Bloor Homes Southern

Land at Sandleford Park,

Newbury,

Berkshire

Soil Resources

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1. Introduction

1.1. Instruction

1.1.1. Reading Agricultural Consultants Ltd (RAC) is instructed by Bloor Home Southern to investigate the soil resources at Sandleford Park, Newbury.

1.1.2. A detailed Agricultural Land Classification (ALC) survey was undertaken at the site by the former Ministry of Agriculture, Fisheries and Food (MAFF) in 1994. The survey found land quality to range from very good quality Grade 2 to poor quality Grade 4.

2. Site and Climatic Conditions

2.1. General Features, Land Form and Drainage

2.1.1. The site extends to around 166ha, predominantly comprising agricultural land. The site is bounded to the north by Monks Lane, to the east by Newbury College and Newtown Road, to the west by residential and commercial buildings off Andover Road, and to the south by the River Enbourne.

2.1.2. Much of the land is in arable use with a small area of permanent grassland to the east. Several large pockets of woodland are dispersed throughout the site, through which a valley also curves from north-west to south-east, containing a river tributary. Flanking the river, the land is boggy and characterised by reeds, forming a functional floodplain. A subordinate valley system also originates in the north-east, connecting with the main tributary in the approximate centre of the site.

2.1.3. Topography is complex. In the north and west, much of land is largely level, sitting at around 120m above Ordnance Datum (AOD). Generally convex slopes fall from the north to the major and minor river tributaries at 110m AOD, although there are microtopographic patterns including concave areas of slope, particularly at the sources of the river tributaries.

2.1.4. From the west, a concave slope falls fairly uniformly to the river in the south-east, from 120m AOD to 90m AOD.

2.2. Soil Parent Material and Soil Type

2.2.1. The principal underlying geology mapped by the British Geological Survey[1] is that of the London Clay Formation, comprising poorly laminated, slightly calcareous silty clay, clayey silt or sometimes silt, with some layers of sandy clay. At the highest elevations across the flatter land to the north and west, the London Clay is overlain by superficial deposits of the Silchester Gravel Member, comprising variable clayey or sandy gravel. To the south, in conjunction with the River Enbourne, superficial alluvium is mapped and may include clay, silt, sand and gravel.

[1] **British Geological Survey (2014).** *Geology of Britain viewer, http://mapapps.bgs.ac.uk/geologyofbritain/home.html*

2.2.2. The Soil Survey of England and Wales soil association mapping[2] (1:250,000 scale) shows the Sonning 1 association to be present to the north of the site. Sonning soils are characterised by flinty, coarse loamy and gravelly profiles. The soils are well drained and of Wetness Class (WC) I[3].

2.2.3. In the south of the site, the Wickham 3 association is mapped. Wickham soils develop in fine loamy or fine silty drift over clay. Profiles are poorly permeable and seasonally waterlogged, commonly of WC IV.

3. Soil Verification

3.1. Soil Survey Methods

3.1.1. Eighteen soil profiles were examined using an Edelman (Dutch) auger in predetermined transects across the site, and two pits excavated with a spade. The locations of observations are indicated on Figure RAC6610-1. Observations were selectively made in areas of each ALC grade mapped by MAFF, at a roughly even distribution across the site.

3.1.2. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:

- soil texture;
- significant stoniness;
- colour (including local gley and mottle colours);
- consistency;
- structural condition;
- free carbonate; and
- depth.

The results are set out in Appendix 1.

3.1.2. Three topsoil samples were submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are given in Appendix 2.

3.2. Soil Characteristics

3.2.1. There are two distinct soil types present at the site which correlate with those mapped.

[2] **Soil Survey of England and Wales (1984)** *1:250,000 scale soil association mapping, Sheet 6 – Soils of South East England.*

[3] **Jarvis et al. (1984)** *Soils and their use in South East England,* Soil Survey of England and Wales, Bulletin 15: Harpenden.

3.2.2. Soils present across the arable land at the site mostly comprise sandy loam or medium clay loam topsoil of 29cm average thickness. Colour varies from very dark brown (10YR2/2) to dark greyish brown (10YR4/2). Few roots and few pores are present in the topsoil which has a moderately well-developed medium to coarse subangular blocky structure. The most notable feature of the topsoil is stoniness, which is commonly between 20 to 30% by volume and thus these areas are limited to Subgrade 3b by stoniness. Photographs of the topsoil stone are provided in Appendix 2.

