

# Appendix 10.1

## Soils

**HAVERHILL - SOILS AND  
AGRICULTURAL USE & QUALITY**

Report 1013  
3<sup>rd</sup> May, 2015

**Land**  
**Research**  
**ASSOCIATES**

**HAVERHILL**  
**SOILS AND AGRICULTURAL USE & QUALITY**

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Report 1013

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3<sup>rd</sup> May, 2015

## **SUMMARY**

A soils and agricultural quality survey has been undertaken of 165.8 ha of land adjoining Haverhill in Suffolk. The land is mainly under winter cereal-oilseed rape rotation. Soils were found to be imperfectly-draining variably calcareous clays, with moderately freely-draining non-calcareous heavy clay loams over clays on lower slopes and valley floors. The agricultural quality of the land is limited by soil wetness, giving a mixture of subgrade 3a and 3b. The slightly lighter topsoils of the valleys are of moderate quality for reuse in landscaping, while the remainder is of low quality.

## 1.0 Introduction

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- 1.1 This report provides information on the soils and agricultural quality and use of 165.8 ha of land adjoining Haverhill in Suffolk. The report is based on a soil and agricultural desk study and a survey of the land in February 2015.

### **SITE ENVIRONMENT**

- 1.2 The land comprises a number of fields and plantation blocks to the north-east of Haverhill. The land is bordered to the south by residential areas adjoining Chalkestone Way and Coupal's Road, to the west by the grounds of a secondary school, to the north by Haverhill Road and to the east by adjoining agricultural land. The topography is gently undulating, with an average elevation of approximately 85 m AOD.

### **AGRICULTURAL USE**

- 1.3 At the time of survey the land was predominantly under winter cereal and oilseed crops. Small areas are under permanent grass.

### **PUBLISHED INFORMATION**

- 1.4 1:50,000 BGS geological information records the geology of the site as Lewes/Sleaford Chalk Formation, mainly overlain by chalky glacial till of the Lowestoft Formation, with head deposits in valley bottoms.
- 1.5 The 1:250,000 scale soil map of Eastern England<sup>1</sup> shows the soils as in the Hanslope Association, comprising heavy soils with impeded subsoil drainage formed in chalky glacial till.
- 1.6 Agricultural Land Classification (ALC) mapping carried out in the 1970s (before revision of the classification) shows the agricultural land of the study area as grade 2. No more detailed survey has been published.

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<sup>1</sup>Hodge, C.A.H *et al.* 1984. *Soils and their Use in Eastern England*. Soil Survey of England and Wales Bulletin No. 13. Harpenden.

## 2.0 Soils

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- 2.1 National Planning Practice Guidance states that the planning system should protect and enhance valued soils and prevent the adverse effects of unacceptable levels of pollution. This is because soil is an essential finite resource that provides important ecosystem services, for example as a growing medium for food, timber and other crops, as a store for carbon and water, as a reservoir of biodiversity and as a buffer against pollution.
- 2.2 A detailed soil resource and agricultural quality survey was carried out in February 2015. It was based on observations at intersects of a 100 m grid, giving a sampling density of one observation per hectare. During the survey soils were examined by a combination of pits and augerings to a maximum depth of 1.2 m. A log of the sampling points and a map (Figure 10.1) showing their location is in an appendix to this report.
- 2.3 Soils vary across the site, principally in drainage and calcium carbonate content. The distribution of soils types is shown in Figure 10.2 in an appendix to this report, and is described below.

### **Imperfectly-draining clay soils**

- 2.4 These soils are found on upper valley slopes and minor ridge summits and are formed in chalky glacial till. They comprise clay or heavy clay loam topsoil, with slowly permeable grey mottled clay subsoil, which becomes chalky at depth. The topsoil is non-calcareous in some patches, and strongly calcareous in others, but is dominantly slightly or very slightly calcareous.

An example soil profile is described below from observation 123 (see Figure 10.2).

0-29 cm	Dark greyish brown (10YR 4/2) clay; slightly stony (small and medium angular very hard flints); weakly developed very coarse angular blocky structure; very firm; very slightly calcareous; clear smooth boundary to:
29-72 cm	Greyish brown (10YR 5/2) clay with many distinct fine and medium reddish yellow (7.5YR 6/8) mottles and grey (10YR 5/1) ped faces; very slightly stony; weakly developed very coarse angular blocky to prismatic structure; very firm; very slightly calcareous; gradual smooth boundary to:
72-120 cm	Grey (10YR 5/1) clay with many medium distinct strong brown (10YR 5/6) mottles; moderately stony (small rounded soft chalk); weakly developed very coarse prismatic to massive structure; very firm; calcareous.

- 2.1 These soils are imperfectly-draining (Soil Wetness Class III). They have a high

capacity to absorb excess rainfall during the growing season, but will stand wet for long periods during winter (between December and March under the local climate) when the runoff risk is high.

### **Moderately freely-draining fine loamy over clayey soils**

- 2.2 These soils occur on the lower valley slopes and valley floors, being formed in localised drift (Head) over till. They have non-calcareous topsoil and upper subsoil. The upper subsoil is only slightly mottled, which suggests that waterlogging to shallow depth is rare.

An example soil profile is described below from observation 136 (see Figure 10.2).

