APPENDIX 13.1

LAND AT JUNCTION 15 OF THE M1, NORTHAMPTON - SOILS AND AGRICULTURAL USE & QUALITY

Report 1002/1

13th October, 2014

Land Research ASSOCIATES

LAND AT JUNCTION 15 OF THE M1, NORTHAMPTON

SOILS AND AGRICULTURAL USE & QUALITY

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Report 1002/1

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13th October, 2014

SUMMARY

A survey has been undertaken of 220 ha of agricultural land west of Junction 15 of the M1, Northampton.

The soils identified are predominantly heavy clays, with some lighter fine loamy and sandy soils. Land over heavy clay soil is limited by soil wetness to sub-grade 3b quality, land over fine loamy soil is limited by soil wetness to grade 2 and sub-grade 3a quality and land over sandy soil is limited by droughtiness to grade 2 quality.

The heavy topsoil found over much of the land would form a poor quality resource for landscaping use if the site is developed. The 260-320 mm-thick lighter fine loamy topsoil found in a band almost central to the site would form a high quality resource and should be stockpiled separately.

1.0 Introduction

1.1 This report provides information on the soils and agricultural quality and use of 220 ha of land west of Junction 15 of the M1, Northampton. The report is based on a soil and agricultural desk study and a survey of the land in 2014. An additional area in the west was surveyed in 2017.

SITE ENVIRONMENT

1.2 The land is bordered to the north by Collingtree Road, to the north-east by the M1 and to the south-east by the A 508. To the south and west the land is adjoined by neighbouring agricultural land. There are two sizeable mixed woodlands within the site, the more northerly of which is occupied by the Courteenhall Shooting School. The land slopes gently from a high point of 102 m AOD in the west, to approximately 80 m AOD in the east.

AGRICULTURAL USE

1.3 Agricultural land at the site is mainly under arable use; recent to the time of survey, peas had been harvested from the land in the north whilst land in the south and west was under bean crops. A small area bordering the A508 in the east was under grass and an area to the north-west of the shooting school under game cover crops.

PUBLISHED INFORMATION

1.4 1:50,000 BGS information records the solid geology of the site as Whitby Mudstone. Towards the site's southern boundary this mudstone outcrops at the land surface but over most of the site mudstone is overlain by till deposits (Oadby Member). Patchy superficial deposits of sand and gravel are recorded in the north and east of the site.

1.5 The reconnaissance (1:250,000) soil map of Midland and Western England[1] shows the land as in the Hanslope and Denchworth Associations, comprising slowly permeable clayey soils.

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

[1] Jarvis, M.G. (*et al)* 1984. *Soils and their Use in Midland and Western England.* Soil Survey of England and Wales Bulletin No. 15

grade 3. No later ALC mapping has been published.

1.7 The majority of this site is registered under an Entry Level Environmental Stewardship Agreement, with the area of grass in the east registered under an Entry Level plus Higher Level Environmental Stewardship Agreement.

2.0 Soils

2.1 The 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 early September 2014. Observations were conducted at a density of one per hectare, and one per two hectares in areas of low variation. 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 (Map 1) showing their location is in an appendix to this report.

2.3 Soils were found to vary according to texture and drainage.

HEAVY SOILS

2.4 These soils are dominant at the site. They comprise heavy clay loam or clay topsoil over clay subsoil that is typically slowly permeable immediately beneath the topsoil. Topsoils and the upper subsoil are non-calcareous or only slightly calcareous, whilst lower subsoils are calcareous to very calcareous, often with many small chalk fragments.

2.5 A profile typical of the heavy soils is described below from observation 34 (Map 1).

0-31 cm	Dark greyish brown (10YR 4/2) silty clay with rare small and medium hard stones; weakly developed coarse to very coarse sub-angular blocky structure; firm; very slightly calcareous; abrupt smooth boundary to:
31-67 cm	Greyish brown (10YR 5/2) silty clay with many fine distinct yellowish brown (10YR 5/6) mottles and grey (10YR 5/1) ped faces; weakly developed very coarse prismatic structure; very firm; stoneless; very slightly calcareous; gradual smooth boundary to:
67-120+ cm	Grey (5Y 5/1) silty clay with medium faint light olive grey (5Y 6/2) mottles; weak very coarse prismatic structure; very firm to plastic; stoneless; calcareous.

