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TNEI

BESS DEVELOPMENT, FYRISH

LAND CAPABILITY FOR AGRICULTURE REPORT

AUGUST 2024

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Wardell Armstrong LLP
City Quadrant, 11 Waterloo Square, Newcastle upon Tyne, NE1 4DP, United Kingdom
Telephone: +44 (0)191 232 0943 www.wardell-armstrong.com

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TNEI

BESS DEVELOPMENT, FYRISH

LAND CAPABILITY FOR AGRICULTURE REPORT

AUGUST 2024

PREPARED BY:

Dr Silvia Arpano — Senior Soil Scientist

[redacted]

REVIEWED BY:

Dr Bill Crooks — Service Lead - Soils

[redacted]

APPROVED BY:

Jim Heather — Regional Director

[redacted]

CONTENTS

TABLES

APPENDICES

Topsoil and Subsoil Analytical Results

Loss On Ignition, Points 10 and 17

DRAWINGS

GL10503/001 Land Capability of Agriculture

1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by TNEI -on behalf of Field Fyrish Ltd- to undertake a Land Capability for Agricultural (LCA) survey on 17.88 hectares (ha) of agricultural land located off the B9176 near Allness, Scotland (Post Code IV17 0XH) (hereafter referred to as 'the Site') to support the planning application for a proposed BESS development.

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

1.1.1 An informed assessment in line with the Land Capability Classification for Agriculture[1] guidelines has been undertaken using a combination of professional judgement, guidance, legislation, and statutory policy.

1.2 Site description

1.2.1 The Site comprises a single agricultural field covering an approximate area of 17.88 ha which is currently managed as unimproved grassland and sits within a wider ~53.5 ha planning boundary that includes the Fyrish substation and its access road from the B9176 and goes around the woodland area between the surveyed area and the Fyrish substation. This report only covers the survey of the 17.88 ha of agricultural land commissioned for the LCA.

1.2.2 The surveyed Site borders a forested area to the north. To the east and west there are agricultural fields and on the southern border there is a rural estate with a variety of businesses including housing and a timber-processing facility. Three radial drains run towards the median point of the south border and discharge into a ditch. At the time of the survey – less that 24h after a storm- the east half of the Site showed several superficial natural-occurring streams of water, running south.

1.3 Elevation

1.3.1 The overall elevation ranges from 53 to 37 m. with a south-facing average slope of 6.7% and east-facing slope of 2%.

[1] Macaulay Land Use Research Institute (now James Hutton) Land Capability Classification for Agriculture (1991 – ISBN 0 7084 0508 8)

1.4 Definitions

1.4.1 Land Capability for Agriculture was developed by the Macaulay Land Use Research Institute (1991, now James Hutton Institute). The classification comprises three main categories: the class, the division, and the unit. Land suited to arable uses (ploughing or tillage and growing a range of crops) is included in Classes 1 – 4, while land not suited to arable use is in Classes 5 – 7. Classes are assigned by investigating the physical soil properties and interrelated factors such as topography and climate; as well as assessing how they limit the land's suitability for agricultural use. Capability units specify the type of main limitation. The unit is designated using letters added after the Class and Division, e.g. 3.1w. The five principal kinds of limitations recognised are:

- Climatic limitations – symbol c
- Gradient limitations – symbol g
- Soil limitations – symbol s
- Wetness limitations – symbol w
- Erosion limitations – symbol e

1.4.2 The limitations are assessed as set out below.

Direct Limitations

1.4.3 The agroclimatic data of a Site influences the LCA in respect of growing conditions, and the soil reaction in terms of wetness and droughtiness. The overall climatic limitation is assessed using the average annual rainfall and accumulated temperature. It reflects direct effects of water supply and energy available for photosynthesis on plant growth.

1.4.4 Gradient has a significant effect on mechanised farm operations since most conventional agricultural machinery performs best on level ground. Microrelief involves complex changes in slope angle and direction over short distances, or the presence of boulders or rock outcrops; all of which can impact upon the use of agricultural machinery.

