

**AGRICULTURAL QUALITY OF
LAND AT BICKER FEN NORTH
LINCOLNSHIRE**

Report 2077/2

18th January, 2023

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NORTH, LINCOLNSHIRE**

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Report 2077/2

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1.0 Introduction

- 1.1 This report provides information on the agricultural quality of land to the north-east of Sleaford, near the villages of Howell and Ewerby, Lincolnshire. The site comprises 526.6 ha of mainly arable land, with lesser areas of grassland, reservoirs and woodlands. The site is slightly undulating at an elevation of approximately 5-15 m AOD
- 1.2 1:50,000 BGS geological information shows the underlying geology of the site as Oxford Clay, with a superficial cover of glacial till, and with some tidal flat deposits in parts.
- 1.3 The National Soil Map¹ shows most of the land Beccles 3 Association comprising mainly slowly permeable seasonally waterlogged fine loamy over clayey soils developed in chalky till, with some similar soils with only slight seasonal waterlogging. Also noted are lesser areas of Ruskington Association: mainly deep calcareous fine loamy and sandy soils affected by groundwater, and Wallasea 2 Association, comprising stoneless clay soils developed in marine alluvium.

¹ Hodge C.A.H. *et al* (1984). *Soils and their use in Eastern England*. Soil Survey Bulletin No 13

2.0 Agricultural Land Quality

2.1 To assist in assessing land quality, the former Ministry of Agriculture, Fisheries and Food (MAFF) developed a method for classifying agricultural land by grade according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use for food production. The MAFF Agricultural Land Classification (ALC) system² classifies land into five grades numbered 1 to 5, with grade 3 divided into two sub-grades (3a and 3b). The system was devised and introduced in the 1960s and revised in 1988.

- The agricultural climate is an important factor in assessing the agricultural quality of land and has been calculated using the Climatological Data for Agricultural Land Classification.³ The site data was calculated at five points across the site with no significant variation in the results. A representative selection of site data is given below from a central point (grid reference TF148485) for an average elevation of 10 m.

- Average annual rainfall: 562 mm
- January-June accumulated temperature >0°C 1425 day°
- Field capacity period 105 days
(when the soils are fully replete with water) Mid Dec – late March
- Summer moisture deficits for: wheat: 117 mm
potatoes: 112 mm

2.2 There are no climatic limitations to agricultural land quality in this location.

2.3 A semi-detailed Agricultural Land Classification survey was conducted in October 2022 at selected intersections of a 100 m grid, giving an average density of approximately 1 observation per 5 ha. This density of survey is below that recommended by Natural England for planning applications, and is intended to give provisional grades only. During the survey soils were investigated via a combination of hand auger borings and small pits to a

² MAFF, (1988). *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

³ *Climatological Data for Agricultural Land Classification*. Meteorological Office, 1989

maximum depth of 1.2 m. Survey logs and pit descriptions are recorded in an appendix to this report.

- 2.4 The survey was used in conjunction with the agro-climatic data above to classify the site using the revised guidelines for ALC issued in 1988 by MAFF².

Survey results

- 2.5 The distribution of the land grades is shown on Map 2 in an appendix to this report.
- 2.6 The majority of the land is dominated by heavy soils developed on glacial till. The soils are slowly permeable and are classed as subgrade 3b because of wetness/workability limitations, which restrict access for cultivations in late autumn and early spring.
- 2.7 On slightly higher ground, especially in the south of the site, the soils have either loamier or calcareous topsoils. This land is considered easier to work and the land is classed as subgrade 3a on wetness/workability.
- 2.8 In the east of the site some soils are developed in either marine deposits of clay and silt and are close to a pumping station, so tend to be in the regime of classic heavy fenland. Air photographs show distinct old creek patterns and the topography is undulating. While some soils have clay subsoils, these are well structured and tend to be more permeable than those on the glacial tills so are more workable. Silt hills or “roddons” on the creek patterns have relatively freely draining soils and in large areas would be classed as grade 1 or 2. The complex soil pattern in this area has led to its inclusion in land quality 3a with a pattern limitation.
- 2.9 Between the glacial till area and the alluvial areas are fen margin deposits often with sandy soils. Some of these are freely draining but slightly affected by groundwater, and the sandier types have limited reserves of available water to sustain crop growth and classed as subgrade 3b with a droughtiness limitation. Other soils with loamier layers are less droughty and the land is in subgrade 3a, and there are also areas of grade 2 land locally.

