawings and supporting calculations are provided in within Appendix B.

Attenuation

Attenuation has been sized using FEH data and Causeway Flow software to accommodate the temporary run-off for rainfall events up to and including the 1:200-year event.

The volume of storage provided in the infiltration basin provided for the BESS/substation compound for the 200-year event is 1092 m^3 with a maximum water level of 9.288 mAOD. The proposed bank level of the basin is 9.600 mAOD and therefore sufficient freeboard is provided for the 200-year event. The basin has been designed with 1:3 side slopes.

To prevent fire water from infiltrating into the underlying soils a clay lined ditch is provided for the collection of surface water runoff from the site. The ditch has a minimum storage requirement of 230m^3 for fire water purposes. As the ditch feeds into the SuDS basin, a penstock valve will be included on the outflow manhole which can be shut off in the case of a fire to prevent fire water from entering the SuDS basin and infiltrating into the underlying soils. The ditch has been designed with 1:2 side slope and a base width of 1m.

4.3 Pollution Mitigation

The above proposal ensures that surface water is managed 'at source'. All surface water from the Proposed Development area will pass through a filter drain and the attenuation basin as pollution mitigation. This type of development has 'Low' pollution hazard level, as shown in table 26.2 of C753. The relevant land use is tabled below, with the SuDS pollution indices tabled (as per table 26.3 of C753).

Pollution Hazard indices for different land use classifications				
Land Use	**Pollution Hazard Level**	**Total suspended solids pollution index**	**Metals**	**Hydrocarbons (HC)**
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie., 300 traffic movements/day	Low	0.5	0.4	0.4
Indicative SuDS mitigation indices for discharges to groundwater				
Swale		0.5	0.5	0.6
Infiltration Basin – soil with good contamination attenuation potential of at least 300mm in depth*		0.4	0.4	0.4
Total		**0.7**	**0.7**	**0.8**

Table 1: SuDS Pollution Assessment

* Mitigation indices halved for secondary treatment

The mitigation techniques provided exceed the required level of treatment to surface water run-off.

4.4 Management and Maintenance

The surface water drainage system should be maintained to ensure the system operates at its maximum capacity for the 40-year lifetime of development. A management and maintenance plan are provided in within Appendix B.

5 Summary and Conclusion

5.1 Summary

HEC has been commissioned by the Client to carry out a Drainage Impact Assessment to support a planning application for the construction and operation of a 100 MW Battery Energy Storage System (BESS) with associated infrastructure, access and ancillary works on land at Dunballoch Farm, Beauly, Inverness IV4 7AY.

Infiltration drainage is feasible at the Site, as confirmed by ground investigation. It is therefore proposed to discharge surface water into the below soils mimicking the existing drainage regime for the Site.

Attenuation has been provided for the 1 in 200-year event.

The use of a clay lined ditch and infiltration basin provides the appropriate mitigation for the pollutants likely for this type of development.

The ditch will be clay lined and of suitable capacity to provide attenuation for water in the case of a fire. A penstock valve will be used to prevent water discharge to the soakaway in a fire when there is a need for fire water.

The surface water drainage system should be maintained to ensure the system operates at its maximum capacity for the lifetime of development in line with the management and maintenance plan provided.

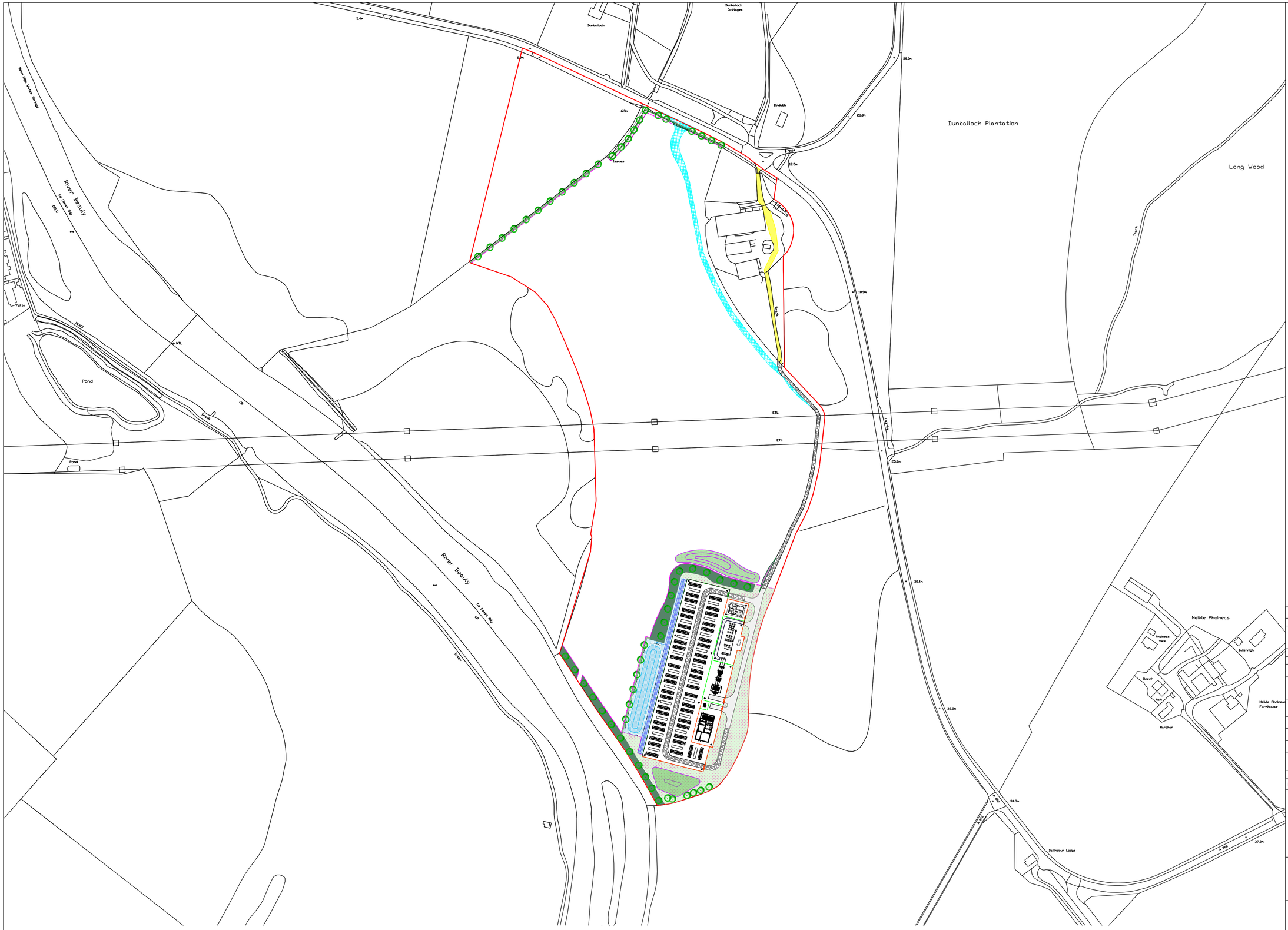
5.2 Conclusion

The drainage strategy complies with guidance; surface water generated by the Proposed Development can be attenuated on site in the relevant extreme event. The proposals for the site do not increase on or off-site flood risk and are therefore considered acceptable.