1.4.5 Flooding can affect choice of crops to be grown, because it may have a negative influence on the yield of some crops and restrict soil cultivation. The main factor determining the risk of flooding is topography. Local conditions can be assessed based on local knowledge and information from the water authorities. Floods which occur in

summer are generally more damaging than winter floods because the growing roots of the crops are more sensitive to waterlogging. The flood limitation is therefore assessed separately for a 'winter' and a longer 'summer' period (the latter including spring sowing and autumn cultivation).

1.4.6 Soil depth is important when determining available water capacity. Shallowness can affect cropping in several ways, such as restricting the range of cultivation methods available and reducing the potential for nutrient uptake and root growth.

1.4.7 Stones act as an impediment to cultivation, harvesting and crop growth. A high stone content reduces the potential for certain agricultural crop management, can impact agricultural machinery, and reduce crop quality (i.e., bruising potatoes during harvesting).

Interactive Limitations

1.4.8 The physical limitations resulting from the interactions between climate, Site and soil characteristics are soil wetness and droughtiness. Soil wetness limitations adversely affect plant growth or agricultural management (e.g., grazing, trafficking by machinery and poaching by livestock). Droughtiness is most likely to be a significant limitation to crop growth in areas with low rainfall and high evapotranspiration, or where the soil profile holds only small reserves of moisture.

1.4.9 For LCA purposes, the soil wetness assessment takes account of duration of time when soil moisture is at field capacity, and soil susceptibility to waterlogging based on the following soil profile characteristics: depth to slowly permeable layer, depth to gleying features (indicating intermittent waterlogging), and topsoil texture.

1.4.10 A secondary factor, accompanying other more critical limitations such as slope or droughtiness, is erosion related to wind or water. Soils can be at risk from the loss of topsoil, seeds, seedlings and fertiliser, as well as damage from abrasion to plants, due to wind erosion.

2 DESK STUDY

2.1.1 Information about the soil resource and agricultural land present in and surrounding the Site was obtained from the following published sources:

- National Scale Land Capability for Agriculture in Scotland 1: 250 000[2] scale;

[2] Natural Scotland (2017) Land Capability for Agriculture. Available at: https://map.environment.gov.scot/Soil_maps/?layer=5. Accessed August 2024.

- Partial Cover Land Capability for Agriculture Map, 1: 50 000[3] map scale; and
- Carbon and Peatland 2016 map[4]

2.1.2 The 1: 250 000 Soil Map of Scotland created by the Macaulay Institute for Soil Research indicates that the Site area is dominated by the Humus iron podzols belonging to the Ardvanie Soil Association, whose parent material is described as coarse-textured moraine Derived from Schists and sandstone. A small section is also shown as having peaty Alluvail Soils.

2.1.3 Published national scale LCA at 1: 250 000[2] scale identifies the majority of the Site area as Class 3.1 agricultural land which is capable of producing good yields of a narrow range of crops, principally grass and cereals. This classification is supported by the land use of adjacent fields.

2.1.4 The more detailed 1: 50 000 scale published LCA data[3] subdivides the Capability for Agriculture within the Site as a mosaic of three classes with the northeast half shown as Class 3.2, the southwest half as Class 3.1 and a small section in the southwest corner as Class 5.3.

2.1.5 The Carbon and Peatland 2016 Map[5] lists a small section on the South-West Quadrant as being an area of Carbon and Peat Class 4.

3 FIELD SURVEY

3.1.1 The survey was conducted on July 15th and July 16th 2024 and consisted of 15 survey points assessed with a hand auger and two hand dug survey pits which provided a survey density of at least 1 point per hectare as shown on drawing GL10503/001.

3.1.2 Soil samples of both the topsoil land subsoil were taken to confirm soil texture and organic content these results are provided in Appendix 1.