APPENDIX

DETAILS OF OBSERVATIONS

MAPS

Land at Bicker Fen North, Lincolnshire: Details of observations at each sampling point

Obs No	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality	
	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling			Grade	Main limitation
1	0-30	HCL	2	30-45	HCL	xxx	45-60 60-80	C C+chk stones	xxx xxx	0	III	3b	W
2	0-28	HCL	2	28-75	C	xxx	75-100	C+chk stones	xxx	0	III	3b	W
3	0-30	HCL	2	30-70	HCL-C	xxx	70-90	C+chk stones	xxx	0	II/III	3a/3b	W
4	0-31	HCL	2	31-40	HCL-C	xxx	40-55 55-70 70+	C C+chk stones stop on stones	xxx xxx	1	III	3b	W
5	0-30	SCL	2	30-70	SCL	xx(x)	70-100	SCL	xxx	0	II	2	W
6	0-30	HCL	2	30-40	HCL	xxx	40-70 70-90	HCL-C C+chk stones	xxx xxx	0	III	3b	W
7	0-30	HCL	1	30-50	C	xxx	50-80+	C+chk stones	xxx	0	III	3b	W
8	0-30	C	2	30-65	C	xxx	65-100	C+chk stones	xxx	0	III	3b	W
9	0-30	C	2	30-60	C	xxx	60-90	C+chk stones	xxx	0	III	3b	W
10	0-30	SCL	4	30-50	SCL-HCL	xxx	50-90	C+chk stones	xxx	0	III	3a	W
11	0-30	C	2	30-50	C	xxx	50-80+	C+chk stones	xxx	0	III	3b	W
12	0-30	HCL	1	30-40	C	xxx	40-80+	C+chk stones	xxx	0	III	3b	W
13	0-30	HCL-C	2	30-50 50-70	HCL-C ca C-HCL	xxx xxx	70-90+	C+chk stones	xxx	0	III	3b	W
14	0-30	ca HCL	2	30-45	ca C	xxx	45-70 70+	v cky C stop on stones	xxx	0	III	3a	W
15	0-28	HCL-C	2	28-50	C	xxx	50-80+	C+chk stones	xxx	0	III	3b	W
16	0-27	ca HCL	2	27-45	ca C	xxx	45-70 70+	v cky C stop on stones	xxx	0	III	3a	W
17	0-30	ca HCL	2	30-60	br ca C	xx	60-80	br C+chks	xxx	0	III	3a	W
18	0-30	HCL	1	30-50	C	xxx	50-70+	C+chk stones	xxx	1	III	3b	W
19	0-30	dk C	3	30-65	gr C	xxx	65-120	rb C	xxxx	0	III	3b	W
20	0-30	HCL	2	30-50	rb C	xxxx	50-100	ca gr C	xxxx	0	III	3b	W
21	0-28	HCL	3	28-55	C	xxx	55-80+	C+chk stones	xxx	0	III	3b	W
22	0-30	HCL	3	30-40	C	xx(x)	40+	stop on stones		1	III	3b	W
23	0-30	HCL	4	30-50	st SCL	xx	50+	stop on stones		1	III	3a	W,D
24	0-30	HCL-C	2	30-80	C	xxx	80-100	C+chk stones	xxxx	0	III	3b	W
25	0-30	HCL	2	30-50	C	xxx	50-90	C+chk stones	xxx	0	III	3b	W
26	0-30	SCL	2	30-45	SCL	xxx	45-65 65-90	C C+chk stones	xxx xxx	0	III	3a	W
27	0-30	C	2	30-65	C	xxx	65-100	C+chk stones	xxx	0	III	3b	W
28	0-28	C	0	28-80	dk C	xxx	80-90	gr C	xxx	1	III	3b	W