Appendix A – Existing & Proposed Site

Field Indicative Site Layout Plan BTGBBEA02-001.1

Topographical Survey by Castle Keep Survey – 290921 Beauly 02-OV



1 Detailed Site Plan
Scale 1:2000 @ A1

Drawing Notes:

1. All dimensions are shown in metres unless noted otherwise.
2. Do not scale from this drawing.

Legend:

- Planning Boundary
- 3m Palisade Fencing with Electric Topper
- Fire Proof 4m Acoustic Fencing
- Stock Proof Fencing
- Access Road - Aggregate Finish
- Access Road - Asphalt Finish
- Access Road from Highways
- Planting/Landscaping Area
- Infiltration Basin
- Temporary Alternative Access
- Passing Places
- Bunding
- Maintenance Strip
- Attenuation Basin
- Surface Water Drain
- Surface Water Manhole
- Native Woodland Edge
- Species-rich Meadow
- Native Mixed Hedgrow
- Wetland Meadow
- Native Broadleaved Tree

REV	DATE	DESCRIPTION	BY	CHK'D
12	13/12/2024	LANDSCAPING PLAN AND POSITION OF CONSTRUCTION COMPOUND AMENDED	WL	ED
11	20/11/2024	LANDSCAPING PLAN AMENDED	WL	JH
10	18/11/2024	OPTION AREA, LANDSCAPING AND FENCING DETAILS AMENDED. DRAINAGE STRATEGY, POSITION OF CCTV AND LIGHTING COLUMNS, AND TEMPORARY ALTERNATIVE ACCESS ROAD AMENDED	WL	JH
9	28/08/2024	INDICATIVE BUND ADDED	WL	JH
8	07/08/2024	CCTV/LIGHTING COLUMNS AND GATES ADDED.	JH	JH
7	01/08/2024	POSITION OF ACCESS ROAD AND INDICATIVE ALTERNATIVE ACCESS AMENDED	WL	JH
6	26/07/2024	LANDSCAPING ADDED TO SOUTH OF SITE, LAYOUT AMENDED TO SUIT, PASSING PLACES ADDED TO ALTERNATIVE ACCESS. POSITION OF TEMPORARY CONSTRUCTION COMPOUND AMENDED	WL	JH
5	19/07/2024	LAYOUT AMENDED FOR TO COMPOUND AND ADDITIONAL BUILDINGS REQUIRED. POSITION OF ATTENUATION POND AMENDED	WL	JH
4	04/07/2024	PASSING PLACES ADDED. SITE LOCATION AMENDED TO ALLOW OFFSET FROM EASTERN WALL	WL	JH
3	28/06/2024	SITE AMENDED TO ACCOUNT FOR EXTRA REQUIRED STRINGS	WL	JH
2	20/06/2024	LAYOUT ADJUSTED TO ACCOUNT FOR ADDITIONAL REQUIRED STRINGS	WL	ED
1	15/05/2024	BESS LAYOUT ADJUSTED, ADDITIONAL CONSTRUCTION COMPOUND AREA ADDED, ATTENUATION POND SIZE INCRESED	EW	ED
0	08/05/2024	DETAILED SITE PLAN - ORIGINAL	EW	JH

FIELD

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

PROJECT
BEAULY 2

TITLE
Detailed Site Plan
100MW 200MWh
Envision Twin Skid

DISCIPLINE
PLANNING

DRAWING STATUS
FOR PLANNING

SCALE	DATE	DRAWN BY	CHECKED BY	APPROVED BY
1:2000 @A1	08.05.2024	WL	JH	ED

PROJECT NO.	DRAWING NO.	REV.
BTGBBEA02	005.1.2	12

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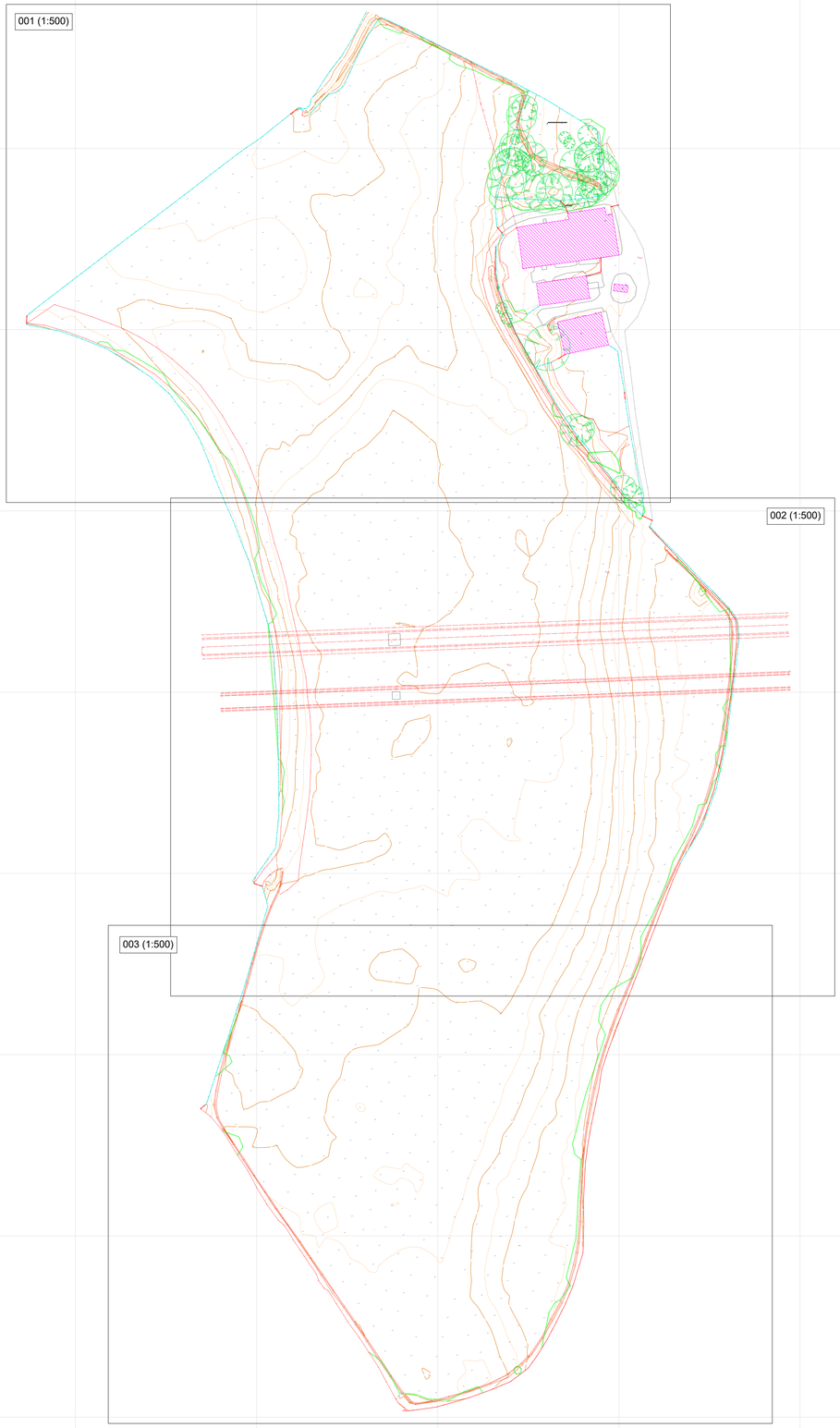