3.1.3 The Site can be divided in three main areas depending on the vegetation cover: drier areas, covered by un-improved grassland, waterlogged areas, covered in rashes and

[3] The James Hutton Institute (2017) Land Capability for Agriculture (1: 50 000). Available at: https://map.environment.gov.scot/Soil_maps/?layer=5. Accessed August 2024.
[4] Carbon and Peatland 2016 map Available at: https://www.spatialdata.gov.scot/geonetwork/srv/eng/catalog.search#/metadata/51b36efb-3521-4243-9bb0-93f8a7a60a71 Accessed August 2024

[5] Carbon and Peatland 2016 map Available at: https://www.spatialdata.gov.scot/geonetwork/srv/eng/catalog.search#/metadata/51b36efb-3521-4243-9bb0-93f8a7a60a71 Accessed August 2024

bog-heather species and a small area of trees. Starting in the southwest corner there is an ~ 5 m higher area of mounded soil that extends north easterly and forms an arched shape across the southwest quadrant of the Site. However, these were later recognised as Drumlins, natural-occurring glacial unconsolidated till.

Figure 1: Looking north at the drumlin running north easterly and forms an arched shape across the southwest quadrant of the Site

3.2 Drainage

3.2.1 Formal drainage consists of a functional ditch running on the southern border of the Site and collecting water from three small water courses running through the Site. The combined catchment of the three drains does not cover the entirety of the Site. Surface water flows from the Western half of the site drains into the south-west quadrant which is topographically lower. This results in standing water in this area, as observed on the survey day.

3.2.2 The Site features two 5 to 10m tall, mounded features that have been identified as naturally-occurring drumlins, a linear one extending from the south-west corner to the centre and discussed above, and a round one in the centre. Due to their irregularity and to the potential difficulties occurring for machinery, both pose a direct gradient constraint on the LCA for the Site.

3.3 Soils identified during the survey

3.3.1 The soil across the northwest (survey points 6, 12 and 16) are consistent with the podzols mapped as occurring on the site. These are moderately well drained (wetness class 2/3) soils with a well-developed dark brown (10 YR 4/3) coloured sandy loam topsoil (Figure 2) to between 35 and 40 cm. This overlays a dark red (5YR 3/3) silt loam

to sandy loam upper subsoil to between 50 and 70 cm which has between 10 to 20% mottling. This overlayed loosely consolidated mixture of stones and sand.

Figure 2: Survey Point 16 showing moderately well-draining sandy loam soils

3.3.2 Soils on the South side of the site are moderately to poorly draining (Wetness class 3/4) gleyed soils. The topsoils are moderately well developed, greyish brown (7.5YR 4/2) sandy loams to between 25 and 40 cm. This overlies gleyed (10YR 6/2) sandy loam upper subsoil to between 50 and 90 cm. The lower subsoils are grey loamy sands or sandy loams (Figure 3).

Figure 3: Survey Point 4 showing gleyed upper subsoils

3.3.3 The soil on the elevated arch-shaped areas (survey Point 13 and 14) and on the other elevated point (Survey point 7) consisted of weakly developed mixtures of topsoil and subsoil.

3.3.4 In the saturated area of the site (survey point 17) the topsoil consisted of an organic layer to 60 cm which overlays a poorly structured and heavily gleyed silt loam subsoil to > 120 cm. Soil structure in the waterlogged areas was massive and the analysis confirmed that the topsoil has an organic content of 62%, as shown by the analytical results of Loss of Ignition in Appendix 2.

3.4 Land capability for Agriculture

Climate

3.4.1 The nearest reference station is Inverness (12) and is located ~ 30km from the Site and located at similar altitude and for the purposes of this assessment the maximum LCA based on climate for the Site is Class 2. The estimated field capacity days used for this assessment was 175.

Gradient

3.4.2 Limitation set by a gradient is primarily a function to the ability of the machinery to

cope with sloping land. The two drumlins could not be a managed using standard agriculture machinery. The area of the arch-shaped relief is therefore classified as 5.3, which is consistent with the 1: 50 000 LCA partial cover grading. The other drumlin (Survey Point 7) was downgraded from 3.2 to 5.3, in contrast with the 1: 50 000 LCA partial cover. The rest of the Site features a maximum gradient of 7% and gradient is not a limiting factor.

Soil

3.4.3 Soil depth, texture and stoniness were not a limiting factor on any part of the Site.

Droughtiness

3.4.4 The site is estimated as having a relatively low available water capacity of between 122 and 153 mm and the free draining soil in the northwest of the site have been downgraded to Class 3.1 due to a moderate droughty limitation.