Obs No	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality	
	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling			Grade	Main limitation
29	0-30	HCL	3	30-45	C	xxx	45-90	C+chk stones	xxx	2	III	3b	W
30	0-26	HCL	2	26-60	C	xxx	60-90	C+chk stones	xxx	0	IV	3b	W
31	0-27	HCL	2	27-50	C	xxx	50-80+	C+chk stones	xxx	0	III	3b	W
32	0-26	C	2	26-70	C	xxx	70-90	C+chk stones	xxx	0	III	3b	W
33	0-26	C	4	26-80	C	xxx	80-100	C+chk stones	xxx	0	III	3b	W
34	0-25	HCL	3	25-65	C	xxx	65-100	C+chk stones	xxx	<1	III	3b	W
35	0-35	dk HCL-C	2	35-60	gr C	xxx	60-100	C+chk stones	xxx	<1	III	3b	W dist
36	0-30	(ca) HCL	1	30-70	gr C	xxxx	70-100	C+chk stones	xxxx	0	III	3b/3a	W
37	0-28	HCL-C	2	28-70	C	xxx	70-100	(chalky) C	xxxx	0	III	3b	W
38	0-28	C	3	28-60	C	xxx	60-90	C+chk stones	xxx	0	III	3b	W
39	0-32	C	3	32-40	HCL	xxx	40-70 70-100	rb C ca C +chks	xxx	0	III	3b	W
40	0-28	HCL	3	28-60	gr br C	xxx	60-100	rb C	xxx	0	III	3b	W
41	0-30	C	3	30-70-	rb C	xxx	70-100	gr C	xxxx	0	III	3b	W
42	0-27	C	3	27-50	C	xxx	50+	stop on stones		0	III	3b	W
43	0-28	HCL	2	28-100	gr C	xxx				0	III	3b	W
44	0-27	C	2	27-60	C	xxx	60-90	C+chk stones	xxx	0	III	3b	W
45	0-30	HCL	2	30-65	C	xxx	65-100	(chky) C	xxx	0	III	3b	W
46	0-28	C	2	28-90	rb C	xxx	90-110	ca gr C	xxxx	0	III	3b	W
47	0-30	C	3	30-90	rb C	xxx				0	III	3b	W
48	0-30	HCL	3	30-50	gr C	xxx	50-80+	C+chk stones	xxx	0	III	3b	W
49	0-30	HCL	2	30-50	grb C	xxx	50-70	C+chk stones	xxx	0	III	3b	W
50	0-30	dk HCL	2	30-50	gr C	xxx	50-80	ca C	xxx	0	IV	3b	W
51	0-28	HCL-C	2	28-100	br C	xxx				0	III	3b	W
52	0-32	SCL	2	32-55	C	xxx	55-70+	C+chk stones	xxx	0	III	3a	W
53	0-33	HCL	2	33-40	C	xxx	40-80+	C+chk stones	xxx	0	III	3b	W
54	0-30	ca HCL	2	30-65	C+chk stones	xxx	65-100	rb C	xxx	0	III	3b	W
55	0-28	HCL	2	28-45	C	xxx	45-60 60+	C+chk stones stop on stones	xxx	0	III	3b	W
56	0-30	C	2	30-80	rb C	xxx				0	III	3b	W
57	0-30	ca HCL	3	30-80	C+chk stones	xxx				0	III	3a	W
58	0-30	HCL	2	30-55	C	xxx	55-80	C+chk stones	xxx	0	III	3b	W
59	0-30	HCL-SCL	1	30-80	C	xxx				0	III	3b/3a	W
60	0-28	MCL	2	28-60	C	xxx	60-90	gr C	xxxx	0	III	3a	W
61	0-28	SCL	2	28-50	MSL	xx	50-80+	C+chk stones	xxx	0	II	2/30	W
62	0-30	C-HCL	2	30-80	rb C	xxx				0	III	3b	W
63	0-30	SCL	2	30-65	SCL	xxx	65-95 95+	MSL stop on gravel	xx	0	II	2	W