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BT CL 100.000
RG 100.000
SU CL 100.000
WM CL 100.000
AV CL 100.000
WO CL 100.000
FH CL 100.000
GV CL 100.000
Cabinet 100.000
LB CL 100.000
MH2 CL 100.000 IL 97.500
MH3 CL 100.000 IL 97.500

Approximate National Grid North

CASTLE KEEP SURVEYS

Job Title: Beauly, Inverness, Scotland

Client Name: FIELD

Drawing Title: Topographical Survey

Scale	Surveyor
NTS @ A1	DA
Date	Approved
15/09/2022	MD

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Castle Eden
County Durham
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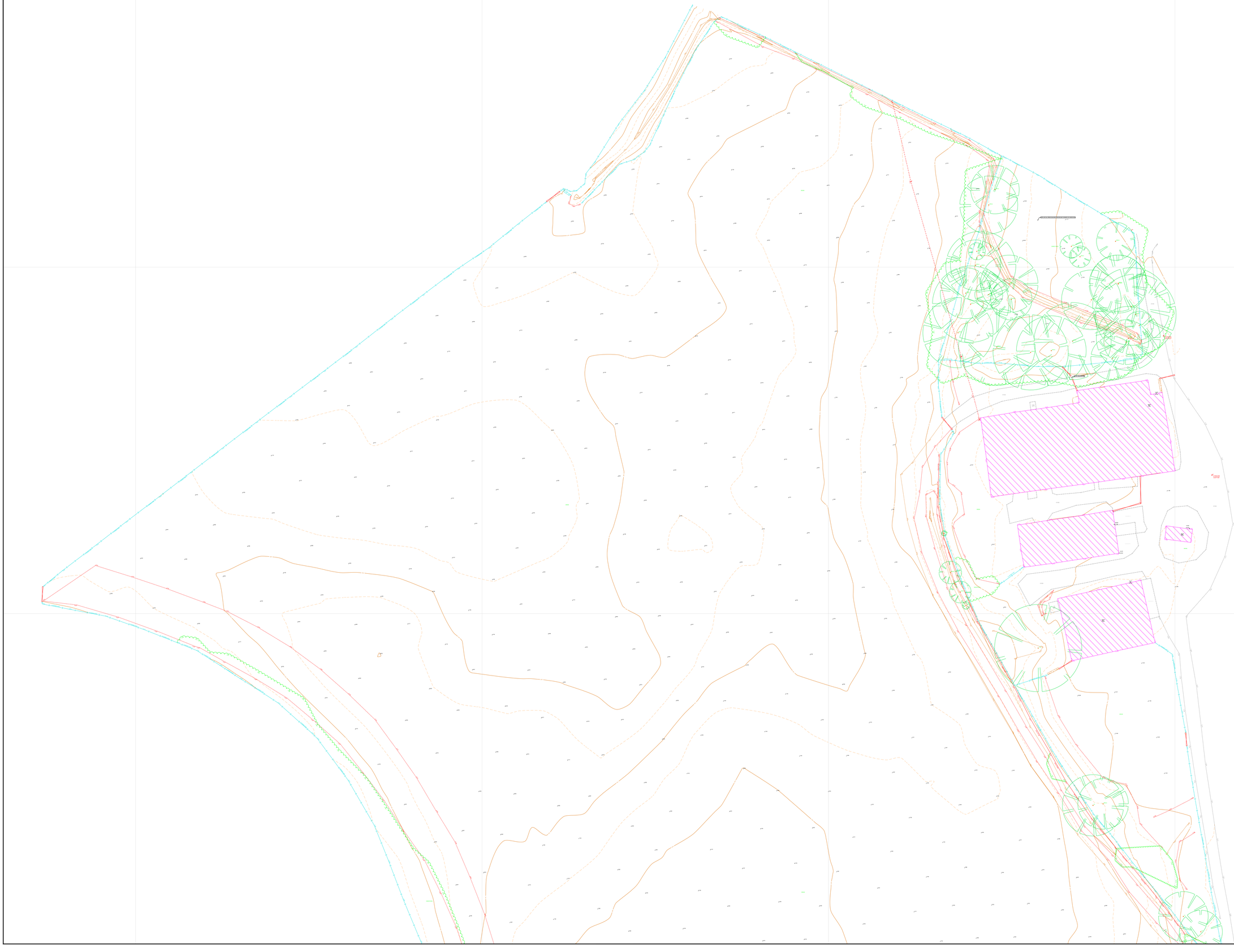
Revision	Amendments	By	Checked

Project Number: OV

Drawing No/Revision:



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Beauly
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Scotland