2.6 These soils are mainly slowly permeable within 40 cm depth and are poorly draining (Soil Wetness Class IV to III). They have a low capacity to absorb winter rainfall.

FINE LOAMY SOILS

2.7 These soils occur in a band across the centre of the site, they comprise sandy clay loam topsoil over non-calcareous, permeable clay loam upper subsoil. Lower subsoils are variable depending on the depth of the loamy drift, but generally become slowly permeable between 60 and 80 cm.

2.8 An example profile is described below from observation 52 (Map 1).

0-32 cm	Dark greyish brown (10YR 4/2) sandy clay loam with a few small and medium pebbles; weakly developed medium sub-angular blocky structure; friable; gradual smooth boundary to:
32-68 cm	Dark yellowish brown (10YR 4/6) sandy clay loam with medium faint greyish brown (10YR 5/2) mottles and rare small pebbles; weakly developed medium sub-angular blocky structure; friable; gradual smooth boundary to:
68-120+ cm	Yellowish brown (10YR 5/8) sandy clay with common medium grey (10YR 5/1) and a few coarse distinct strong brown (7.5YR 5/8) mottles and ferrimanganiferous concentrations; weakly developed coarse angular to very coarse prismatic structure; firm.

2.9 These soils are imperfectly-draining (Soil Wetness Class II or III). They have a high to moderate capacity to absorb winter rainfall.

SANDY SOILS

2.10 These soils are mapped over one small area in the north-east. Soils have medium sandy loam topsoil and upper subsoil over medium sand lower subsoil. They are permeable, non-calcareous and only slightly gleyed at depth.

2.11 A profile typical of these sandy soils is described below from observation 20 (Map 1).

0-31 cm	Dark brown (7.5YR 3/2) medium sandy loam with rare small quartzite stones; weakly developed medium sub-angular blocky structure; friable; clear smooth boundary to:
31-67 cm	Dark reddish brown (5YR 3/3) medium sandy loam with a few medium distinct strong brown (7.5YR 5/8) mottles; weakly developed fine sub-angular blocky structure; very friable; clear smooth boundary to:
67-120+ cm	Pale brown (10YR 6/3) medium sand with common yellowish brown (10YR 5/6) mottles; single grain structure; loose; stoneless.

2.12 These soils are permeable and freely-draining (Soil Wetness Class I). They have a high capacity to absorb winter rainfall, but are slightly droughty for arable crops and moderately droughty for grass.

3.0 Agricultural Quality

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[2]. The relevant site data for an average elevation of 90 m is given below.

• Average annual rainfall:	638 mm
• January-June accumulated temperature >0°C	1384 day°
• Field capacity period (when the soils are fully replete with water)	135 days late Nov-early April
• Summer moisture deficits for:	wheat: 106 mm potatoes: 98 mm

3.3 The survey described in the previous section was used in conjunction with the agroclimatic 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[3]. There are no climatic limitations to land quality in this part of Northamptonshire.

SURVEY RESULTS

3.4 The agricultural quality of the land is most limited by wetness and in a small area by droughtiness. Land of grade 2 and 3 quality has been identified.

[2] *Climatological Data for Agricultural Land Classification*. Meteorological Office, 1989
[3] *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*. MAFF, 1988.

Grade 2

3.5 Land of this quality is found in the north-east of the site where permeable loamy drift deposits are deepest and wetness restrictions are minor. The land has fine loamy soils (see paragraphs 2.7-2.9), which have occasional minor restrictions to access during wet springs, but a wide range of crops may be grown.

Also included is the small area of sandy soils (see paragraphs 2.10-2.12) which have limited subsoil moisture reserves, leading to slight reductions in crop yield, although not affecting the range of crops which can be grown.