0-28 cm	Very dark greyish brown (10YR 3/2) heavy clay loam; slightly stony (small and medium angular very hard flints); weakly developed very coarse angular blocky structure; firm; non-calcareous; clear smooth boundary to:
28-52 cm	Yellowish brown (10YR 5/3) heavy clay loam with common faint fine greyish brown (10YR 5/2) mottles; very slightly stony (small and medium angular flints); weakly developed medium sub-angular structure; friable; non-calcareous; clear gradual boundary to:
52-69	Pale brown (10YR 6/3) clay with common medium distinct brownish yellow (10YR 6/8) mottles; slightly stony; weakly developed coarse angular blocky structure; firm; calcareous; clear smooth boundary to:
69-120 cm	Light yellowish brown (10YR 6/4) clay with common medium distinct grey (10YR 6/1) and brownish yellow (10YR 6/8) mottles; moderately stony (small rounded chalk stones); weakly developed very coarse prismatic to massive structure; firm; calcareous.

- 2.5 These soils are moderately freely-draining (Soil wetness Class II) and have a high to capacity to absorb excess rainfall, with occasional runoff risk during wet winter periods.

## 3.0 Agricultural Quality

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3.1 To assist in assessing land quality, the 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) system 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.

3.2 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<sup>2</sup>. The relevant site data for an average elevation of 85 m is given below.

- Average annual rainfall: 598 mm
- January-June accumulated temperature >0°C 1372 day°
- Field capacity period 115 days  
(when the soils are fully replete with water) early Dec-late Mar
- Summer moisture deficits for: wheat: 112 mm  
potatoes: 107 mm

3.3 The survey described in the previous section was used in conjunction with the agro-climatic data above to classify the site using the revised guidelines for agricultural land classification issued in 1988 by the Ministry of Agriculture, Fisheries and Food<sup>3</sup>. There are no climatic limitations to land quality in this part of England.

### **SURVEY RESULTS**

3.4 The agricultural quality of the land is limited by soil wetness. Land of grade 3 quality has been identified.

#### **Sub-grade 3a**

3.5 Sub-grade 3a land is found over calcareous imperfectly-draining soils and non-calcareous moderately freely-draining soils. The slow permeability of the lower

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<sup>2</sup> *Climatological Data for Agricultural Land Classification*. Meteorological Office, 1989

<sup>3</sup> *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*. MAFF, 1988.



subsoil means soils are often not suitable for spring cultivations, but few restrictions apply to autumn-sown cereals and oilseeds, of which high average yields are likely.

**Sub-grade 3b**

- 3.6 This land comprises imperfectly-draining soils with non-calcareous or very slightly calcareous topsoil, which occur in patches of variable size throughout the site. These lack the improved structure and workability attributed to calcareous topsoils, and the flexibility of autumn, as well as spring cultivations are restricted. Moderate average yields of cereals and oilseeds are likely.

**Non-agricultural land**

- 3.7 This comprises blocks of deciduous and mixed woodland plantation, and a number of farm tracks, streams and drainage ditches

**Grade areas**

- 3.8 The boundaries between the different grades of land are shown in Figure 10.3 and the areas occupied by each are shown below.

**Table 1. Areas occupied by the different land grades**

<i>Grade/sub-grade</i>	<i>Area (ha)</i>	<i>% of the agricultural land</i>
<b>Sub-grade 3a</b>	107.9	75
<b>Sub-grade 3b</b>	36.2	25
<b>Non-agricultural land</b>	21.7	-
<b>Total</b>	165.8	100

## 4.0 Soil resources and their use

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- 4.1 An objective of the Defra Soil Strategy was to ensure that the construction industry and planning authorities take sufficient account of the need to protect soil resources, and ensure soils are able to fulfil as many as possible of their functions. An Environment Agency strategy Soil a Precious Resource: Our strategy for protecting, managing and restoring soil (Environment Agency, 2007) has complementary aims.

### **Topsoil**

- 4.2 The heavy clay loam topsoil of the moderately-freely draining soils found in the valley floors and on lower valley slopes (see Figure 10.2) is a moderate quality resource for landscaping, being difficult to handle with machinery when wet. The topsoils of the remainder of the site are largely of low quality, being clayey and difficult to handle over a range of moisture contents.
- 4.3 To avoid damage to topsoil resources, stripping, stockpiling and soil replacement activities are best conducted outside the winter period (December-March inclusive) and outside of wet periods during other times of year.

### **Subsoil**

- 4.4 The upper subsoils of all areas of the site are highly susceptible to compaction by machinery traffic, which would result in restricted rooting depth and increased runoff and risk of flooding. Machinery traffic should be restricted to designated roadways as far as possible. If compaction were to occur during construction soils should be loosened/ripped before topsoil is replaced.

### **Soil Handling**

- 4.5 All soil resources are easily damaged by being stripped or moved when wet. Consequently, stripping should take place using the excavator and dumper method as described by Sheet 1 in the MAFF Good Practice Guide for Handling Soils.
- 4.6 Topsoil should be stripped from areas designated for storing subsoil. The bunds should be constructed either by excavator or bulldozer (Sheets 2 and 14 in the MAFF Good Practice Guide) avoiding over-compaction. They should be sown with grass to help maintain biological activity and prevent water erosion.

- 4.7 The soils should be removed from storage (Sheet 3 in the MAFF Good Practice Guide) and replaced by excavator using the loose tipping technique (Sheet 4 in MAFF Good Practice Guide), which avoids traffic on the restored surfaces.