Client Name

FIELD

Drawing Title

Topographical Survey

Scale	Surveyor
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Date	Approved
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Castle Eden
County Durham
TS27 4SL
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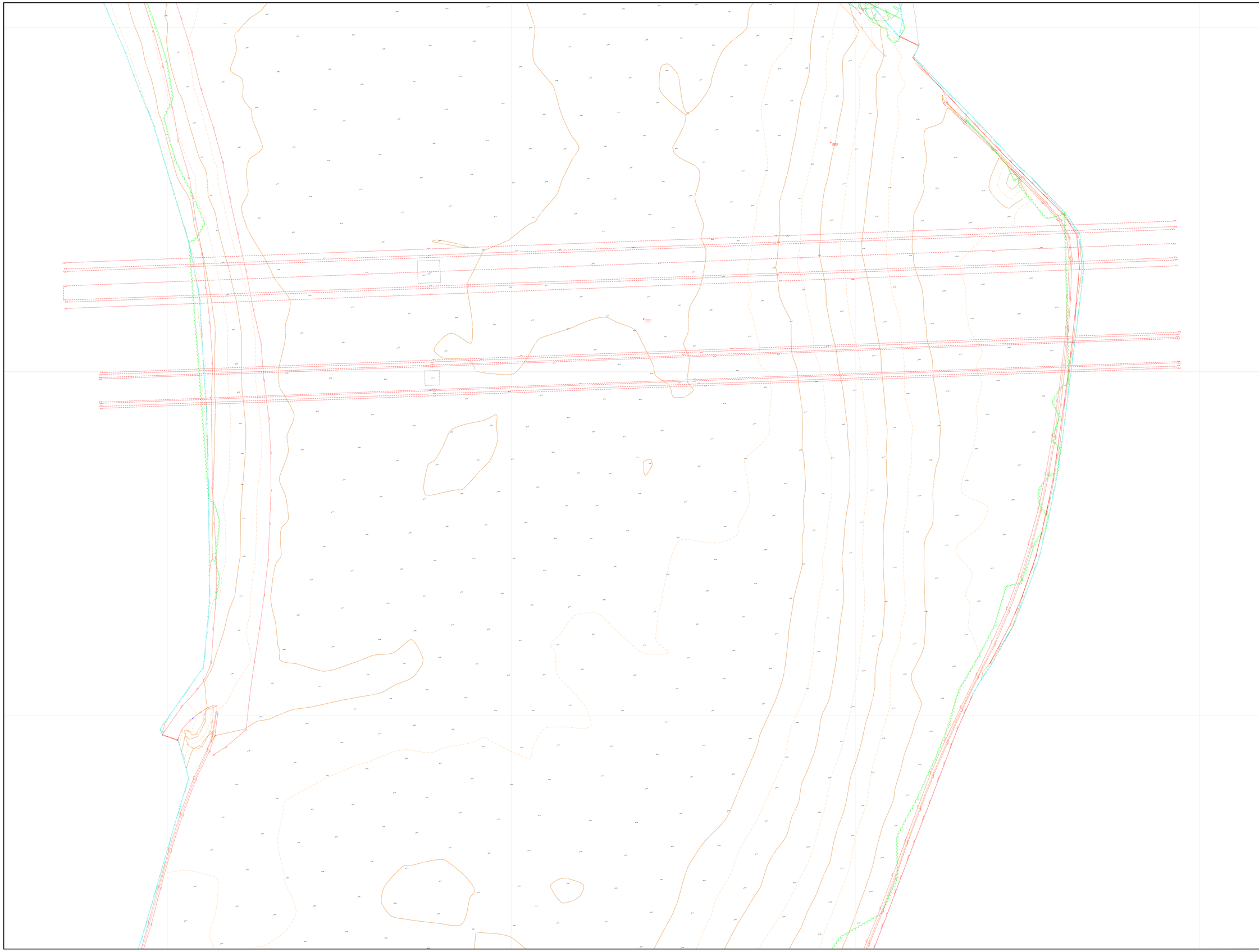
E: info@castlekeepsurveys.co.uk

Revision	Amendments	By	Checked

Project Number: 001

Drawing No/Revision



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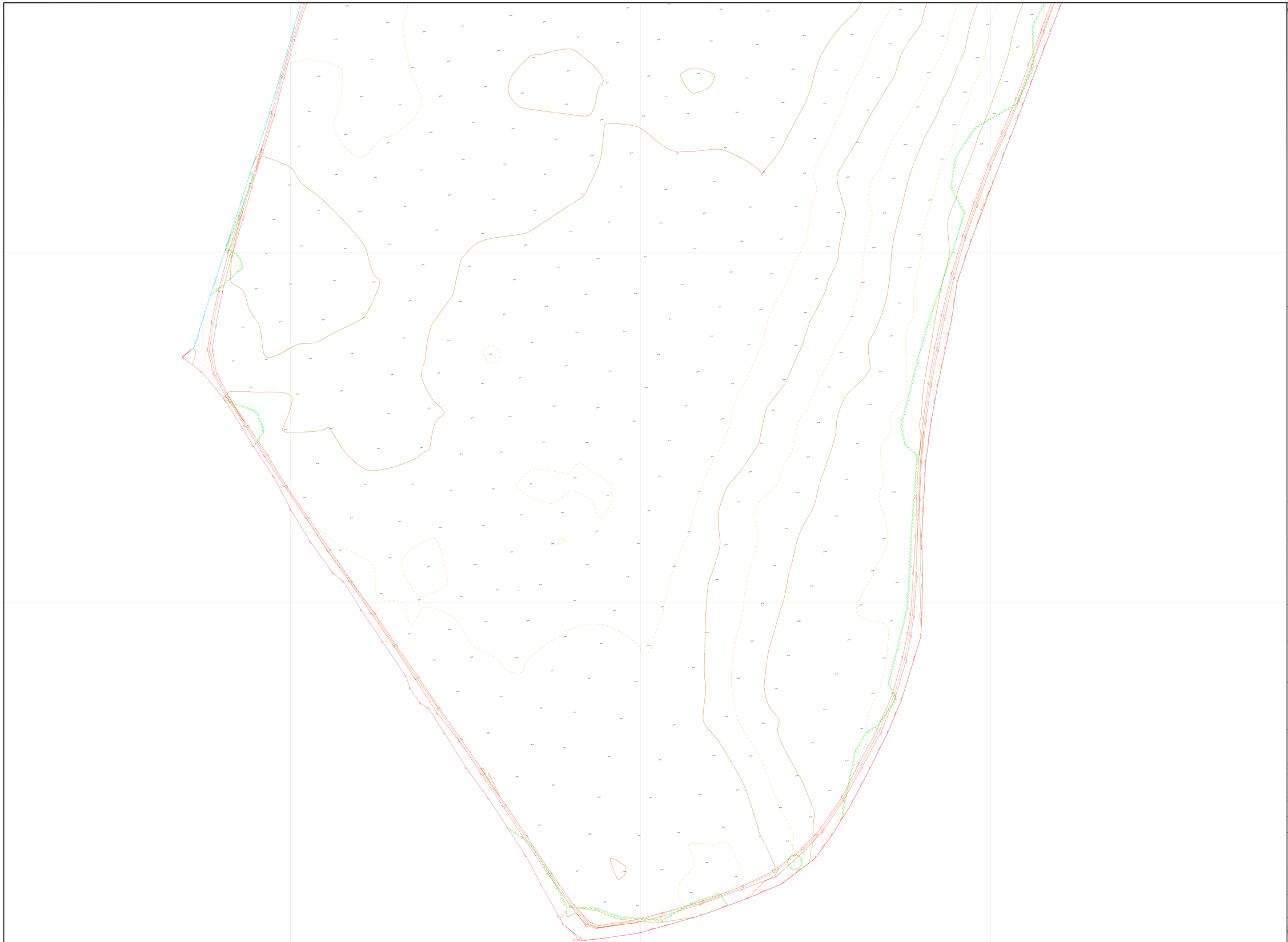
E: info@castlekeepsurveys.co.uk