3.2.3. Subsoil was not regularly able to be observed with the auger due to increasing stone content with depth. A pit excavated in a characteristically stony area showed that from around 60cm depth, the profile comprised around 60% gravel within a medium clay loam matrix. Where auger observation of the subsoil was obstructed by stones, it has been assumed that a similarly gravelly layer is present at depth.

3.2.4. Where subsoil could be observed with the auger, it was found to comprise medium clay loam. The subsoil contains ochreous mottles, typically fine and faint in character, but which indicate intermittent periods of soil wetness. Although sometimes gleyed, depending upon the soil colour, the clay loam subsoil is permeable.

3.2.5. These profiles are well drained, of WC I, and are predominantly limited by stoniness and droughtiness, in agreement with the findings of the MAFF ALC survey of 1994.

3.2.6. The second soil variant is similar in many characteristics with the first variant, the primary differences being stone content and drainage. Topsoil continues to comprise sandy loam and medium clay loam which is dark greyish brown (10YR4/2) or very dark grey (10YR3/1), but is only slightly stony or stoneless (up to 5% by volume). Coarse subangular blocky peds are also formed.

3.2.7. The topsoil has an earthy, organic aroma and indeed the organic matter content is fairly high, at 8 to 8.9%, which is also reflected in low pH (pH5.4 to 5.8). These topsoils are considered organic mineral soils.

3.2.8. Subsoil is medium clay loam, or clay where distinguishable as a lower subsoil horizon, which is mostly brown (10YR5/3) with light olive brown also present (2.5Y5/3). Ochreous mottles are more common and more prominent in this soil variant and the profiles of WC II, or III to IV, depending on whether clay is absent or present respectively. Profiles of WC III and IV are limited to Subgrades 3a and 3b, distinguished by depth to the weakly structured, poorly permeable clay, with medium clay loam topsoil under the climatic conditions of the site. The areas of each Subgrade found in RAC's 2015 soil survey largely correlate with those found in the MAFF survey of 1994.

3.2.9. The profiles of WC II, although theoretically better drained, are located in a character area identified in the MAFF report on agricultural land quality, occurring in low lying areas characterised by wetland flora (an example is shown in a site photograph in Appendix 3). The topsoil is strongly malodorous due to prolonged waterlogging causing the soil to become anaerobic. These areas are confirmed as poor-quality Grade 4 agricultural land at best, as utilisation of the land for agricultural purposes is severely restricted.

3.2.10. The MAFF report identified two areas of very good quality Grade 2 agricultural land, described as "*very slightly limited in some cases by soil wetness, due to shallow gleying*

(<40cm), over deep (>80cm) slowly permeable clay horizons, and soil droughtiness due to stone contents very slightly restricting profile water availability".

3.2.11. Although three points along RAC's transects were aimed at identifying areas of MAFF's Grade 2, the presence of these areas could not be confirmed during the 2015 survey, highlighting a minor limitation of the soil survey methodology: that cores extracted with an auger provide a very narrow sample which is extremely difficult to replicate (to pinpoint the exact location following any time lapse) and furthermore, highlights limitations of mapping scale. That RAC did not find Grade 2 in the transects does not necessarily indicate that Grade 2 is not present at the site.

3.2.12. Overall, the findings of RAC's targeted sampling transects are in agreement with the MAFF survey findings, and it is considered very likely that the classification remains representative of land at Sandleford Park.

3.3. Soil Handling

3.3.1. The well drained soils found across the arable land should not pose any significant issues with regard to handling, provided that best practice is followed[4], other than that the significant stoniness may cause additional wear and tear to machinery.

3.3.2. The second more clayey soil variant, found in those areas mapped by MAFF as being of Grade 4 and those limited to Subgrade 3b due to wetness, is anticipated to be highly susceptible to damage when being handled or tracked. As many of the soils are generally very wet due to their location, the timeframe within which they are dry enough to handle or traverse without damage is limited.

