
ES VOLUME 2

Technical Appendices

G - Agricultural Land Classification and Soils

KEDD DEVELOPMENT LIMITED

AGRICULTURAL LAND CLASSIFICATION AND SOIL RESOURCE REPORT ON LAND AT LEA CASTLE FARM, WOLVERLEY

prepared by
Richard Stock
Soils and Agriculture
17 Kings Road, Hunstanton
Norfolk PE36 6ET
Tel. 01485 534503
Email. richard.stock3@btconnect.com

**Richard Stock BSc. MIAgrE
May 2018**

CONTENTS

- 1.0 INTRODUCTION**
- 2.0 CLIMATE**
- 3.0 THE SITE**
- 4.0 THE SOILS**
- 5.0 AGRICULTURAL LAND CLASSIFICATION**
- 6.0 SOIL RESOURCES**
- 7.0 SOIL STORAGE**
- 8.0 SOIL HANDLING**

APPENDIX

- 1. Schedule of auger borings and soil pit descriptions**
- 2. Soil analysis laboratory reports (P, K, Mg, pH)**

PLANS

- 1. Soil survey locations (W25/1)**
- 2. Agricultural land classification (W25/2)**

1. INTRODUCTION

- 1.1 Kedd Development Limited instructed Richard Stock to prepare an Agricultural Land Classification and Soil Resource report on approximately 46.9 ha of land at Lea Castle Farm, Wolverley, near Kidderminster. The report is required as part of the baseline information for a planning application and EIA for a new sand and gravel quarry and includes recommendations for soil storage and handling.
- 1.2 An earlier survey had been undertaken by The Ministry of Agriculture, Fisheries and Food (MAFF) in 1998 (reference ALCB04098). The report has been made available by Natural England, but is limited to a summary of the survey findings and the Agricultural Land Classification map. This information is available through the MAGIC website, (Multi-Agency Geographic Information for the Countryside defra.gov.uk). However, the report is incomplete and the survey field notes and/or survey data is not available.
- 1.3 The current report is based on further soil survey work which was undertaken on the 1st and 2nd May 2018 by sampling soil at forty five locations using a 1.2 m dutch auger and spade and examining three soil profile pits. Further information has been obtained from the Soil Survey of England and Wales.
- 1.4 The survey area is centred on National Grid Reference SO 840 790 and comprises variable topography from very gently undulating to steeply graded at elevations of between 53 and 83 m AOD.
- 1.5 The soil survey details have been interpreted to grade the site in accordance with the Ministry of Agriculture, Fisheries and Food Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for Grading the Quality of Agricultural Land) published in 1988. The system considers criteria relating to the **climate, site and soil**.

2. CLIMATE

- 2.1 Agroclimatic data for the site influences the agricultural land classification in respect of growing conditions for crops, and the soil reaction in terms of wetness and drought.
- 2.2 The meteorological office has published agroclimatic data for England and Wales on a five km grid basis, which can be interpolated to produce data for specific grid points. Data for the site is presented in the table below.

Grid Reference	SO 841791	SO843789	SO846790
Altitude – ALT (m)	73	80	61
Average Annual Rainfall – AAR (mm)	690	693	685
Accumulated Temperature - Jan to June - ATO	1413	1405	1426
Moisture Deficit Wheat - MDMWHT	99	98	100
Moisture Deficit Potatoes - MDMPOTS	88	87	90
Duration of Field Capacity - FCD	156	156	155

- 2.3 The climatic criteria are considered first when classifying land as climate can be overriding irrespective of soil and site conditions. The main parameters used in the assessment of climatic limitation are Average Annual Rainfall (AAR), as a measure of overall wetness, and Accumulated Temperature (ATO, Jan to June), as a measure of the relative warmth of the area.
- 2.4 On the basis of Rainfall and Accumulated Temperature, the site is climatic grade 1.

3 THE SITE

- 3.1 The land extends to approximately 46.9 hectares of mixed arable and grassland. It is located 1 km east of Wolverley, 1.2 km south of Cookley and 2 km north of Kidderminster. Access is gained from the B4189 on the south boundary.
- 3.2 The site is divided into two areas, Western and Eastern, by a privately owned access track which leads from the B4189 northwards to a bungalow, equestrian centre and Lea Castle Farm.
- 3.3 The site comprises mainly agricultural land. The Western area is very gently undulating at elevations of between 60 and 70 maod. The Eastern area is steeply undulating rising from the central access track to a high point at 83 maod, before falling back to 53 maod on the east boundary with the A449.
- 3.4 At the time of survey the Western area was in an emerging cereal crop and the Eastern area was mainly being planted with potatoes. A field to the north of the potatoes was in grass, which had been recently sprayed off, and there was a small parcel of grassland on the south side associated with adjacent buildings. There was a further very small grass patch associated with a dwelling on the south boundary, which was assessed as non agricultural.
- 3.5 Although the topography on the Eastern area is steeply undulating it does not present any significant gradients, which might affect farming practice.
- 3.6 There is no evidence that the site is at risk of flooding or that micro-relief influences land use through frost risk.
- 3.7 On the basis of **site** characteristics relating to gradient, microrelief and flooding there is no limitation to grade.