Revision	Amendments	By	Checked

Project Number: 002

Drawing No/Revision:



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- RS — Road Sign
- SVP — Soil Vent Pipe
- CK31 E=436076.617 N=546728.511 Level=25.558 — Station Control Details
- RE — Rodding Eye
- LOR — Lane of Reflection
- Gate
- MH1 CL 100.000 IL 98.000
- Manhole
- IC CL 100.000
- Inspection Chamber
- CATV CL 100.000
- Cable TV Cover
- BT CL 100.000
- BT Cover
- RG 100.000
- Road Gully
- SV CL 100.000
- Stop Valve
- WM CL 100.000
- Water Meter
- AV CL 100.000
- Air Valve
- WO CL 100.000
- Wash Out
- FH CL 100.000
- Fire Hydrant
- GV CL 100.000
- Gas Valve
- Cabinet 100.000
- Cabinet
- LB CL 100.000
- Electric Link Box
- MH2 CL 100.000 IL 97.500
- Circular Manhole
- MH3 CL 100.000 IL 97.500
- Triangular Manhole
- Tree
- EOS — End of Topsoil

Approximate National Grid North

CASTLE KEEP SURVEYS

Job Title

Beauly
Inverness
Scotland

Client Name

FIELD

Drawing Title

Topographical Survey

Scale	1:500 @ A1	Surveyor	DA
Date	15/09/2022	Approved	MD

Castle Keep Surveys Ltd
The Keep
The Village
Castle Eden
County Durham
TS27 4SL
T: 01429 836038
E: info@castlekeepsurveys.co.uk

Revision	Amendments	By	Checked

Project Number: 003

Drawing No/Revision

Appendix B Surface Water Drainage

Haydn Evans calculations 336-005-CA1 Greenfield Run-off Calculations

Haydn Evans calculations 336-005-CA2 Attenuation Calculations

Haydn Evans calculations 336-005-CA4 Soakaway Rates

Haydn Evans drawing 336-005-001 Surface Water Drainage Strategy

Haydn Evans document 336-005-RP3 – SuDS Management & Maintenance Plan

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Tayler Evans
Site name:	336-005
Site location:	Beauly

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	57.46472° N
Longitude:	4.462° W
Reference:	1209470396
Date:	Nov 07 2024 09:09

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.46

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	785	785
Hydrological region:	1	1
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.95	1.95
Growth curve factor 100 years:	2.48	2.48
Growth curve factor 200 years:	2.84	2.84

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	4.8	4.8
1 in 1 year (l/s):	4.08	4.08
1 in 30 years (l/s):	9.35	9.35
1 in 100 year (l/s):	11.89	11.89
1 in 200 years (l/s):	13.62	13.62

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Basin	1.604	5.00	9.600	1200	252374.795	844054.878	1.500

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
200	0	0	0

Node Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.08280	Safety Factor	2.0	Invert Level (m)	8.100
Side Inf Coefficient (m/hr)	0.08280	Porosity	1.00	Time to half empty (mins)	896

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	536.0	536.0	1.500	1448.0	1427.1

Results for 200 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Basin	464	9.288	1.188	120.5	1092.5660	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
480 minute winter	Basin	Infiltration	14.2

Trial Pit Dimensions

Width =	0.85	m
Length =	1.40	m
Depth =	2.10	m
Pipe Length =		m
Top of pipe to gravel		m

BRE365 Calculation Values

Effective Depth	0.95	m
75% WL	0.713	m
25% WL	0.238	m
Effective Volume	1.131	m3
75% Vol	0.848	m3
25% Vol	0.283	m3
Vp75-25	0.565	m3
a50	3.328	m2

Test 1

Time	WL
0	0.95
8	0.75
18	0.63
28	0.57
60	0.47
96	0.27
114	0.00

T25	11	mins
T75	98	mins
Tp75-25	87	mins
f	3.25E-05	m/s
	117	mm/hr

Trial Pit Dimensions

Width =	0.85	m
Length =	1.40	m
Depth =	2.10	m
Pipe Length =		m
Top of pipe to gravel		m

BRE365 Calculation Values

Effective Depth	0.97	m
75% WL	0.728	m
25% WL	0.243	m
Effective Volume	1.154	m3
75% Vol	0.866	m3
25% Vol	0.289	m3
Vp75-25	0.577	m3
a50	3.373	m2

Test 1

Time	WL
0	0.97
8	0.84
21	0.67
42	0.55
73	0.43
103	0.34
138	0.25
171	0.08
188	0.00

T25	16	mins
T75	140	mins
Tp75-25	124	mins
f	2.30E-05	m/s
	83	mm/hr

Trial Pit Dimensions

Width =	0.90	m
Length =	1.50	m
Depth =	2.00	m
Pipe Length =		m
Top of pipe to gravel		m