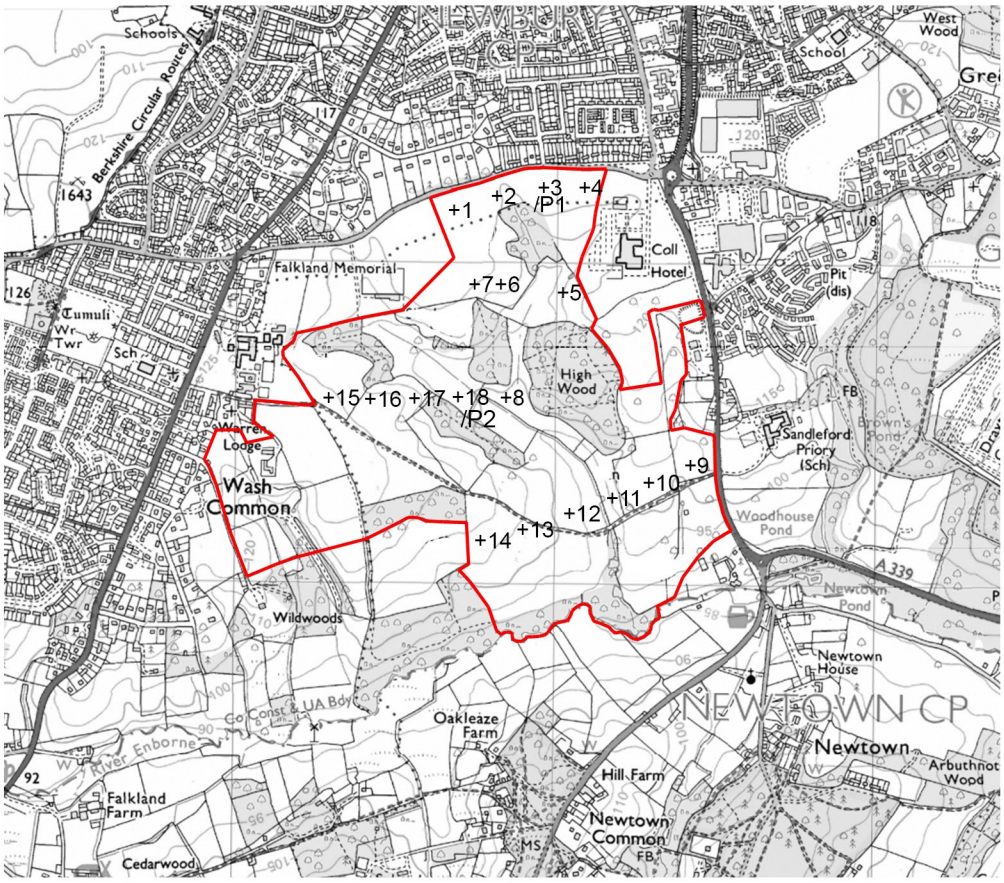
3.3.3. Access could also be an issue across these soils, as well as across parts of the site where gradients are fairly steep.

[4] Provided in **DEFRA (2009**). *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*

Appendix 1: Soil Survey Data

Site	Depth (cms)	Texture	Colour	Mottle	Stones (%)	Gley	SP	WC	Grade	Limitation
1	0-29	mSL	10YR/2		30	n	n	I	3b	stoniness
	29-50	MCL			30	n	n			
	50-70	MCL			30	n	n			
	70-120	MCL			30	n	n			
2	0-32	MZCL	10YR3/2		20	n	n	I	3b	stoniness
	32-50	MCL	10YR5/3	fff och	20	n	n			
	50-70	MCL	10YR5/3	fff och	20	n	n			
	70-120	MCL	10YR%/3	fff och	20	n	n			
3	0-32	MCL	10YR3/2		30	n	n	I	3b	Stoniness
	32-50	MCL	10YR3/2		60	n	n			
	50-70	MCL	10YR3/2		60	n	n			
	70-120	MCL	10YR/3/2		60	n	n			
4	0-23	MCL	10YR3/2		30	n	n	I	3b	Stoniness
	23-50	MCL	10YR3/2		60	n	n			
	50-70	MCL	1!0YR3/2		60	n	n			
	70-120	MCL	10YR3/2		60	n	n			
5	0-28	MCL	10YR4/2		2	n	n	IV	3b	Wetness
	28-50	C			2	n	y			
	50-70	C			2	n	y			
	70-120	C			2	n	y			
6	0-28	MCL	10YR4/2		2	n	n	IV	3b	Wetness
	28-50	C	10YR5/6	fff och	2	n	y			
	50-62	C	10YR5/6	fff och	2	n	y			
	62-70	C	10YR5/6	fff och	2	n	y			
	70-120	C	10YR5/6	fff och	2	n	y			
7	0-18	MCL	10YR3/2		15	n	n	I	2/3a	Stoniness
	18-50	MCL	10YR3/2		10	n	n			
	50-70	MCL	10YR3/2		10	n	n			
	70-120	MCL	10YR3/2		10	n	n			
8	0-38	MCL	10YR3/1		0	n	n	II	4	Wetness
	38-50	MCL	2.5Y5/3	fff och	0	y	n			
	50-70	MCL	2.5Y5/3	fff och	0	y	n			
	70-120	MCL	2.5Y5/3	fff och	0	y	n			
9	0-38	MCL	10YR4/2		5	n	n	II	2	Wetness
	38-50	MCL	10YR5/2	fff och	10	n	n			
	50-70	MCL	10YR5/2	fff och	10	n	n			
	70-120	MCL	10YR5/2	fff och	10	n	n			
10	0-20	MCL	10YR4/2		30	n	n	I	3b	Stoniness
	20-50	MCL	10YR5/2	fff och	30	n	n			
	50-70	MCL	10YR5/2	fff och	30	n	n			
	70-120	MCL	10YR5/2	fff och	30	n	n			
11	0-31	SL	10YR4/2		0	n	n	III	3b/4	Wetness
	31-50	MCL	10YR4/4	fff och	0	n	n			
	50-56	MCL	10YR4/4	fff och	0	n	n			
	56-70	C	10YR5/3	cff och	0	y	y			
	70-120	C	10YR5/3	cff och	0	y	y			