Wetness

3.4.5 In the north of the site the upper subsoils soils are heavily gleyed and this area is wetness class 3 to 4. The soils have a medium retained water capacity, and this area is Class 3.2 due to moderately severe wetness limitation.

3.4.6 The 60 cm carbon-rich topsoil that occur onsite will not to be suitable for arable production at any time of the year and is wetness class 6. This area has been downgraded from 3.2 to Class 6.3, as is able to support low value grazing only.

3.4.7 The LCA considers the final class as if systematic drainage system were implemented. For this reason, the southeast quadrant, although waterlogged at the time of the survey is confirmed as classified as 3.2 as it is the entire east half of the Site.

3.4.8 Similarly, the northwest quadrant of the Site, is confirmed as 3.1 due to the absence of gleyed features in the upper subsoil, that partially lift the wetness limitation.

Erosion and Flood risk

3.4.9 Wind erosion and flood risk were not considered a limitation.

3.5 Overall Agricultural Land Classification

3.5.1 The whole site is limited to Class 2 due to Climate.

3.5.2 The northwest section (2.80 ha) has been downgraded to Class 3.1 due to a minor droughtiness limitation and the eastern half of the site (10.71 ha) has been downgraded to Class 3.2 due to a moderately severe wetness limitation.

3.5.3 The area of organic soils in southwestern section of the site (1.58 ha) has been downgraded to Class 6.2 due to a very severe wetness limitation. This area has been given a Class 4 status on the Carbon and Peatland Map for Scotland and this assessment confirmed the presence of carbon rich soils.

3.5.4 The two areas of mounded soil, the drumlins, have been downgraded to Class 5.3 due to gradient.

3.5.5 A small area (0.27 ha) along the Southern Boundary has been classed as Urban as it is not used for Agriculture.

3.5.6 A summary of the LCA gradings for the Site is shown in Table 1, and shown geographically in *Drawing GL10503/001.*

Table 1: Summary of LCA within the Site Boundary

LCA	Area (ha)	Percentage (%)
Class 3.1	2.8	15.7
Class 3.2	10.7	59.8
Class 5.3	2.51	14.1
Class 6.3	1.57	8.8
Non-Agriculture Land	0.27	1.5
Total	17.88	100

4 POLICY AND GUIDANCE

4.1 National level

The National Planning Framework 4

4.1.1 The National Planning Framework 4 (NPF4)[6], published in February 2023, is the national spatial strategy for Scotland. It sets out the spatial principles, regional priorities, national developments, and national planning policy.

4.1.2 Policy 5 (a) states development proposals will only be supported if they are designed and constructed: i) in accordance with the mitigation hierarchy by first avoiding and then minimising the amount of disturbance to soils on undeveloped land; and ii) In a manner that protects soil from damage including from compaction and erosion, and that minimises soil sealing.

4.1.3 Policy 5 (b) states development proposals on prime agricultural land, or land of lesser quality that is culturally or locally important for primary use, as identified by the Local

[6] Scottish Government (2023) National Planning Framework 4. Available at: https://www.gov.scot/publications/national-planning-framework-4/pages/3/. Accessed August 2024.

Development Plans (LDP), will only be supported where it is for: iv) The generation of energy from renewable sources or the extraction of minerals and there is secure provision for restoration; and in all of the above exceptions, the layout and design of the proposal minimises the amount of protected land that is required.

Getting the best from our land - A land use strategy for Scotland (Published March 2021)[7]

4.1.4 The document provides a broad context for planning authorities on Government policies relevant to land use. Planning authorities are expected to have regard to the Strategy in preparing development plans. The principal policy framework, however, continues to be provided by the National Planning Framework, and decisions should be made in accordance with the development plan unless material considerations indicate otherwise.

4.2 Local policy

4.2.1 The Site falls within the administrative area of the Highland Council, A new local development plan is currently being prepared for Highland and is expected to be adopted towards the end of 2027[8] which will replace existing local development plans,. Until this time, the Inner Moray Firth Local Development Plan 2 (adopted June 2024)[9] and the Highland-wide Local Development Plan (adopted April 2012)[10] apply. No policies relevant to soils and agricultural land are included in the Inner Moray Firth Local Development Plan adopted in June 2024.