Sub-grade 3a

3.6 This land is found to the north of the central woodland, over those fine loamy soils that are slowly permeable at relatively shallow depth. Soils are imperfectly to poorly-draining (Soil Wetness Class III). Wetness restricts access in early spring, meaning flexibility of spring cropping is restricted, although greater flexibility exists for autumn sowings.

Sub-grade 3b

3.7 This land dominates the site. Soils are similar to those described in paragraphs 2.4-2.6, being heavy- textured and poorly-draining (Soil Wetness Class IV/III). These heavy soils are not suitable for cultivation when wet, conditions which are likely to rule out spring-sowings in most years, and reduce flexibility of autumn sowings. Arable crops are mainly limited to autumn-sown cereals and oilseeds.

Non-agricultural land

3.8 These include several small woodlands, the Courteenhall Shooting School, farm buildings and associated hard standings and sealed farm tracks. Also included are existing road areas included within the site boundary.

Grade areas

3.9 The areas occupied by each grade are shown below.

Table 1. Areas occupied by the different land grades

Grade/sub-grade	*Area (ha)*	*% of the agricultural land*
Grade 2	12.2	7
Sub-grade 3a	18.8	11
Sub-grade 3b	140.9	82
Non-agricultural land	49.0	-
Total	219.9	100

4.0 Soil resources and their use

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 topsoil on this site is of mixed texture. The lighter fine loamy topsoils would form a high quality 260-320 mm thick resource for use in landscaping and residential gardens. Those heavier clay loams and clays would form a moderate to poor quality resource, being difficult to handle due to their high clay content.

Subsoil

4.3 The subsoils are often naturally slowly permeable but would easily be damaged further by trafficking during topsoil stripping and other construction activities. If compacted during they should be loosened before any topsoil is spread on them, in order to retain their ability to absorb excess winter rainfall.

Soil Handling

4.4 Areas not being built over (e.g. environmental buffers and landscape areas) should not be trafficked by construction vehicles as this will render the soils impermeable, preventing percolation of rainfall beyond the base of the topsoil, which will quickly become saturated.

4.5 Stripped topsoil should be stored in separate resource bunds no more than 3 m high, and kept grassed and free from construction traffic until required for re-use. The *Construction Code of Practice for Sustainable Use of Soils on Construction Sites* (Defra 2009) provides guidance on good practice in soil handling.

APPENDIX

MAPS AND DETAILS OF OBSERVATIONS

Land at Junction 15, Northampton: ALC and soil resources survey – Details of observations at each sampling point