12	0-32	SCL	10YR4/2		0	n	n	II	3a	Wetness
	32-50	SCL	10YR5/3	fff och	0	y	n			
	50-70	SCL	10YR5/3	fff och	0	y	n			
	70-120	SCL	10YR5/3	cff och	0	y	n			
13	0-31	MCL	10YR4/2		20	n	n	IV	3b	Wetness
	31-43	MCL	10YR5/1	ffd och	5	y	n			
	43-50	C	10YR5/3	mmp och	0	y	y			
	50-70	C	10YR5/3	mmp och	0	y	y			
	70-120	C	10YR5/3	mmp och	0	y	y			
14	0-31	MCL	10YR4/2		20	n	n	I	3b	Stoniness
	31-50	MCL			5	n	n			
	50-70	MCL			0	n	n			
	70-120	MCL			0	n	n			
15	0-29	mSL	10YR2/2		20	n	n	I	3b	Stoniness
	29-34	LmS	10YR4/2	cmd och	0	n	n			
	34-50	LmS	10YR4/2	cmd och	0	n	n			
	50-70	LmS	10YR4/2	cmd och	0	n	n			
	70-120	LmS	10YR4/2	cmd och	0	n	n			
16	0-23	mSL	10YR2/2		20	n	n	I	3b	Stoniness
	23-50	LmS	10YR4/2	cmd och	0	n	n			
	50-70	LmS	10YR4/2	cmd och	0	n	n			
	70-120	LmS	10YR4/2	cmd och	0	n	n			
17	0-32	MCL	10YR2/2		10	n	n	II	3a	wetness
	32-46	C	10YR5/3+5/4		0	y	y			stoniness
	46-50	C	10YR5/3+5/4		0	y				
	50-70	C	10YR5/3+5/4		0	y				
	70-120	C	10YR5/3+5/4		0	y				
18	0-22	MCL	10YR3/1		0	n	n	IV	3b	Wetness
	22-50	C	10YR5/3	fff och	0	y	y			
	50-70	C	10YR5/3	fff och	0	y	y			
	70-120	C	10YR5/3	fff och	0	y	y			