Highland-wide Local Development Plan (adopted April 2012)

4.2.2 Policy 28 (Sustainable Design) states that the Council will support developments which promote and enhance the social, economic and environmental wellbeing of the

[7] Scottish Government (2021) Land use - getting the best from our land: strategy 2021 to 2026. Available at: https://www.gov.scot/publications/scotlands-third-land-use-strategy-2021-2026-getting-best-land/. Accessed August 2024.
[8] The Highland Council (2024) Highland Local Development Plan. Available at: https://www.highland.gov.uk/info/178/development_plans/1101/highland_local_development_plan_hldp. Accessed August 2024.
[9] The Highland Council (2024) Inner Moray Firth Local Development Plan. Available at: https://www.highland.gov.uk/downloads/file/28837/inner_moray_firth_local_development_plan_2_strategy_and_general_policies. Accessed August 2024.
[10] Highland-wide Local Development Plan (2012) Highland-wide Local Development Plan. Available at: https://www.highland.gov.uk/info/178/development_plans/199/highland-wide_local_development_plan. Accessed August 2024.

people of Highland. Policy 28 states that proposed developments will be assessed on the extent to which they impact on prime quality agricultural land.

4.2.3 Policy 55 (Peat and Soils) of the Highland-wide Local Development Plan states that development proposals should demonstrate how they have avoided unnecessary disturbance, degradation or erosion of peat and soils. Additionally, this policy outlines that unacceptable disturbance of peat will not be permitted unless it is shown that the adverse effects of such disturbance are clearly outweighed by social, environmental or economic benefits arising from the development proposals. Where development on peat is clearly demonstrated to be unavoidable then the Council may ask for a peatland management plan to be submitted which clearly demonstrates how impacts have been minimised and mitigated.

5 CONCLUSIONS

5.1.1 The Site consists of 2.8 ha of LCA Class 3.1 land, 10.71 ha of LCA Class 3.2, 2.52 ha of LCA Class 5.3, 1.58 ha of LCA Class 6.3 and 0.27 ha of non-agricultural land.

5.1.2 The Site features clay loam brown topsoils, followed by a dark red silt loam upper subsoil sitting on a loosely consolidated mixture of stones and sand in the northwest. Moderately to poor-draining, gleyed soils on the south of the site overlying gleyed sandy loam. the Drumlins consists of weakly developed mixtures of topsoil and subsoil, and finally, south of a drumlin, and organic, 60cm deep soil was sampled on site.

APPENDICES

Appendix 1: analytical Results

ANALYTICAL REPORT

Report Number	**45063-24**	**H448**	**WARDELL ARMSTRONG LLP**	**Client**
Date Received	**26-JUL-2024**		**CITY QUADRANT**	
Date Reported	**13-AUG-2024**		**11 WATERLOO SQUARE**	
Project	**GL20503**		**NEWCASTLE UPON TYNE**	
Reference	**SILVIA ARPANO**		**NE1 4DP**	
Order Number	**PO GL1580**			

Laboratory Reference		**SOIL705517**	**SOIL705518**
Sample Reference		**FYRISH SUB SOIL 1,3**	**FYRISH S/S 6 11 12**
Determinand	**Unit**	**SOIL**	**SOIL**
pH water [1:2.5]		5.9	6.1
Sand 2.00-0.063mm	% w/w	16	79
Silt 0.063-0.002mm	% w/w	67	14
Clay <0.002mm	% w/w	17	7
Textural Class **		ZL	LS

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Document Control

** Please see the attached document for the definition of textural classes.

Reported by

Teresa Clyne

Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: [redacted]
Fax:
email: enquiries@nrm.uk.com

ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

Class	Code
Sand	S
Loamy sand	LS
Sandy loam	SL
Sandy Silt loam	SZL
Silt loam	ZL
Sandy clay loam	SCL
Clay loam	CL
Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

For the *sand, loamy sand, sandy loam* and *sandy silt loam* classes the predominant size of sand fraction may be indicated by the use of prefixes, thus:

- vf Very Fine (more than 2/3's of sand less than 0.106 mm)
- f Fine (more than 2/3's of sand less than 0.212 mm)
- c Coarse (more than 1/3 of sand greater than 0.6 mm)
- m Medium (less than 2/3's fine sand and less than 1/3 coarse sand).