BRE365 Calculation Values

Effective Depth	0.84	m
75% WL	0.63	m
25% WL	0.21	m
Effective Volume	1.134	m3
75% Vol	0.851	m3
25% Vol	0.284	m3
Vp75-25	0.567	m3
a50	3.366	m2

Test 1

Time	WL
0	0.84
6	0.58
15	0.38
26	0.18
38	0.00

T25	5	mins
T75	24	mins
Tp75-25	19	mins
f	1.48E-04	m/s
	532	mm/hr

Trial Pit Dimensions

Width =	0.90	m
Length =	1.50	m
Depth =	2.00	m
Pipe Length =		m
Top of pipe to gravel		m

BRE365 Calculation Values

Effective Depth	0.96	m
75% WL	0.72	m
25% WL	0.24	m
Effective Volume	1.296	m3
75% Vol	0.972	m3
25% Vol	0.324	m3
Vp75-25	0.648	m3
a50	3.654	m2

Test 1

Time	WL
0	0.96
10	0.64
45	0.34
79	0.00

T25	7.5	mins
T75	55	mins
Tp75-25	47.5	mins
f	6.22E-05	m/s
	224	mm/hr

Trial Pit Dimensions

Width =	0.90	m
Length =	1.50	m
Depth =	2.00	m
Pipe Length =		m
Top of pipe to gravel		m

BRE365 Calculation Values

Effective Depth	1.03	m
75% WL	0.773	m
25% WL	0.258	m
Effective Volume	1.391	m3
75% Vol	1.043	m3
25% Vol	0.348	m3
Vp75-25	0.695	m3
a50	3.822	m2

Test 1

Time	WL
0	1.03
26	0.63
56	0.39
79	0.20
92	0.14
112	0.00

T25	17	mins
T75	73	mins
Tp75-25	56	mins
f	5.41E-05	m/s
	195	mm/hr

Trial Pit Dimensions

Width =	0.80	m
Length =	1.40	m
Depth =	2.00	m
Pipe Length =		m
Top of pipe to gravel		m

BRE365 Calculation Values

Effective Depth	0.97	m
75% WL	0.728	m
25% WL	0.243	m
Effective Volume	1.086	m3
75% Vol	0.815	m3
25% Vol	0.272	m3
Vp75-25	0.543	m3
a50	3.254	m2

Test 1

Time	WL
0	0.97
15	0.52
45	0.23
61	0.00

T25	8	mins
T75	43.5	mins
Tp75-25	35.5	mins
f	7.84E-05	m/s
	282	mm/hr

Trial Pit Dimensions

Width =	0.80	m
Length =	1.40	m
Depth =	2.00	m
Pipe Length =		m
Top of pipe to gravel		m

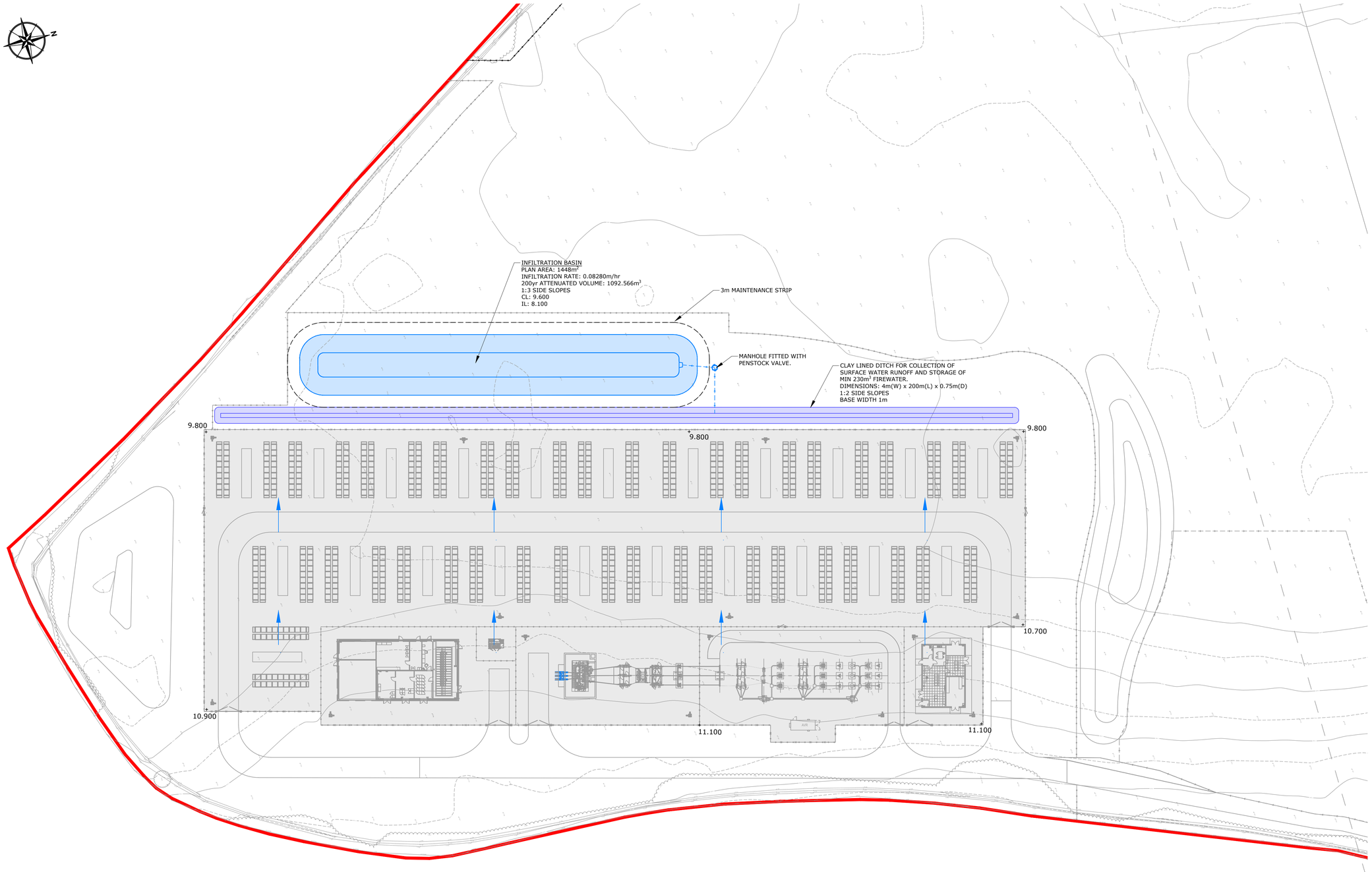
BRE365 Calculation Values

Effective Depth	1.02	m
75% WL	0.765	m
25% WL	0.255	m
Effective Volume	1.142	m3
75% Vol	0.857	m3
25% Vol	0.286	m3
Vp75-25	0.571	m3
a50	3.364	m2