Survey Area

.1 Auger Observation

.P1 Pit Observation

N

Scale 1:10,000@A4 Apr/2015

Figure RAC6610-1: Observations

Site: Sandleford Park, Newbury

Client: Bloor Homes Southern

Reading Agricultural Consultants

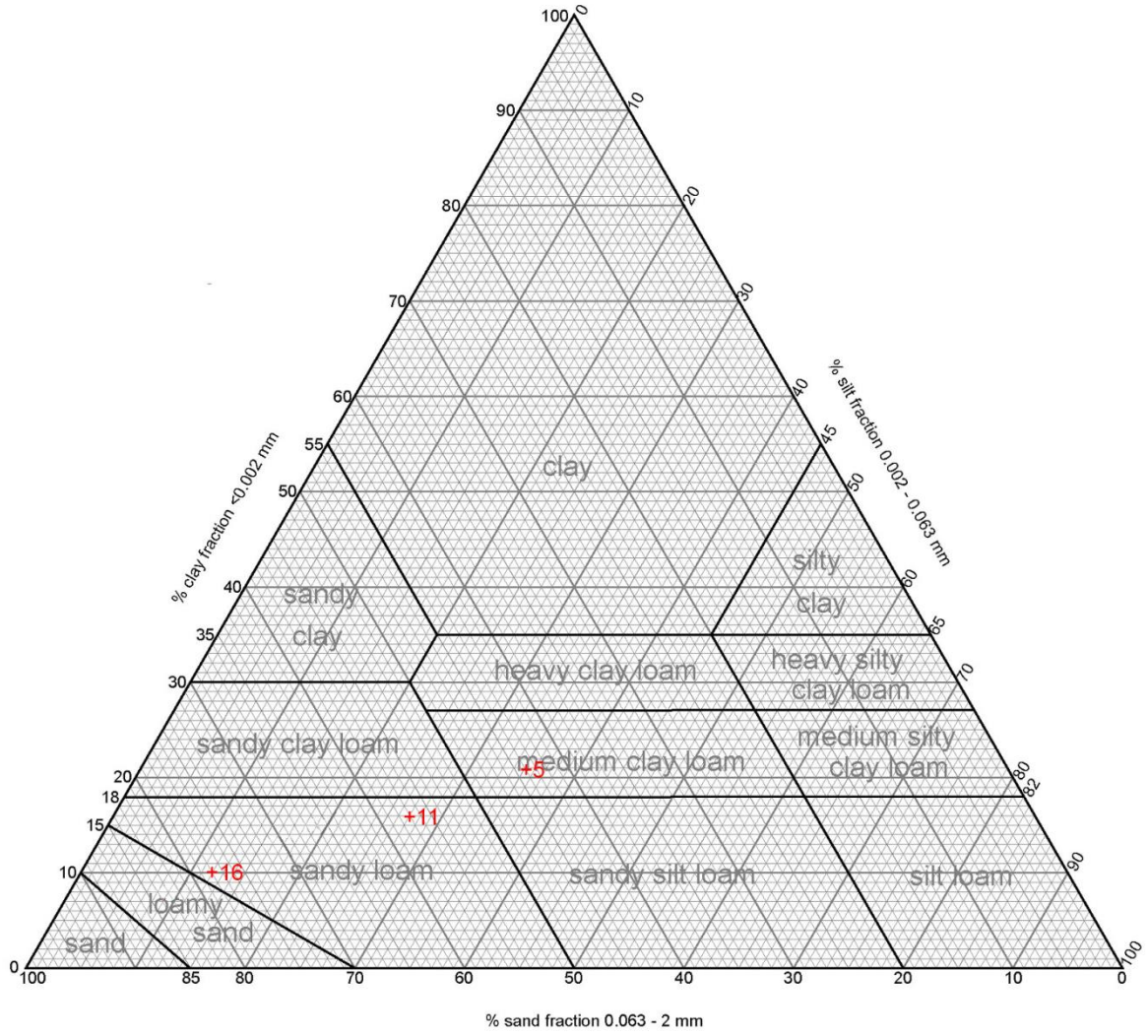
Appendix 2: Laboratory Data

Determinand	Site 5	Site 11	Site 16	Units
Sand 2.00-0.063 mm	44	57	68	% w/w
Silt 0.063-0.002 mm	35	27	22	%w/w
Clay <0.002 mm	21	16	10	% w/w
Organic Matter WB	8.9	8.0	5.7	% w/w
Texture	Organic Medium Clay Loam	Organic Sandy Loam	Sandy Loam	% w/w