**APPENDIX**  
**DETAILS OF OBSERVATIONS**

Land east of Haverhill: ALC and soil resources survey – 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	28	C sl ca	<5	28-110+	C ca	xxx				1	III	3a	W
2	31	HCL non	<5	31-54	C sl ca	xxx	54-110+	C ck sts, ca	xxx	2	III	3b	W
3	33	HCL	4	33-65	C sl ca	xxx	65-110+	C ck sts, ca	xxx	2	III	3b	W
4	34	C ca	6	34-55	C ck sts, ca	xxx	55-110+	C ck sts, ca	xxxx	1	III	3a	W
5	30	C v sl ca	<5	30-110+	C ck sts, ca	xxx				1	III	3b	W
6	32	HCL v sl ca	<5	32-43	HCL v sl ca	xx	43-110+	C sl ca	xxx	2	II	3a	W
7	32	HCL sl ca	<5	32-40	HCL sl ca	xx(x)	40-73 73-110+	C sl ca C v ca	xxx xxx	2	II/III	3a/3b	W
8	32	HCL v sl ca	6	32-45	C ca	xx	45-110+	C ck sts, ca	xxx	1	II	3a	W
9	27	C sl ca	2	27-38	C sl ca	xx	38-54 54-110+	C (sl) ca C ck sts, ca	xxx xxxx	1	III	3a	W
10	30	C sl ca	4	30-35	C sl ca	xx	35-110+	C ck sts, ca	xxx	2	III	3a	W
11	28	C non	5	28-40	C sl ca	xx	40-110+	C ck sts, ca	xxx(x)	3	III	3b	W
12	27	C non	<5	27-51	C non	xxx	51-110+	C ck sts, ca	xxx	3	III	3b	W
12a	30	HCL v sl ca	6	30-110+	C ck sts, ca	xxx(x)				<1	III	3b	W
13	30	C ca	2	30-63	C ck sts	xxx	63-88 88+	C ck sts, ca Stopped, chalk	Xxxx	3	III	3a	W
13a	31	C non	<5	31-45	C v sl ca	xx	45-65 65-110+	C v sl ca C ck sts, ca	xxx xxx	3	II	3b	
14	28	C sl ca	4	28-68	C ck sts, ca	xxx	68-110+	C ck sts, ca	xxxx	1	III	3a	W
15	27	HCL v sl ca	3	27-42	C ca	xx	42-110+	C ck sts, ca	xxx(x)	2	II	3b	W
16	32	C sl ca	3	32-38 38-70	C ca C ck sts, ca	xx xxx	70-110+	C ck sts, ca	xxxx	2	III	3a	W
17	30	C non	<5	30-37	C non	xx	37-110+	C non	xxx	2	III	3b	W
18	30	C sl ca	<5	30-56	C sl ca	xxx	56-110+	C ca	xxx	3	III	3a	W
19	31	HCL non	<5	31-51	HCL non	xx	51-70 70-110+	HCL C ca	xx(x) xxx	2	II	3a	W
20	23	HCL/C vslca	<5	23-36	HCL v sl ca	xx	36-52 52-110+	C sl ca C ca	xxx xxx	2	III	3b	W
21	29	C sl ca	<5	29-74	C sl ca	xxx	74-110+	C ck sts, ca	xxx	1	III	3a	W
22	34	C ca	3	34-50	C ca	xxx	50-90 90-110+	C ck sts, ca C ck sts, ca	xxx xxxx	1	III	3a	W
23	29	C ca	3	29-77	C ck sts, ca	xxx	77+	Stopped, chalk		2	III	3a	W
24	31	C v/sl ca	2	31-42	C sl ca	xxx	42-110+	C ck sts, ca	xxx	3	III	3b	W
25	28	C (sl) ca	4	28-37 37-65	C ca C ck sts, ca	xx xxx	65-110+	C ck sts, ca	xxxx	2	III	3a	W
26	28	C sl ca	10	29-43	C ca	xxx	43-110+	C ck sts, ca	xxxx	3	III	3a	W
27	29	HCL non	3	29-50	C v sl ca	x(x)	50-68 68-110+	C ck sts, ca C ck sts, ca	xxx xxxx	2	II	3a	W
28	27	C sl ca	<5	27-110+	C ca	xxx				3	III	3a	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													
30	30	C v sl ca	<5	30-39	C sl ca	xx(x)	39-53 53-110+	C sl ca C ck sts, ca	xxx xxx	3	II/III	3a/3b	W
31													
32	30	C sl ca	<5	30-110+	C ca	xxx(x)				1	III	3a	W
33	28	C non	<5	28-68	C	xxx	68-110+	C ck sts, ca	xxxx	3	III	3b	W
34	12	HCL (Disturbed)	-	Bricks and rubble.						1	n/a		n/a
35	45	C non (Disturbed)	0	45-74	C non	xxx				2	III	3b	W
36	22	HCL	0	22-40	HCL	xx	40-66 66-110+	C ca C ck sts, ca	xxx xxx	1	II/III	3a/3b	W
37													Non Agricultural
38	28	C v sl ca	<5	28-60	C sl ca	xxx	60-110+	C ck sts, ca	xxx	<1	III	3b	W
39	26	C sl ca	<5	26-40	C sl ca	x	40-110+	C ck sta, ca	xxx	2	II	3a	W
40	42	C v sl ca	<5	42-110+	C v sl ca	xx	Disturbed soil?			1	I/II	2/3a	W
41	30	C sl ca	2	30-110+	C ck sts, ca	xxx				1	III	3a	W
42	29	C sl ca	2	29-110+	C sl ca	xxx				2	III	3a	W
43	29	C v sl ca	<1	29-42	C sl ca	xxx	42-110+	C ck sts, ca	xxx	2	III	3b	W
44	29	C ca	2	29-110+	C ck sts, ca	xxx				<1	III	3a	W
45	31	ZC v sl ca	0	31-49	ZC v sl ca	xx	49-100+	ZC v sl ca	xxx	<1	II	3b	W
46	28	HCL non	<1	28-110+	C non	xxx				1	III	3b	W
47													Non Agricultural
48	24	C v sl ca	<5	24-110+	C ck sts, ca	xxx				2	III	3b	W
49													
50	28	C non	<1	28-35	C non	xx	35-110+	C non	xxx	3	III	3b	W
51	26	C ca	5	26-110+	C ck sts, ca	xxx				2	III	3a	W
52	31	C ca	4	31-110+	C ck sts, ca	xxx				2	III	3a	W