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
1	0-38	ZC ca.	<5	38-60	ZC ca.	xxx	60-110+	ZC	xxx	3	III/IV	3a/b	W
2	0-22	ZC	<5	22-55	ZC	xxxx	55-110+	ZC ca.	xxxx	3	IV	3b	W
3	0-34	HZCL	<5	34-52	ZC	xxx	52-110+	ZC sl ca.	xxxx	1	IV	3b	W
4	0-33	HCL	<5	33-49	HCL	xxx	49-110+	C	xxx	4	III/IV	3b	W
5	0-30	HCL	4	30-63	C sand lenses	xxx	63-110+	ZC	xxxx	5	IV	3b	W
6	0-31	ZC	<5	31-54	ZC	xxx	54-110+	ZC v. ca.	xxxx	1	IV	3b	W
7	0-31	HZCL	<5	31-64	ZC	xxx	64-110+	ZC ca.	xxxx	3	IV	3b	W
8	0-36	HZCL	<5	36-110+	ZC	xxx	-	-	-	1	IV	3b	W
9	0-32	HCL	5	32-60	C sl. ca	xxx	60-77 77+	C v. ca. st & ck stones Stopped, stony.	xxx	2	IV	3b	W
10	0-34	SCL	<5	34-58	SCL	xxx	58-78 78-110+	HCL ZC	xxx xxxx	1	III	3a	W
11	0-33	ZC	<5	35-64	ZC	xxx	64-110+	ZC ca.	xxxx	3	IV	3b	W
12	0-27	HZCL	3	27-110+	ZC	xxx(x)	-	-	-	4	IV	3b	W
13	0-33	HCL	<5	33-70	SCL	xx	70-110+	SC	xx(x)	1	II	3a	W
14	0-33	HCL	<5	33-71	ZC	xxx	71-110+	ZC	xxxx	1	IV	3b	W
15	0-33	SCL sl. ca	7	33-67	SC	xxx	67-110+	SCL ca. ck stones	xx(x)	3	IV	3b	W
16	0-32	SCL	4	32-63	SC ca.	xxx	63-70 70+	LMS ca. stony + ck stones Stopped, stony.	xx	5	IV	3b	W
17	0-34	HCL	<5	34-73	C	xxx	73-110+	ZC ca.	xxxx	3	IV	3b	W
18	0-30	SCL	3	30-52	SC	xxx	52-90 90-110+	SCL LMS	xx xx(x)	2	IV	3b	W
19	0-27	SCL	4	27-75	SCL	xx	75-110+	SC	xxx	2	II	2	W
20	0-31	MSL	<5	31-69	MSL	x	69-110+	MS	xx(x)	3	I	2	D
21	0-29	ZC	<5	29-54	ZC sl. ca.	xxx	54-110+	ZC ca.	xxxx	<1	IV	3b	W
22	0-32	SCL	3	32-45	HCL	xxx	45-80 80-110+	SC C	xxx xxx	3	III	3a	W
23	0-42	HZCL	4	42-110+	ZC	xxx	-	-	-	3	III	3b	W
24	0-25	ZC	<5	25-110+	ZC ca.	xxxx	-	-	-	2	IV	3b	W
25	0-30	M/SCL	4	30-57	SC	xx	57-85 85-110+	SCL MSL	xx xx	2	I	2	D
26	0-30	C	<5	30-67	C	xxx	67-110+	SC	xxx	3	IV	3b	W
27	0-28	H/SCL	4	28-45	SC	xxx	45-110+	ZC	xxx	1	III	3a/b	W
28	0-32	SCL	<5	32-42	SCL	xxx	42-81 81-110+	C SC	xxx xxx	2	III	3a	W
29	0-32	HCL/SC	<5	32-61	C	xxx	61-110+	ZC ca.	xxxx	0	IV	3b	W
30	0-34	SCL/HCL	xxx	34-80	SC	xxx	80-110+	SCL	xx(x)	3	IV	3b	W
31	0-31	SCL	6	31-50	SC stony	xxx	50+	Stopped, stony.	-	2	IV	3b	W
32	0-30	HCL	<5	30-43	HCL	xxx	43-75 75-110+	ZC ZC ca.	xxx xxxx	3	III	3b	W