The subdivisions of *clay loam* and *silty clay loam classes* according to clay content are indicated as follows:

- M medium (less than 27% clay)
- H heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

ANALYTICAL REPORT

Report Number	**45064-24**	**H448**	**WARDELL ARMSTRONG LLP**	**Client**	**SA-GL20503-001**
Date Received	**26-JUL-2024**		**CITY QUADRANT**		**GL10538**
Date Reported	**14-AUG-2024**		**11 WATERLOO SQUARE**		
Project	**SA GL20503 001**		**NEWCASTLE UPON TYNE**		
Reference	**GL10538**		**NE1 4DP**		
Order Number	**PO GL1580**				

Laboratory Reference		**SOIL705522**	**SOIL705523**
Sample Reference		**FYRISH TOP SOIL 1,3**	**FYRISH TS 6,11,12**
Determinand	**Unit**	**SOIL**	**SOIL**
pH water [1:2.5]		5.9	5.8
Available Phosphorus (Index)	mg/l	18.4 (2)	35.8 (3)
Available Potassium (Index)	mg/l	25.0 (0)	69.3 (1)
Available Magnesium (Index)	mg/l	41.6 (1)	92.3 (2)
Sand 2.00-0.063mm	% w/w	77	73
Silt 0.063-0.002mm	% w/w	13	17
Clay <0.002mm	% w/w	10	10
Organic Matter LOI	% w/w	2.6	4.6
Textural Class **		SL	SL

Notes

Analysis Notes

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Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: [redacted]
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Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

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- M medium (less than 27% clay)
- H heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

Appendix 2 Loss On Ignition: Points 10 and 17

ANALYTICAL REPORT

Report Number	**45065-24**	**H448**	**WARDELL ARMSTRONG LLP**	**Client**	**GL10538**
Date Received	**26-JUL-2024**		**CITY QUADRANT**		
Date Reported	**02-AUG-2024**		**11 WATERLOO SQUARE**		
Project	**SA GL20503 001**		**NEWCASTLE UPON TYNE**		
Reference	**GL10538**		**NE1 4DP**		
Order Number	**PO GL1580**				

Laboratory Reference		**SOIL705526**	**SOIL705527**
Sample Reference		**FYRISH T/S 17 PEAT**	**FYRISH T/S 10 PEAT**
Determinand	**Unit**	**SOIL**	**SOIL**
Organic Matter LOI	% w/w	62.8	5.3