53	29	C ca	3	29-110+	C ck sts, ca	xxx				2	III	3a	W
54	29	C non	3	29-38	C non	xx	38-110+	C ck sts, ca	xxx	2	III	3b	W
55	28	ZC non	<1	28-110+	C v sl ca	xxx				1	III	3b	W
56	23	HCL non	<1	23-35	C non	xx	35-110+	C ca	xxx	1	III	3b	W
57	27	HCL/C non	<1	27-49	C non	xx	49-110+	C ca	xxx	1	II	3a	W
58	17	HCL	1	17-60	HCL/C v sl ca	x(x)	60-110+	C ca	xxx	4	II	3a	W
59	18	HCL	1	18-35 35-55	HCL C v sl ca	o xxx	55-110+	C ck sts, ca	xxx	2	III	3b	W
60	25	C ca	<1	25-52	C ca	xx	52-64 64+	C ca Stopped	xxx	1	II	3a	W
61	30	C non	<1	30-43	C non	xx	43-110+	C non	xxx	2	II	3a	W
62	30	C non	5	30-85	C sl ca	xx	85-110+	C ck sts, ca	xxx	4	I	2	W
63	32	C sl ca	5	32-110+	C ck sts, ca					4	III	3a	W
64	33	C non	5	33-60	C	xx	65-110+	C ck sts, ca		2	II	3a	W
65	33	C sl ca	<5	33-57	C sl ca	xx	57-110+	C ca	xxx	1	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
66	31	C sl ca	<5	31-44	C sl ca	xxx	44-110+	C ca	xxx	1	III	3a	W
67	33	C sl ca	<5	33-110+	C ca	xxx				1	III	3a	W
68	27	C v sl ca	<1	27-53	C ca	xx(x)	53-72 72+	C ca Stopped, chalk	xxx	1	II/III	3a/3b	W
69	28	C v sl ca	1	28-38	C v sl ca	xx	38-55 55-110+	C sl ca C ck sts, ca	xxx xxx	1	III	3b	W
70	28	C ca	1	28-55	C ca	xx	55-110+	C ck sts, ca	xxx	1	II	3a	W
71	38	HCL v sl ca	<1	38-110+	HCL sl ca	xxx				1	III	3b	W
72	29	C ca	2	29-110+	C ck sts, ca	xxx(x)				1	III	3a	W
73	30	C sl ca	3	30-110+	C ck sts, ca					3	III	3a	W
74	29	C ca	10	29-42	C ck sts, ca	xx	42-110+	C ck sts, ca	xxxx	4	II	3a	W
75	33	C non	<1	33-55	C (v) sl ca	xxx	55-110+	C sl ca	xxx	3	III	3a	W
76	27	C sl ca	<5	27-110+	C ca	xxx				3	III	3a	W
77	23	C v sl ca	<5	23-110+	C ca	xxx				1	III	3b	W
78	30	C sl ca	<5	30-53	C sl ca	xxx	53-110+	C ck sts, ca	xxx	1	III	3a	W
79	27	C v sl ca	<5	27-41	C sl ca	xx	41-110+	C ca	xxx	1	III	3b	W
80	28	C v sl ca	<5	28-110+	C ck sts, ca	xxx				1	III	3b	W
81	28	C sl ca	2	28-55	C ca	xx	55-110+	C ck sts, ca	xxx	4	II	3a	W
82												Non Agricultural	
83	26	C sl ca	<5	26-67	C sl ca	xxx	67-110+	C ck sts, ca	xxx	2	III	3a	W
84	27	C v sl ca	<5	27-71	C sl ca	xxx	71-110+	C ck sts, ca	xxx	3	III	3b	W
85	24	C v sl ca	<1	24-42	C v sl ca	xx(x)	42-74 74-110+	C v sl ca C ck sts, ca	xxx xxx	3	II/III	3a/3b	W
86	29	C v sl ca	<5	29-53	C sl ca	xx	53-110+	C sl ca	xxx	2	II	3a	W
87	28	ZC non	<1	28-88	C v sl ca	xxx	88-110+	C ck sts, ca	xxx	2	III	3b	W
88	26	C non	1	26-54	C v sl ca	xx	54-76 76-110+	C sl ca C ck sts, ca	xxx xxx	4	II	3a	W
89	33	C non	<1	33-56	C non	xx	56-110+	C ck sts, ca	xxx	4	II	3a	W
90	29	C ca	<5	29-110+	C ck sts, ca	xxx				3	III	3a	W
91													W
92	20	C v sl ca	<5	20-43	C sl ca	xxx	43-110+	C ca	xxx	2	III	3b	W
93	27	C v sl ca	<5	27-44	C v sl ca	x	44-110+	C sl ca	xxx	2	II	3b	W
94	34	C ca	<5	34-68	C ca	xxx	68-110+	C ck sts, ca	xxxx	<1	III	3a	W
95	32	C ca	4	32-60	C ck sts, ca	xxx	60+	Stopped, chalk		2	III	3a	W
96	32	HCL/C ca	6	32-110+	C ck sts, ca	xxx				2	III	3a	W
97	30	C v sl ca	4	30-40	C sl ca	xx	40-110+	C ck sts, ca	xxx	3	II	3b	W
98	0-33	C v sl ca	<5	33-63	C v sl ca	xxx	63-90+	C ca	xxx	1	III	3b	W
99	0-40	C sl ca	<5	40-90+	C sl ca	xxx				2	III	3a	W
100	34	C non	1	34-62	C v sl ca	xxx	62-110+	C ck sts, ca	xxx	4	III	3b	W
101	29	HCL non	2	29-50	HCL/C non	xx	50-75 75-110+	C non C ck sts, ca	xxx	4	II	3a	W
102	30	HCL/C non	2	30-65	HCL non	xx	65-110+	C ck sts, ca	xxx	2	II	3a	W
103	28	C (sl) ca	3	28-55	C v sl ca	xxx	55-110+	C ck sts, ca	xxx	3	III	3a	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
104	26	C sl ca	8	26-47	C ca	xx(x)	47-110+	C ck sts, ca	xxx	4	II/III	3a/3b	W
105	29	C sl ca	<5	29-42	C ca	xx	42-110+	C ck sts, ca	xxx	3	II	3a	W
106	27	C sl ca	<5	27-54	C ca	xxx	54-75 75+	C ck sts, ca Stopped, chalk	xxx	3	III	3a	W
107	26	C v sl ca	<5	26-92	C sl ca	xx(x)	92-110+	C ca	xxx	1	I-III	3a/3b	W
108	32	C sl ca	<5	32-36	C sl ca	xx	36-72 72-110+	C ca C ck sts, ca	xxx xxx	3	III	3a	W