33	0-27	HCL sl. ca	3	27-70	C ca.	xxx	70-110+	ZC	xxxx	3	IV	3b	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
34	0-31	ZC	<5	31-67	ZC	xxx	67-110+	ZC	xxxx	3	IV	3b	W
35	0-29	SCL	<5	29-75	SCL	xx(x)	75-110+	C	xxx	<1	II	2	W
36	0-31	SCL	<5	31-62	SCL	x	62-82 82-110+	SCL MSL	xx xx	1	I	1	
37	0-34	SCL	<5	34-69	SCL	x	69-105 105-110	LMS MSL	xx x	1	I	2	D
38	0-34	SC	<5	34-57	ZC	xxx	57-110+	ZC	xxxx	1	IV	3b	W
39	0-28	SCL	6	28-46	SCL	xx(x)	46-110+	LMS	xx	2	I	3a	D
40	0-32	SCL	4	32-52	SCL/SC	xxx	52-100 100+	SC ZC	xxx xxxx	2	III	3a	W
41	0-32	SCL	<5	32-49 49-69	SCL SC	xxx xxx	69-85 85-110+	MSL MS	xx xxx	2	III	3a	W
42	0-28	SCL	<5	28-59	SCL	xx	59-83 83+	SC Stopped, stony.	xxx -	1	II	2	W
43	0-27	SCL	<5	27-76	SCL	xx	76-110+	C	xxx	2	II	2	W
44	0-33	SCL	<5	33-50	HCL	xxx	50-110+	C	xxx	1	III	3a	W
45	0-31	HCL	<5	31-42	HCL	xxx	42-62 62-110+	C HCL ca.	xxx xx	1	III	3b	W
46	0-26	M/HCL	<5	26-52	HCL	xx	52-81 81-110+	HCL SCL	xxx xxx	2	II/III	2/3a	W
47	0-35	SCL	<5	35-45	SCL	xxx	45-70+ 70+	HCL Stopped, stony.	xxx -	<1	III	3a	W
48	0-35	SCL	<5	35-52	SCL	xxx	52-73 73-110+	SC ex. ca. ZC v. ca.	xxx xxxx	<1	III	3a	W
49	0-33	SCL	<5	33-54	SCL	xxx	54-110+	SC	xxx	1	III	3a	W
50	0-32	SCL	5	32-45	SCL	xx	45-110+	SC	xxx	1	III	3a	W
51	0-30	SCL	6	30-50	SCL	x(x)	50-80 80-110+	SCL SC	xx(x) xxx	2	II	2	W
52	0-32	SCL	4	32-68	SCL	xx	68-110+	SC	xxx	2	II	2	W
53	0-32	HCL/SC	<5	32-42	SC	xxx	42-74 74-110+	C ZC	xxx xxxx	2	III/IV	3b	W
54	0-29	HCL sl ca.	7	29-55	SCL	xxx	55-110+	C	xxx	1	III	3a/b	W
55	0-35	HCL	<5	35-55	HCL ca.	xxx	55-88 88-110+	ZC v. ca. ZC v. ca.	xxx xxxx	1	III	3b	W
56	0-30	HCL	<5	30-62	ZC sl. ca.	xxx	62-110+	ZC ex. ca.	xxx	1	IV	3b	W
57	0-32	HCL/SC slca	<5	32-82	CSL v.ca.	xx	82-110+	MS v. ca	xxx	1	I	1/2	D
58	0-33	SC	5	33-62	SCL sl. st.	xx(x)	62-110+	SCL sl. ca. stony	xxx	1	I	2	D
59	0-35	HCL sl. ca.	<5	35-54	C ca.	xxx	54-81 81+	C ck st. v ca Stopped, stony..	xxx -	<1	III/Iv	3b	W
60	0-29	HCL/SCL	5	29-58	C	xxx	58-110+	C ca. ck stones.	xxx	1	IV	3b	W
61	0-30	SCL	5	30-55	SC	xx	55-90 90-110+	ZC sl. ca. ZC ca. ck stones	xxx xxx	2	III	3a	W