Obs No	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality	
	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling			Grade	Main limitation
64	0-32	HCL	2	32-60	grb C	xxx	60-90	rb C	xxx	0	III	3b	W
65	0-30	HCL-C	1	30-90	rb C	xxx				0	III	3b	W
66	0-30	HCL	2	30-50	C	xxx	50-70	C+chk stones	xxx	0	III	3b	W
67	0-28	ca HCL	2	28-50	v chky C	xxxx	50+	stop on stones		0	III	3a	W
68	0-30	dk C	1	30-70	gr C	xxx	70-90	HCL	xxx	0	III	3b	W
69	0-32	dk HCL	2	32-50	gr C	xxx	50-100	rb C+chks?	xxx	0	III	3b	W
70	0-30	dk C	1	30-60	gr C	xxx	60-100	ca C	xxxx	0	III	3b	W
71	0-26	C	2	26-100	rb C	xxx				0	IV	3b	W
72	0-30	C	2	30-65	C	xxx	65-90+	C+chk stones	xxx	0	III	3b	W
73	0-30	dk C	1	30-50 50-62	C SCL	xxx xxx	65-80 80-120	C+S MSL	xxx xxx	0	III	3b	W
74	0-28	dk C	1	28-80	C	xxx	80-100 100-120	MS gr C	xxx xxx	0	II/III	3a/3b	W
75	0-30	HZCL	1	30-100	banded ZCL	xxx				0	I/II	2/3a	W
76	0-30	HCL-C	0	30-60	C	xxx	60-100	rb C	xxx	0	II/III	3a/3b	W
77	0-30	dk C	0	30-60	C	xxx	60+	stop on tile		0	II/III	3a/3b	W
78	0-30	HCL	2	30-45	C	xxx	45-80	C+chk stones	xxxx	0	III	3b	W
79	0-30	SCL-MCL	2	30-45	SCL	xxx	45-90	rb C	xxx	0	III	3a	W
80	0-30	dk HCL	0	30-55	SCL-MSL	xxx	55-80	ca rb C	xxx	0	III	3a	W
81	0-30	HCL	0	30-80	C+S banded	XXX				0	II/III	3a/3b	W
82	0-33	HCL	2	33-40 40-55	HCL-C MSL	xxx o-x	55-90 90-110	LMS MS	x xxx	0 0	 III	 3a	 W
83	0-30	SCL	2	30-75	C	xxx	75-120	SCL-MS	xxxx	0	III	3a	W
84	0-28	,SL	1	28-110	(st) MS	xx				0	II	3b	D
85	0-30	LMS	1	30-70	st MS	x	70+	stop on stones		0	II	3b	D
86	0-30	MSL	2	30-100+	LMS-MS	x				0	II	3a	D
87	0-35	SCL	2	35-60	C+S	xxx	60-75 75-100	MS C+chk stones	xxx xxx	0	II/III	2/3a	W
88	0-30	HCL	0	30-40	HCL-C	xx	40-90	LMS	xxx	0	II	3a	W
89	0-30	SCL-MCL	1	30-70	LMS	xx	70-90	(st) MS		0	II	3a	D
90	0-35	HCL	2	35-60	rb C	xxx	60-90 90-120	LMS st MS	xx	0	II/III	3b	W
91	0-30	HCL	2	30-70	rb C	xxx	70-90 90-120	MSL MS+gravel	xxx xxx	0	III	3b	W
92	0-30	dk C	2	30-60	rb C	xxx	60-100	gr C	xxx	0	III	3b	W
93	0-30	dk C	2	30-55	rb C	xxx	55-100	C+chk stones	xxx	0	II/III	3a/3b	W
94	0-30	C	1	30-110	rb C	xxx		good structure		0	I/III	3b	W
95	0-30	C	0	30-75	rb C	xxx	75-110	MS	xxx	0	III	3a/3b	W