Test 1

Time	WL
0	1.02
10	0.76
36	0.43
46	0.20
103	0.10
116	0.00

T25	10	mins
T75	44	mins
Tp75-25	34	mins
f	8.32E-05	m/s
	300	mm/hr



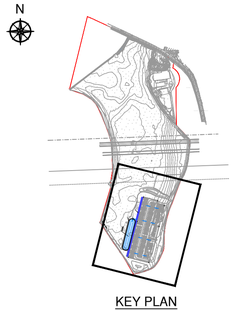
NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM HAYDN EVANS PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.
3. SITE LAYOUT BASED ON 'FIELD', DRAWING REF 'BTGBBEA02-005.1.2' REV. 12, DATED 13/12/2024 . TOPOGRAPHICAL SURVEY FROM 'CASTLE KEEP SURVEYS' DRAWING REF. '220921 BEAULY02-OV', UNDERTAKEN 15/09/2022.
4. THIS DRAINAGE STRATEGY DRAWING SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON SITE USING INFILTRATION, FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 200 YEAR RETURN PERIOD EVENT TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THE PROPOSED DEVELOPMENT.

   THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT TO MEET CERTAIN TECHNICAL CRITERIA.

KEY

- RED LINE BOUNDARY
- CONTRIBUTING AREA - 1.604ha
- ATTENUATION BASIN
- OVERLAND FLOW ROUTE
- SURFACE WATER MANHOLE
- SURFACE WATER DRAIN
- CLAY LINED DITCH
- xx.xxx+ PROPOSED LEVELS (TAKEN FROM FIELD LEVELS DESIGN)



KEY PLAN

Rev'n	Date	Description	Drawn	Chk'd	App'd
P02	16.12.2024	UPDATED TO SUIT LATEST LAYOUT	BP	JRC	JRC
P01	03.12.2024	PRELIMINARY ISSUE	TE	JRC	JRC

Status: PRELIMINARY

HAYDN EVANS
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www.haydnevans.co.uk
mail@haydnevans.co.uk

Client: FIELD

Project: BEAULY

Drawing title: SURFACE WATER DRAINAGE STRATEGY

Scale	Drawn	Checked	Approved	Date
A1@1:500	TE	BP	JRC	NOV 2024

Drawing no.: 336-005-001

Revision: P02

PRINT ACCURACY INDICATOR 50mm 100mm

200 MW BESS, Beauly, Inverness
SuDS Management & Maintenance Plan

1 Introduction

Sustainable Drainage Systems (SuDS) features are utilised to manage rainfall and use landscape features to deal with surface water. SuDS control the flow rate and volume of water leaving the development area and reduce pollution by intercepting silt and cleaning run-off from hard surfaces.

Like all aspects of drainage systems, SuDS components should be regularly inspected and maintained. This ensures efficient operation and reduces the likelihood of failure. The level of inspection and maintenance will vary depending on the type of SuDS component. Further information on maintenance can be found in The SuDS Manual (CIRIA publication C753).

The SuDS and drainage features for the Proposed Development are to be maintained by the site owner/occupant.

This Plan should be updated following any changes to the proposed drainage design at detailed design stage.

2 Managing SuDS

The SuDS features have been designed for easy maintenance and comprise:

- Regular maintenance – litter collection and checking the inlets and outlets where water enters or leaves the SuDS feature.
- Occasional tasks – removing any silt that builds up, cutting back and clearing excessive vegetation growth, inspection of outlets, manholes and flow controls.
- Remedial work – repairing damage where necessary.

3 Contact

In the event of concern over any matter to do with the SuDS, please contact the site owner/occupant.

4 SuDS Maintenance

The surface water drainage system includes filter drains, an attenuation basin, flow control, pipes and manholes.

Surface water is collected by filter drains and directed to the attenuation basin via a piped network. Surface water is then directed to filter drains to infiltrate water and also a positive outfall to a highway drain.

Table 1 below provides a breakdown of general maintenance requirements to be undertaken, appropriate to the types of SuDS and surface water drainage systems proposed at this site.

Regular Maintenance		Frequency
1	**Litter Management** Check for and pick up litter around the entire site.	Monthly
2	**Inlets and Outlets** Remove silt and debris from inlets and outlets.	Quarterly
3	**Respond to reported blockages, etc.**	As required
Occasional Maintenance		**Frequency**
4	**Inspection of Control Chamber** Inspection of chambers for silt build up and visually check pipes appear clear and free flowing. Remove silt as required. Jetting as required.	Annually
5	**Inspection of Attenuation** Check for blockages within the connecting pipes.	Quarterly and following heavy storms
Remedial Work		**Frequency**
6	**Inspect SuDS systems to check for damage or failure** Undertake remedial work as required.	Annually
7	**Silt control and removal** Wash or replace filter medium when required.	As required

Table 1: SuDS General Maintenance Requirements

Tables 2 to 6 below provides a breakdown of typical maintenance requirements appropriate to the types of SuDS proposed at this site.

Operation and Maintenance Requirements for Attenuation Basin		
Responsible for Maintenance	**Site Owner/Occupier**	
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular maintenance	Remove litter and debris.	Monthly
	Cut grass - for spillways and access routes.	Monthly (during growing season)
	Cut grass - meadow grass in and around basins.	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants.	Monthly (at start), then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually
	Check any penstocks and other mechanical devices.	Annually
	Tidy all dead growth before start of growing season.	Annually
	Remove sediment from inlets, outlets and forebay.	Annually
	Manage wetland plants in outlet pool, where provided.	Annually
Occasional maintenance	Reseed areas of poor vegetation growth	To be reviewed every 2 years
	Prune and trim any trees and remove cuttings	Every 2 years
	Remove sediment from inlets, outlets, forebay and main basins when required	Every 5 years (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing.	As required
	Realignment of rip-rap.	As required
	Repair/rehabilitation of inlets, outlets and overflows.	As required
	Relevel uneven surfaces and reinstate design levels.	As required