62	0-32	SCL	6	32-55	SCL	xx	55-100 100-110	SCL sl st. SC sl ca. sl st.	xxx xxx	2	I	1	D
63	0-33	SCL	<5	33-40	SCL	xxx	40-63 63-110+	SC ZC	xxx xxxx	1	III	3a	W
64	0-32	SCL	<5	32-73	SCL m. st.	xxx	73-110+	ZC	xxxx	1	II	2	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
65	0-30	HCL	2	30-66	C ca. ck stones	xxx	66-110+	HCL ca. ck stones	xxxx	1	IV	3b	W
66	0-29	HCL sl. ca	4	29-66	HCL sl. ca	xxx	66-95 95-110+	ZC v. ca ZC ex ca. ck st.	xxx xxx	1	IV	3b	W
67	0-34	C ca.	<5	34-55	C ca.	xxx	55-74 74+	MSZL ca. Stopped.	xxx	1	III/IV	3a/b	W
68	0-34	HCL	<5	34-52	HCL/C	xx(x)	52-110+	C ca.	xxx	<1	III	3b	W
69	0-18	HCL ca. ck stones.	4	18-40	HCL ca.	x	40+	Stopped, stony.	-	-	-	-	-
70	0-26	HCL/SCL	<5	26-42	SC	xxx	42-110+	C	xxx	<1	III	3a/b	W
71	0-28	SCL	5	28-55	SC	xxx	55-95 95-110+	C ZC	xxx xxxx	<1	IV	3b	W
72	0-32	HCL	<5	32-40 40-54	HCL C	xxx xxx	54-83 83-110+	ZC ZC	xxxx xxx	<1	III	3b	W
73	0-32	HCL	3	32-61	C	xxx	61-110+	ZC	xxx	2	IV	3b	W
74	0-32	SC	<5	32-41	SC	xxx	41-110+	SC	xxx(x)	2	III/IV	3b	W
75	0-28	HCL	2	28-75	C sl. stony	xxx	75-110+	ZC	xxx	2	IV	3b	W
76	0-34	HCL	3	34-100	C	xxx	100-110	C ca. ck stones	xxx	1	IV	3b	W
77	0-28	ZC	<5	28-61	ZC	xxx	61-110+	ZC ca.	xxx	1	IV	3b	W
78	0-24	HCL	2	24-55	C	xxx	55-88 88-110+	SCL ca HCL ck stones	xxx xxx	<1	IV	3b	W
79	0-32	SC	<5	32-73	HZCL	xxx	73-110+	SCL	xxx	<1	IV	3b	W
80	0-26	HCL/HZCL	3	26-70	C	xxx	70-110+	ZC	xxx	1	IV	3b	W
81	0-28	HCL	3	28-50	C sl. ca	xxx	50-110+	ZC ca. ck stones	xxx(x)	1	IV	3b	W
82	0-25	HZCL	1	25-60	C/ZC sl. ca	xxx	60-110+	C/ZC ca. rare ck stones.	xxx	3	IV	3b	W
83	0-30	C ca.	<5	30-83	C ca.	xxx	83-110+	C v. ca.	xxx	1	IV	3b	W
84	0-30	HCL	3	30-90	ZC	xxx	90-110+	ZC	xxxx	<1	IV	3b	W
85	0-27	HZCL sl. ca	4	27-77	ZC ca. ck stones	xxx	77-110+	ZC ca. ck stones	xxxx	1	IV	3b	W
86	0-27	HZCL	4	27-55	ZC sl. ca	xxx	55-110+	ZC ca. ck stones	xxxx	1	IV	3b	W
87	0-28	HZCL	3	28-42	ZC sl. ca	xxx	42-90 90-110+	ZC ex. ca ck stones ZC ca.	xxx xxxx	1	IV	3b	W
88	0-35	ZC ca.	<5	35-64	ZC v. ca.	xx(x)	64-110+	ZC v. ca.	xxx	1	III/IV	3a/3b	W
89	0-33	ZC sl. ca.	<5	33-53	ZC ca.	xxx	53-110+	ZC v. ca.	xxxx	2	IV	3b	W