Obs No	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality	
	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling			Grade	Main limitation
96	0-27	C	0	27-40	MSL	0	40-65 65	(h) MS st MS	xxx xxx	0 0	II II	3a 3a	W W
97	0-28	HZCL	1	28-50	C	xxx	50-75 75-110	(h) MSL MS	o xxx	0	II/III	3a/3b	W
98	0-30	C	1	30-70	rb C	xxx	70-100 100-120	MSL MS	o xxx	0	II/III	3a/3b	
99	0-25	SCL	1	25-40	SCL	xxx	40-50 80-90+	MSL C+chk stones	xxx xxx	0	II/III	2/3a	W
100	0-28	SCL	2	28-50	SCL	xxx	50-90+	SBC	xxx	0	III	3a	W
101	0-35	HCL-SCL	2	35-50	SCL	xxx	50-80+	C+chk stones	xxx	0	III	3a	W
102	0-30	ca HCL	2	30-70	C+chk stones	xxx	70+	stop on stones		<1	III	3a	W
103	0-30	C	1	30-90	gr C	xxx				0	III	3a	W
104	0-33	HCL	1	33-45	SCL	xxx	45-120	MS	xxx	<1	II	3a	W,D
105	0-30	ca HZCL	0	30-70	HZCL banded	xxx	70-110	ZL	xxx	0	II	2	W
106	0-33	HCL-C	0	33-80	rb C	xxx				0	III	3b	W
107	0-30	ca HCL	0	30-50	gr C	xxx	50-80	C+chk stones	xxx	0	III	3b(3a)	W
108	0-30	HCL	4	30-45	C	xxx	45-80+	C+chk stones	xxx	0	III	3b	W
109	0-30	SCL	3	30-50	C	xxx	50-80+	C+chk stones	xxx	0	III	3a	W
110	0-28	SCL	3	28-42	SCL	xxx	42-80+	C+chk stones	xxx	0	III	3a	W

Key to table

Mottle intensity:

o	unmottled
x	1-2% ochreous mottles and brownish matrix (or a few to common rusty root mottles (topsoils) ³)
xx	>2% ochreous mottles and brownish matrix and/or dull structure faces (slightly gleyed horizon)
xxx	>2% ochreous mottles and greyish or pale matrix or reddish matrix and >2% greyish, brownish or ochreous mottles or fmn concentrations (gleyed horizon)
xxxx	dominantly bluish matrix , often with some ochreous mottles (gleyed horizon)

Slowly permeable layers⁴

A depth underlined (e.g. 50) indicates the top of a slowly permeable layer

A wavy underline (eg 5Q) indicates the top of a layer bordering to
extremely)

slowly permeable

Texture:

C	- clay
ZC	- silty clay
SC	- sandy clay
CL	- clay loam (H-heavy, M-medium)
ZCL	- silty clay loam (H-heavy, M-medium)
SCL	- sandy clay loam
SZL	- sandy silt loam (F-fine, M-medium, C-coarse)
SL	- sandy loam (F-fine, M-medium, C-coarse)
LS	- loamy sand (F-fine, M-medium, C-coarse)
S	- sand (F-fine, M-medium, C-coarse)
P	- peat (H-humified, SF-semi-fibrous, F-fibrous)
LP	- loamy peat; PL - peaty loam

Wetness Class⁵

I (freely drained) to VI (very poorly drained)

Limitations:

W	- wetness/workability
D	- droughtiness
De	- depth
St	- stoniness
SI	- slope
F	- flooding
T	- topography/microrelief

Suffixes & prefixes

r-reddish, gn greenish, brbrownish, gr-grey

o-organic,

(m, v, x)st (very slightly, slightly, extremely) stony

chky-chalky

⁷{vsl, sl, m, v,x}(very slightly,slightly,moderately, very,

ca – calcareous

Other abbreviations

fmn –ferri-manganiferous concentrations

dist - disturbed soil layer;

R – bedrock (chky – Chalk, SST – Sandstone,

PLST – Limestone, MST – Mudstone, FeSt – Ironstone))

¹Gley indicators in accordance with Hodgson, J.M. (1997) Soil survey Field Handbook (third edition) Soil Survey Technical Monograph No 5

²Texture in accordance with particle size classes in Hodgson (1997)