109	28	C ca	5	28-53	C ca	xxx	53-110+	C ck sts, ca	xxx(x)	1	III	3a	W
110	33	C ca	2	33-45	C ck sts, ca	xxx	45-110+	C ck sts, ca	xxxx	1	III	3a	W
111	27	C v/sl ca	3	27-38	C sl ca	xxx	38-110+	C ck sts, ca	xxx	3	III	3a/3b	W
112													W
113	30	C v sl ca	<5	30-38	C v sl ca	xx	38-61 61-110+	C sl ca C ck sts, ca	xxx xxx	2	III	3b	W
114													W
115	24	C v sl ca	<5	24-45	C v sl ca	xx	45-110+	C ck sts, ca	xxx	3	II	3a	W
116	25	HCL/C non	<5	25-110+	C non	xx(x)				3	II	3a	W
117	34	HCL/C	2	34-45	HCL	xx	45-110+	HCL	xxx	2	II	3a	W
118	33	C sl ca	<5	33-78	C sl ca	xx	78-110+	C ck sts, ca	xxx	1	I/II	2/3a	W
119	29	C ca	<5	29-40	C ca	xx	40-110+	C ck sts, ca	xxx	3	II/III	3a/3b	W
120	26	HCL v sl ca	<5	26-58	HCL v sl ca	xx	58-110+	HCL v sl ca	xxx	3	II	3a	W
121	24	C sl ca	<5	24-110+	C ca	xxx				3	III	3a	W
122													W
123	29	C v sl ca	<5	29-52	C sl ca	xxx	52-110+	C ck sts, ca	xxx	3	III	3b	W
124	26	HCL/C non	<5	26-37	C non	xx	37-110+	C ca	xxx	3	III	3b	W
125	31	HCL non	<5	31-63	HCL non	(x)	63-92 92-110+	SCL non C ca	xx xxx	1	I	2	W
126													Non Agricultural
127	30	C sl ca	<5	30-57	C sl ca	xx	57-110+	C ck sts, ca	xx(x)	4	II	3a	W
128	25	C ca	<5	25-37	C ca	xx	37-110+	C ck sts, ca	xxx	3	III	3b	W
129	25	C sl ca	<5	25-110+	C ca	xxx				1	III	3a	W
130	26	HCL non	<5	26-56	HCL sl ca	xx	56-110+	C ck sts, ca	xxx	3	II	3a	W
131	32	HCL v sl ca	<5	32-69	HCL v sl ca	x(x)	69-110+	C ck sts, ca	xxx	<1	II	3a	W
132	34	C sl ca	<5	34-68	C sl ca	xx	68-110+	C ck sts, ca	xxx	3	III	3b	W
133	28	C ca	3	28-60	C ck sts, ca	xxx	60+	Stopped, chalk		2	III	3a	W
134	24	C sl ca	<5	24-62	C sl ca	xxx	62-110+	C ck sts, ca	xxx	3	III	3a	W
135	27	C v sl ca	<5	27-46	C sl ca	xxx	46-110+	C v ca	xxx	2	III	3b	W
136	28	HCL non	<5	28-52	HCL non	xx	52-120	C ca	xxx	3	II	3a	W
137	32	HCL/C	<1	32-72	HCL/C	x	72-110+	C	xxx	1	II	3a	W
138	27	C v sl ca	3	27-48	C sl ca	xx	48-110+	C ck sts, ca	xxx	2	II	3a	W
139	31	C ca	<5	31-55+	C ca	xxxx				2	III	3a	W
140	47	C ca	5	47-110+	C ck sts, ca	xxx				3	III	3a	W
141	26	C sl ca	<1	26-110+	C ck sts, ca					2	III	3a	W
142	28	C non	2	28-58	C non	xxx	58-110+	C ck sts, ca	xxx	4	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
143	27	C v sl ca	3	27-38	C sl ca	xx	38-110+	C sl ca	xxx	1	III	3b	W
144	32	C v sl ca	<5	<u>32</u> -60	C sl ca	xxx	60-110+	C ck sts, ca	xxx	3	III	3b	W
145	25	C ca	1	25-110+	C ck sts, ca					2	III	3a	W
146	25	C ca	4	25-110+	C ck sts, ca	xxx				4	III	3a	W
147	27	HCL non	1	27-80	HCL non	xx	80-110+	HCL non	xxx	2	I/II	2/3a	W
148	33	C v sl ca	<5	33-60	C v sl ca	xx	60-76 76-110+	C sl ca C ck sts, ca	xx(x) xxx	2	II	3a	W
149	29	C ca	<5	<u>29</u> -49	C ck sts, ca	xx(x)	49-110+	C ck sts, ca	xxx	1	II/III	3a/3b	W
150	30	C v sl ca	<5	<u>30</u> -76	C v sl ca	xx(x)	76-110+	C ck sts, ca	xxx	1	II/III	3a/3b	W
151	30	C ca	4	<u>30</u> -45	C ca	xxx	45-110+	C ck sts, ca	xxx	1	III	3a	W
152	27	C sl ca	3	<u>27</u> -43	C sl ca	xx(x)	43-60 60-110+	C sl ca C ck sts, ca	xxx xxx	3	II/III	3a	W
153	35	HCL/C sl ca	3	<u>35</u> -110+	HCL sl ca	xxx				2	III	3a	W
154	31	HCL v sl ca	<5	31-62	C sl ca	x(x)	62-110+	C sl ca	xx(x)	2	I/II	3a	W
155													W
156	30	HCL/C v sl ca	<1	<u>30</u> -110+	C v sl ca	xxx				2	III	3b	W
157	32	C non	2	32-40	C v sl ca	xx	40-110+	C ck sts, ca	xxx	2	II	3a	W
158	27	C non	2	27-47	C sl ca	x(x)	47-110+	C sl ca	xxx	2	II	3a	W
159	27	C sl ca	<5	<u>27</u> -57	C sl ca	xxx	57-110+	C ck sts, ca	xxx	2	III	3a	W
160	20	C sl ca	<5	<u>20</u> -110+	C ck sts, ca	xxx				2	III	3a	W
161	27	HCL v sl ca	<5	27-36	HCL v sl ca	xx	36-62 62-110+	HCL sl ca C ck sts, ca	xxx xxx	2	III	3b	W
162	28	C sl ca	7	28-47	C sl ca	xxx	47-110+	C ck sts, ca	xxx	2	III	3a	W
163	38	C v sl ca	<5	<u>38</u> -110+	C v sl ca	xxx	Disturbed?			1	III	3b	W
164	30	HCL v sl ca	<5	30-61	HCL sl ca	xx	61-110+	C ck sts, ca	xxx	3	II	3a	W