90	0-33	ZC	<5	33-54	ZC	xxx	54-110+	ZC	xxxx	2	IV	3b	W
91	0-34	ZC sl. ca.	<5	34-61	ZC ca.	xx(x)	61-110+	ZC v. ca.	xxx	1	II/III	3a/b	W
92	0-29	HZCL	3	29-80	ZC sl. ca	xxx	80-110+	ZC ex. ca. ck stones	xxx	1	IV	3b	W
93	0-22	HCL	4	22-40	C sl. ca	xxx	40-110+	C ex. ca. ck stones.	xxx(x)	1	IV	3b	W
94	0-32	ZC sl. ca.	<5.	32-68	ZC m st. v ca.	xxx	-	-	-	2	IV	3b	W
95	0-33	C	<5	33-57	C ca.	xxx	57-110+	ZC v. ca.	xxx	2	IV	3b	W
96	0-26	ZC sl. ca.	<5	26-55	ZC sl. ca.	xxx	55-110+	ZC v. ca.	xxxx	1	IV	3b	W
97	0-25	ZC sl. ca.	<5	25-110+	ZC ca.	xxx	-	-	-	<1	IV	3b	W
98	0-22	ZC ca.	<5	22-51	ZC sl. ca.	xxx	51-110+	ZC	xxxx	2	IV	3b	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
99	0-32	ZC sl. ca.	<5	32-42	ZC	xxx	42-110+	ZC	xxxx	2	IV	3b	W
100	0-30	ZC	0	30-40	ZC	xxx	40-62 62-110+	ZC ZC ca.	xxx xxxx	<1	IV	3b	W
101	0-32	HZCL	5	32-60	ZC sl. ca	xxx	60-110+	ZC ca. ck stones.	xxxx	1	IV	3b	W
102	0-30	ZC	<5	30-61	ZC	xxx	61-110+	ZC	xxxx	1	IV	3b	W
103	0-31	C	0	31-62	ZC	xx	62-110+	ZC	xxx	2	II/III	3a/b	W
104	0-31	HZCL	2	31-55	ZC sl. ca	xxx	55-110+	ZC ca. ck stones	xxxx	1	IV	3b	W
105	0-30	HZCL calc	4	30-52	ZC	xxx	52-110+	ZC	xxxx	2	IV	3b	W
106	0-28	C	2	28-75	ZC	xxx	75-110+	ZC	xxxx	2	IV	3b	W
107	0-29	HZCL	3	29-65	ZC	xxx	65-110+	SC	xx(x)	1	IV	3b	W
108	0-34	C/HZCL	0	34-43	C	xxx	43-110+	C	xxxx	3	III	3b	W
109	0-30	C	2	30-110+	C	xxx(x)	-	-	-	4	IV	3b	W
110	0-30	HZCL	4	30-65	ZC	xxx	65-110+	SC	xxx	1	IV	3b	W
111	0-28	Cca	<5.	28-45	C	xx	45-80+			3	III	3a	W
112	0-27	C	<5	27-80+	C	xxx				2	III/IV	3b	W
113	0-30	Cca	<5	30-70+	C	xxx				6/7	III/IV	3b	W
114	0-32	HCL/SCL	<5	32-70+	HCL/SCL	xxx	70+	stopped on stones		4	III	3b/3a	W
115	0-24	HCL	<5	24-80+	Cca	xxx				3	III/IV	3b	W
116	0-25	SCL	<5.	25-90+	C	xxx				2	III/IV	3a/3b	W
117	0-33	C/SC	<5	33-80+	CC	xxx				2	III/IV	3b	W
118	0-25	HCL/C	<5	25-80+	C	xxx				3	III/IV	3b	W
119	0-25	HCL/SC	<5	25-55	C	xxx	55-70+	Cca	xxx	2	III/IV	3b	W
120	0-28	C	<5	28-51	C	xxx	51-80+	Cca	xxx	2	III/IV	3b	W
121	0-35	C	<5	35-80+	C	xxx				4	III/IV	3b	W
122	0-27	Cca	<5	27-50+	C	xxx				1	IV/III	3b	W