Table 2: Site specific maintenance requirements – Attenuation Basins

Operation and Maintenance Requirements for Pipes, Manholes and Gullies		
Responsible for Maintenance	**Site Owner/Occupier**	
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular inspections	Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	Annually and after leaf fall in autumn
Remedial action	Repair physical damage if necessary.	As required
Monitoring	Inspect for evidence of poor performance. CCTV survey to investigate poor performance.	As required

Table 3: Site specific maintenance requirements – Pipes, manholes and gullies

Operation and Maintenance requirements for Swales		
Responsible for Maintenance	**Site Owner/Occupier**	
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for .48hrs	Monthly, or when required
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, after plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 4: Site specific maintenance requirements – Swales

Operation and Maintenance requirements for Infiltration Basins		
Responsible for Maintenance	**Developer/Household**	
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular maintenance	Remove litter, debris and trash	Monthly
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass – meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation, establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

Table 5: Site specific maintenance requirements – Infiltration Basin

Appendix C Geotechnical Reports

GDG Beauly BESS Geoenvironmental and Geotechnical Desk Study

HGS Dunballoch Farm Site Investigations

GDG
GAVIN & DOHERTY
GEOSOLUTIONS

Beauly BESS Geoenvironmental and Geotechnical Desk Study

FIELD

Client	**Field Beauly Ltd.**
Document Ref.	24092-R-001-01
Project Title	Beauly BESS
Date	04/12/2024

Project Title:	Beauly BESS
Report Title:	Geoenvironmental and Geotechnical Desk Study
Document Reference:	24092-R-001-01

Client:	Field Beauly Ltd.
Confidentiality	Non Confidential

REVISION HISTORY

Rev	Date	Reason for Issue	Originator	Reviewer	Approver
[00]	21/06/2024	Draft	E Cline	R Harrison	J McGrath
01	04/12/2024	Post Review	E Cline	A Shepherd	A Shepherd

DISCLAIMER

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 GENERAL

Gavin and Doherty Geosolutions Ltd. (GDG) was commissioned by Field Beauly Ltd. to complete a Desk Study to establish the geoenvironmental and geotechnical ground conditions at Beauly (the Site) located south of Beauly, Highland, Scotland.

The Site location and Site planning boundary are outlined in Figure 1-1.

Figure 1-1: Site Location Plan

The Desk Study review is intended to inform the proposed development of a 100 MW battery energy storage system (BESS) 1.5 km to the east of the existing Beauly Substation. The proposed development comprises a BESS of up to 100 MW with associated infrastructure, earthworks, drainage, accesses and ancillary works (including landscaping and biodiversity enhancement). The proposed development is illustrated in Figure 1-2 below.

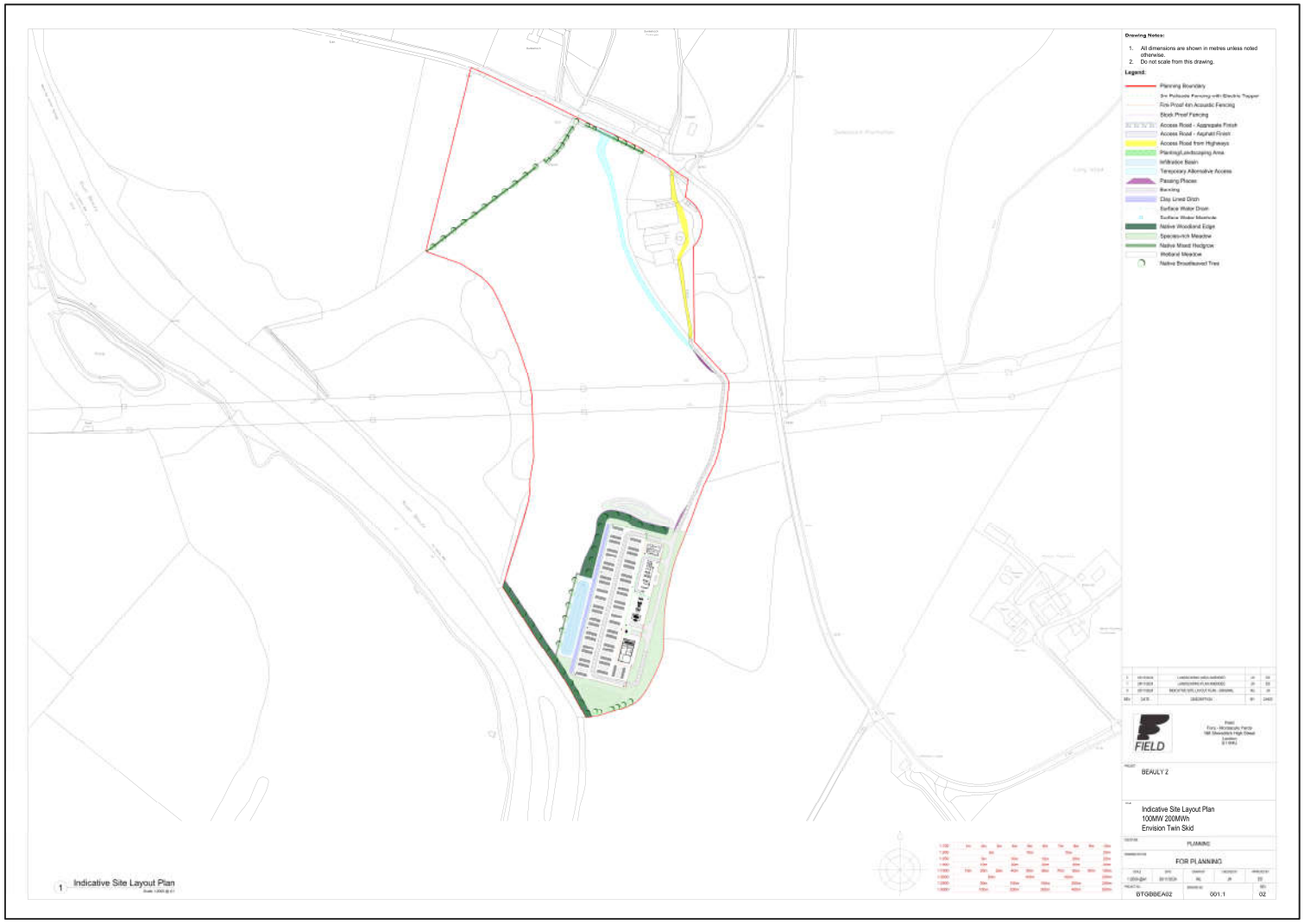

Figure 1-2: Beauly BESS 100 MW Proposed Development (Field 2024)