Notes

Analysis Notes
The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

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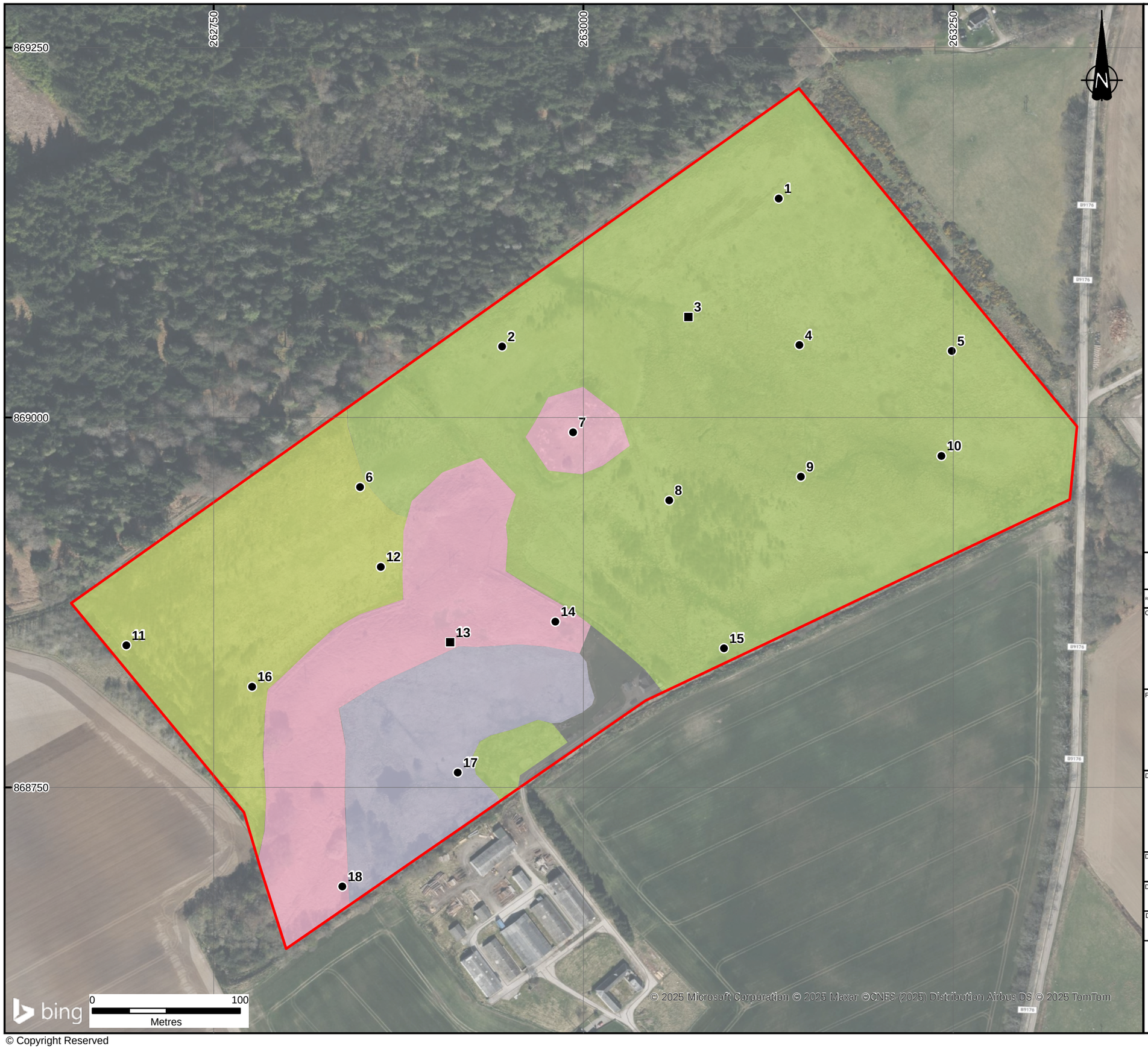
Reported by *Teresa Clyne*

Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: [redacted]
Fax:
email: enquiries@nrm.uk.com

DRAWINGS



KEY

- Surveyed Area

Land Capability for Agriculture

- Class 3.1
- Class 3.2
- Class 5.3
- Class 6.3
- Urban
- Auger Core
- Profile Pit

Land Capability for Agriculture	Area
Class 3.1	2.8 ha
Class 3.2	10.71 ha
Class 5.3	2.52 ha
Class 6.3	1.58 ha
Urban	0.27 ha

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
B	KEY AMENDMENTS	02/25	SRW	BC	JH
A	FIRST ISSUE	08/24	SRW	BC	JH

CLIENT

TNEI

PROJECT

FYRISH BESS

DRAWING TITLE

LAND CAPABILITY FOR AGRICULTURE - FYRISH

DRG No.	REV	SUIT. CODE
GL10503/001	B	--

DRG SIZE	SCALE	DATE
A3	1:2,500	12/02/2025

DRAWN BY	CHECKED BY	APPROVED BY
SRW	BC	JH

wardell armstrong

wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)1782 276 700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

BOLTON
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)1204 227 227

BRISTOL
Temple Studios
Temple Gate
Redcliffe
Bristol
BS1 6QA
Tel: +44 (0)117 203 4477

BURY ST EDMUNDS
Armstrong House
Lamdin Road
Bury St Edmunds
Suffolk
IP32 6NU
Tel: +44 (0)1284 765 210

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial Estate
Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)1228 550 575

EDINBURGH
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW
24 St Vincent Place
Glasgow
G1 2EU
Tel: +44 (0)141 428 4499

LEEDS
36 Park Row
Leeds
LS1 5JL
Tel: +44 (0)113 831 5533

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International office:

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

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