### Key to table

#### Mottle intensity:

- o unmottled
- x few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
- xx common to many ochreous mottles and/or dull structure faces
- xxx common to many greyish or pale mottles (gleyed horizon)
- xxxx dominantly grey, often with some ochreous mottles (gleyed horizon)

#### 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)

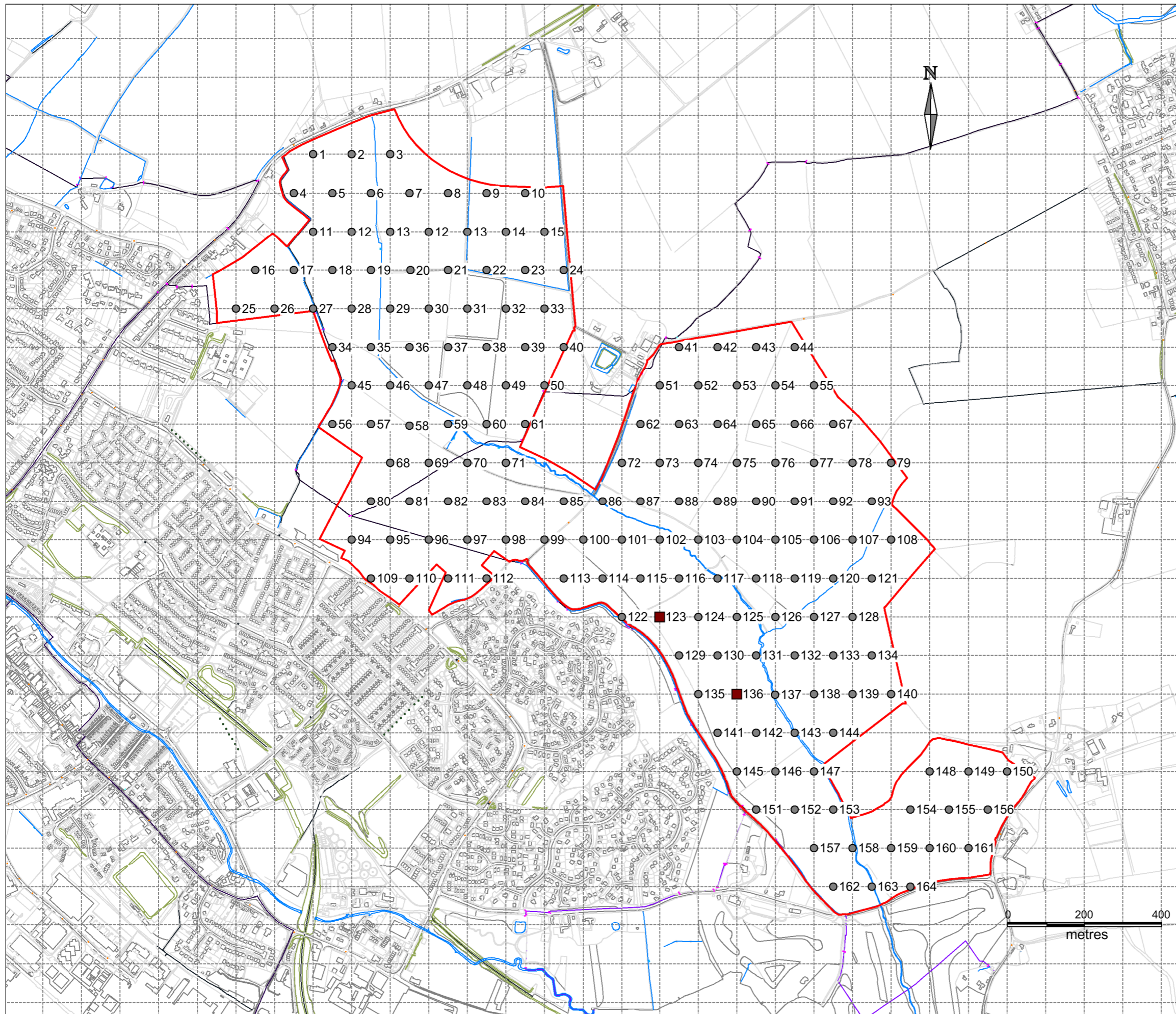
#### Limitations:

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

#### Texture suffixes & prefixes:

- mn - ferrimanganiferous concentrations
- ca - calcareous: x-extremely, v-very, sl-slightly
- gn - greenish, yb - yellowish brown, rb - reddish brown
- r - reddish; (v)st - (very) stony; sdst - sandstone

a depth underlined (e.g. 50) indicates the top of a slowly permeable layer  
(a dotted underline indicates the top of a layer borderline to slowly permeable)



**KEY**

- Auger observation
- Soil/land grade description pit
- Survey area

Client:



Site:

**Haverhill**

Map title:

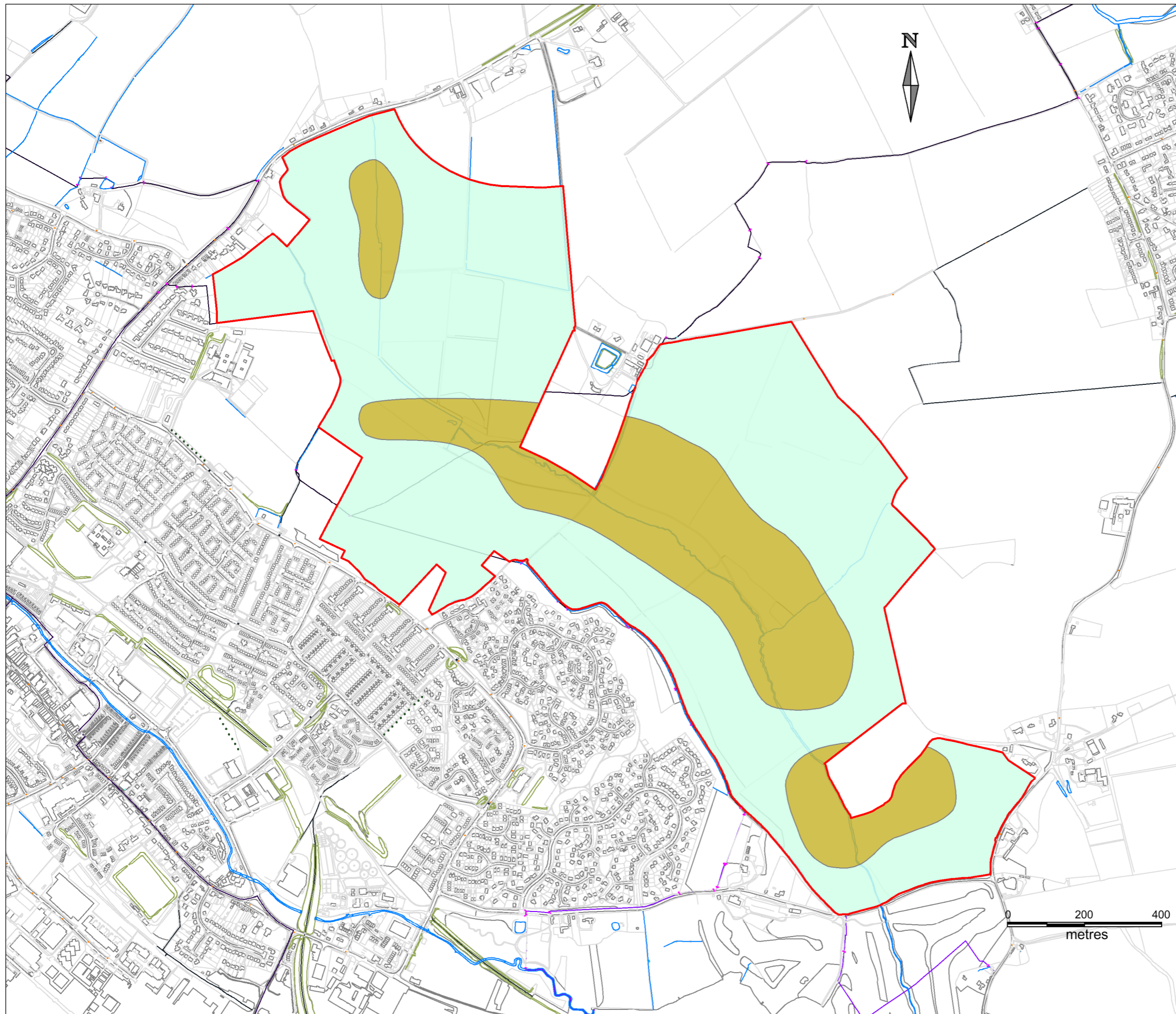
**Figure 10.1  
Survey observations**



Land Research Associates  