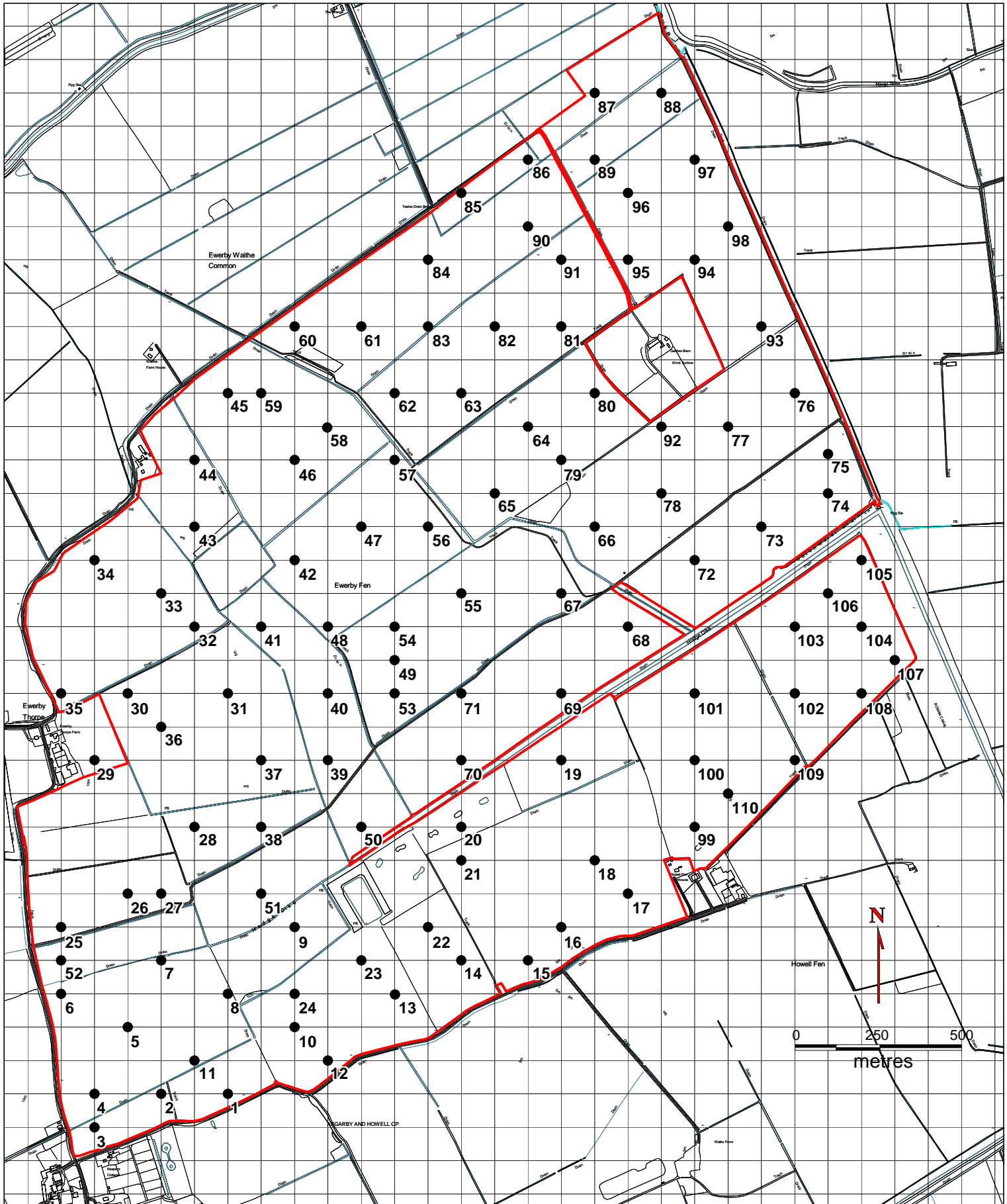
³Occasionally recorded in the texture box

⁴Permeability is estimated for auger borings and confirmed by full pit observations in accordance with the definitions in Hodgson (1997)

⁵Soil Wetness Classes are defined in Hodgson (1997)

⁶Stoniness classes as defined in Hodgson (1997)

⁷Calcareous classes as defined in Hodgson (1997)