Key to table

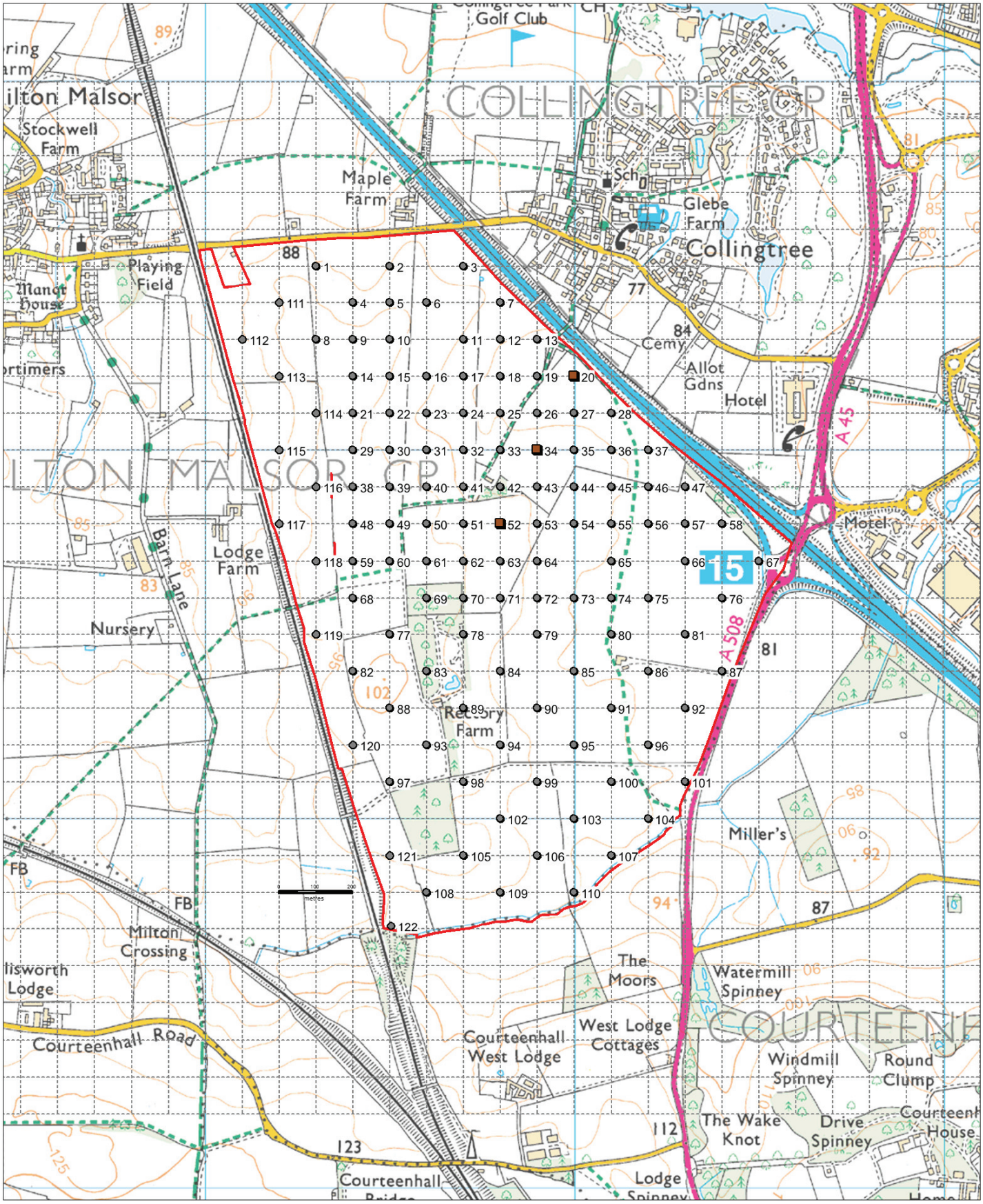
Mottle intensity:
- o unmottled
- x few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
- xx common to many ochreous mottles and/or dull structure faces
- xxx common to many greyish or pale mottles (gleyed horizon)
- xxxx dominantly grey, often with some ochreous mottles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

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)

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

Limitations:
- W - wetness/workability
- D - droughtiness
- De - depth
- St – stoniness
- Sl – slope
- F - flooding
- T – topography/microrelief

Texture suffixes & prefixes:
- ca – calcareous: x-extremely, v-very, sl-slightly
- (ca) – marginally calcareous
- mn - ferrimanganiferous concentrations
- gn – greenish, yb – yellowish brown, rb – reddish brown
- r – reddish; (v)st – (very) stony; sdst - sandstone
- dist - disturbed soil layer; mdst - mudstone



Client: ROXHILL

Project: Junction 15, M1 Northampton

Map title: Map 1 Location of Observations

KEY

- Survey area
- Survey observation
- Soil description pit

Scale: 1:6,500 at A3

Date: 21/09/2017

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