Lockington Hall  
Lockington  
Derby DE74 2RH  
01509 670570

Scale: 1:10,000

Date: 07/05/2015



**KEY**

- Imperfectly-draining clay soils
- Moderately freely-draining fine loamy over clayey soils
- Survey area

Client:



Site:

**Haverhill**

Map title:

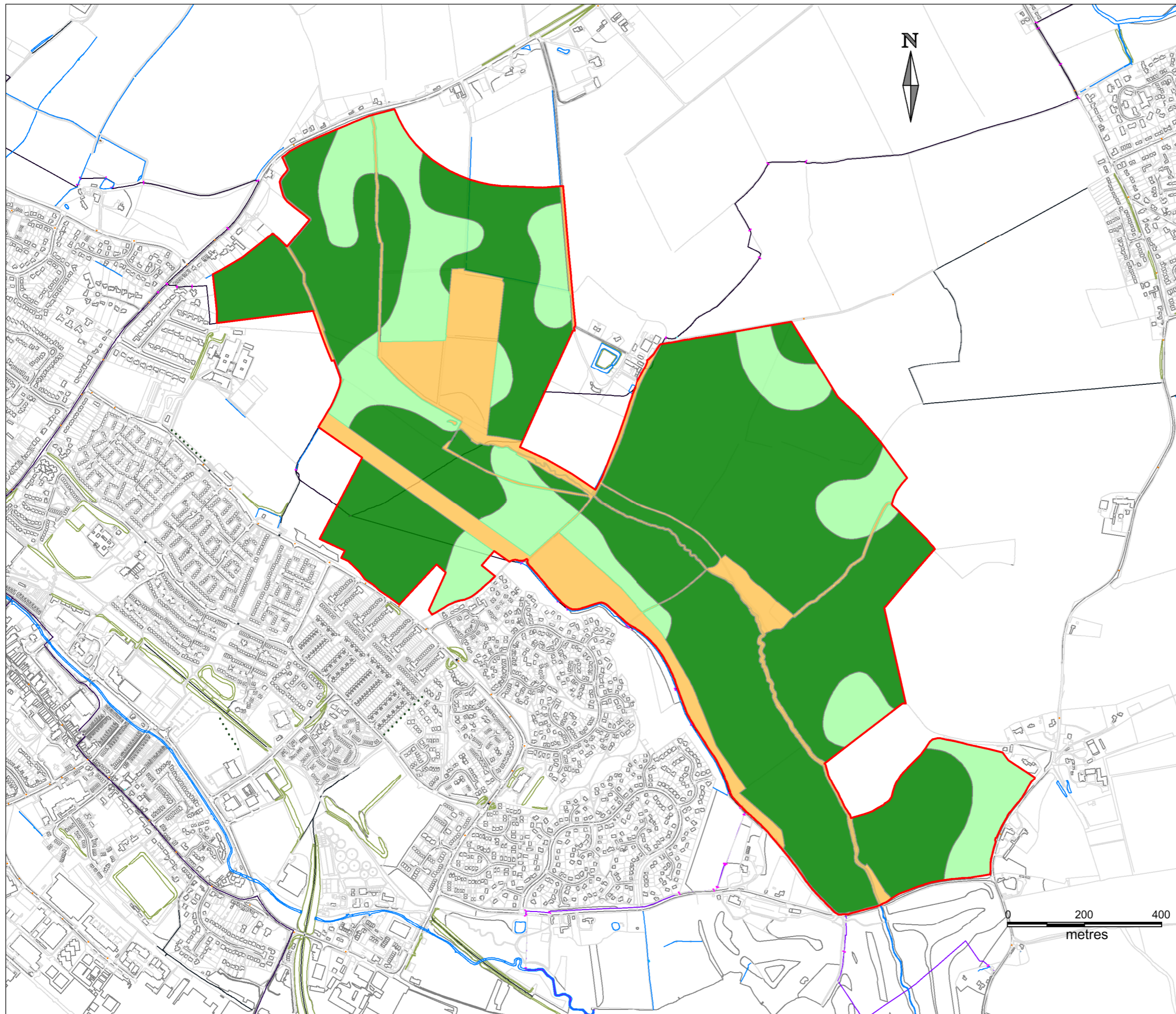
**Figure 10.2  
Soil Types**



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Lockington Hal  
Lockington  
Derby DE74 2RH  
01509 670570

Scale: 1:10,000

Date: 07/05/2015



**KEY**

- Subgrade 3a
- Subgrade 3b
- Non Agricultural
- Survey area

Client:



Site:

**Haverhill**

Map title:

**Figure 10.3  
Land Quality**



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Date: 07/05/2015