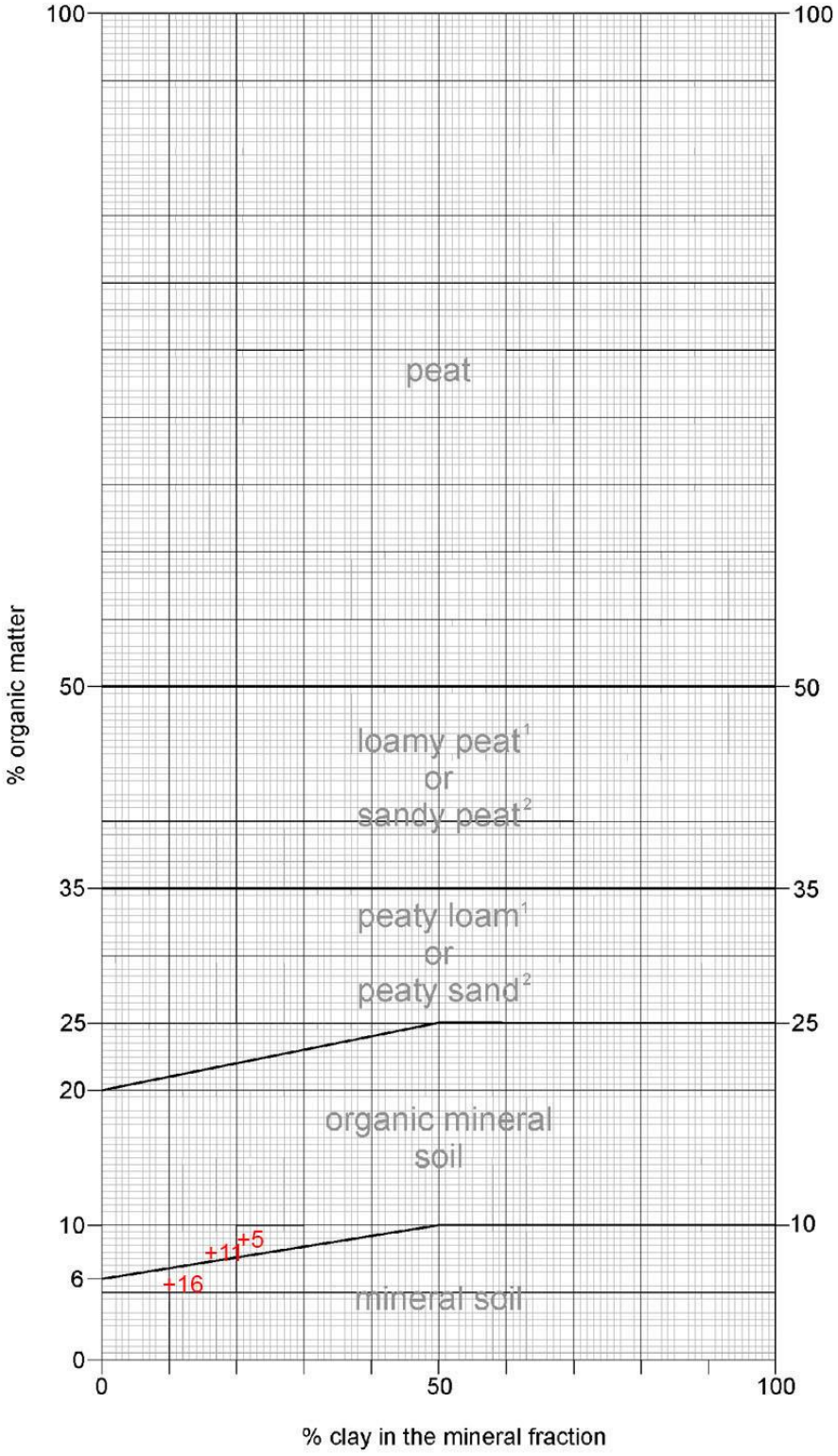
Determinand	Site 5	Site 11	Site 16	Units
Soil pH	5.4	5.8	6.1	
Phosphorus (P)	14.4	11.0	12.4	mg/l (av)
Potassium (K)	147	216	99.9	mg/l (av)
Magnesium (Mg)	76.2	83.0	31.9	mg/l (av)

Determinand	Site 5	Site 11	Site 16	Units
Phosphorus (P)	1	1	1	ADAS Index
Potassium (K)	2-	2+	1	ADAS Index
Magnesium (Mg)	2-	2	1	ADAS Index

Soil Texture by Particle Size Distribution



Organic Matter Class



[1] Less than 50% sand in the mineral fraction

[2] 50% sand or more in the mineral fraction

Appendix 3: Site Photographs

Stones at Observation Point 3

Stones at Observation Point 14

Viewpoint West from Observation Point 5.