Client



Project

Bicker Fen North

Map

**Map 1
Location of the observations**

KEY

● Auger location

□ Survey area

Scale

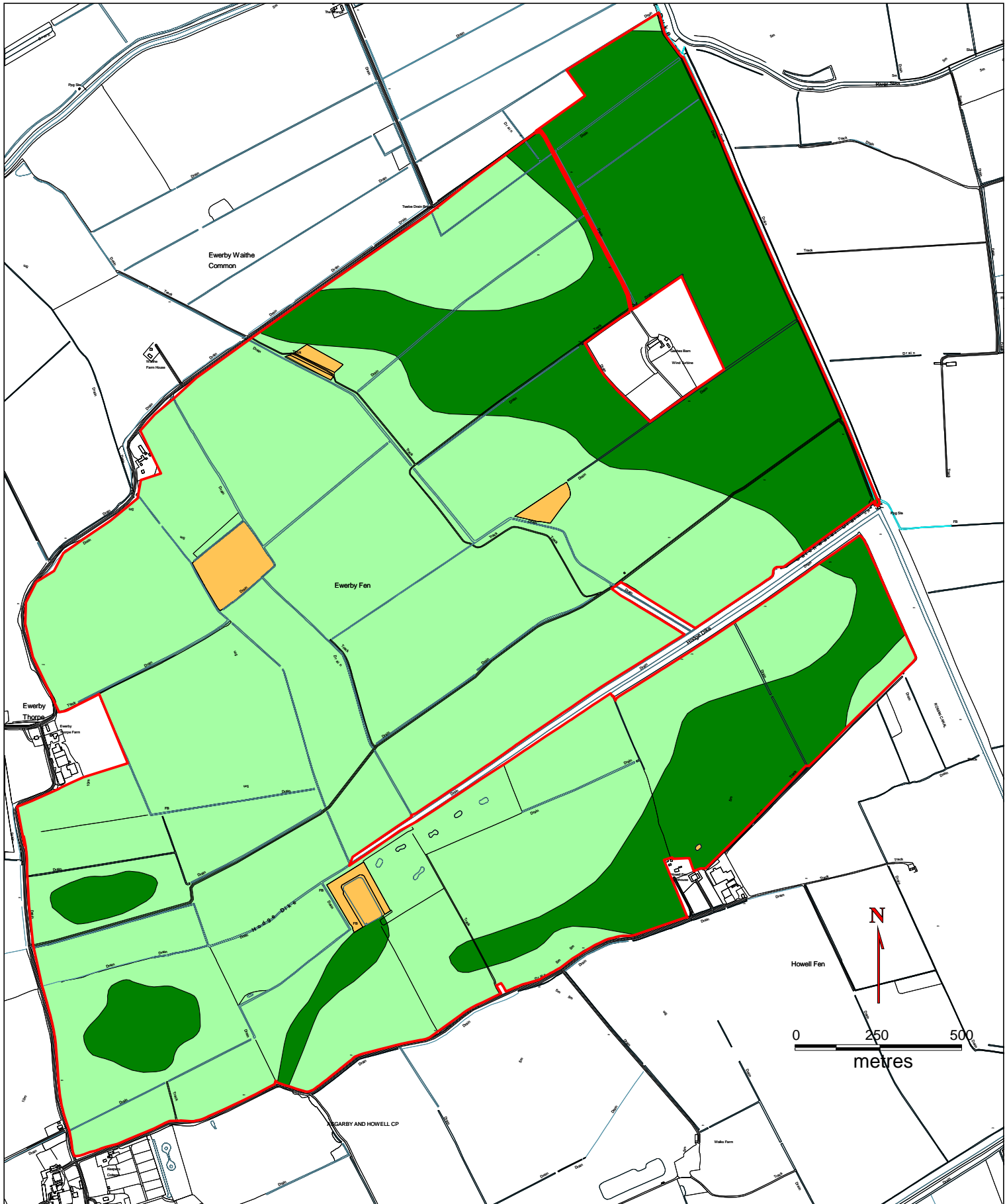
1:15,000 at A4

Date

10/10/2022



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Client







Project

Bicker Fen North

Map

**Map 2
Provisional ALC**

KEY

-  Mainly sub-grade 3a, some 2 and some 3b
-  Mainly sub-grade 3b
-  Principal areas of other land
woodland, reservoirs etc
-  Survey area

Scale

1:15,000 at A4

Date

10/10/2022

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Research**
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