4 THE SOILS

- 4.1 The soils are described in Soil Survey of England and Wales Bulletin 12 (Soils and Their Use in Midland and Western England), and identified on the 1:250,000 soil map of England and Wales Sheet 3. The information given in the Bulletin and maps is limited in several ways and is not a definitive soil description. Firstly, soil patterns in England and Wales are commonly complex and vary greatly in composition. Secondly, the minimum area that can be shown on the map is 0.5 km² and because of this many soil associations include small patches of soils which, at a larger scale, would be correlated with a different map unit. It is therefore noted that within the limitations of the map, the Eastern Area is dominated by soils in the Bridgnorth Association, and in the Western area by the Newport 4 Association.
- 4.2 The Bridgnorth Association is described as '*Well drained sandy and coarse loamy soils over soft sandstone*' and the Newport 4 Association as '*Deep well drained sandy soils with some very acid soils with bleached subsurface horizons*'.
- 4.3 The Bulletin confirms that the typical Bridgnorth soil comprises loamy sand topsoil and subsoil passing to sand and soft sandstone within 1.2 m depth. The Newport soils are typically sandy loam or loamy sand topsoil overlying loamy sand subsoil which sits on slightly stony sand.
- 4.4 During the soil survey, compound soil samples were collected from 7 identifiable parcels of land for analysis of basic nutrients and pH. Three samples were taken from the Western area (north, central and south), and four samples from the Eastern area (east of the ridge, west of the ridge, north grass field, south grass field). A summary of the pH results are shown in the table below, the laboratory results are presented at Appendix 2 and the areas are identified by

reference to the auger locations on Plan W25/1.

Area	survey locations	pH
West north	29 and 38-42	4.9
West central	30, 31, 36, 37, 43	5.1
West south	32-35, 44, 45	5.4
Pots west	1-4, 16-18	5.6
Pots east	5-15	5.6
Grass north	19-25	6.0
Grass south	26, 27, 28	5.8

- 4.5 The detailed soil survey accords with the broad description of the Associations and concurs with the earlier MAFF survey. One marginal variation is that topsoil in the Eastern area occupied by Bridgnorth soil was hand textured mainly as sandy loam, although borderline with loamy sand, with isolated areas of loamy sand. The MAFF survey identified similar borderline texture, which was confirmed by laboratory analysis of particle size distribution.
- 4.6 The soil survey details are attached at Appendix 1 and plan W25/1 shows the soil survey locations.

5. AGRICULTURAL LAND CLASSIFICATION

- 5.1 The site was graded by applying the survey details to the Ministry of Agriculture, Fisheries and Food Guidelines for Agricultural Land Classification (October 1988).
- 5.2 The current classification system was adopted in 1988 and was a refinement of the previous system. A series of Provisional ALC maps were produced at a scale of 1 inch to 1 mile between 1967 and 1974 based on the earlier classification system, and were intended to be for guidance only for strategic planning purposes. A new series of soil maps at a scale of 1:250,000 based on the same information are available on MAGIC, an interactive, geographical information website. The 1:250,000 map of the area shows the site to be Provisional Grade 3.
- 5.3 The agricultural land classification system provides a framework for classifying land according to the extent to which it's physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can affect the range of crops that can be grown, the level of yield, the consistency of yield and the cost of obtaining it. The principal factors considered are **Climate, Site and Soil**. These factors, together with interactions between them, form the basis for classifying land into one of five grades. Grade 1 is land of excellent quality and grade 5 is very poor. Grade 3 is divided into sub-grades 3a and 3b since this grade covers about half of England and Wales. The grade or sub-grade is determined by the most limiting factor present.
- 5.4 On this site there is no limit according to **Climate**.
- 5.5 The assessment of **Site** factors considers the way the topography affects agricultural machinery use and crop production. This site comprises a mixed topography from gently to steeply undulating. The steepest gradient in the Eastern area is about 1 in 12 and fundamentally offers no restrictions to agricultural use and cropping potential.
- 5.6 The main **Soil** properties, which may affect cropping potential, are texture, structure, depth, stoniness and chemical fertility. The land has been actively farmed for generations and there are no overriding limitations caused by the individual soil factors. The earlier MAFF report downgraded two isolated areas to Grade 3b based on slight to moderate surface stone but

these levels of stone were not recorded in the current survey. It is assumed that higher stone occurs in small isolated patches which are too small to map at this scale.

- 5.7 The remaining consideration for ALC grading on this site relates to **Interactive** limitations, principally wetness and drought.
- 5.8 In terms of wetness the soil profile is deep and free draining (wetness class I) and there is no wetness or drainage limitation.
- 5.9 The most limiting factor is droughtiness. In the ALC System the method used to assess droughtiness provides an indication of the average droughtiness based on two reference crops, winter wheat and potatoes. The method used takes account of crop rooting and foliar characteristics to obtain an estimate of the average soil moisture balance (MB). MB is calculated on the basis of crop adjusted available water capacity (AP) and moisture deficit (MD). AP is a measure of the quantity of water held in the soil profile which can be taken up by the specified crop, and MD is a crop related climatological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.
- 5.10 The calculation of AP depends on the texture and depth of each soil horizon, the stone content and subsoil structure. Moisture balance calculations have been made for all the representative soil profiles and the results are presented in the schedule of auger borings at Appendix 1.
- 5.11 It is concluded that the site is dominated by grade 3a through drought limitation. There are three patches in the Eastern area which are uplifted to Grade 2 where the sandy loam topsoil and/or the loamy sand subsoil horizons are deeper over the soft sandstone. There is also a small patch of very droughty grade 3b where the subsoil is absent and the topsoil sits directly on sand.
- 5.12 The distribution of the grades is shown on Plan W25/2 and summarised in the table below.

Grade	Are (ha)	%
2	10.0	21.3
3a	31.2	66.5
3b	0.8	1.7
non agricultural	4.9	10.5
Total	46.9	100

6. SOIL RESOURCES

- 6.1 The agricultural soil profile on this site is identified to a depth of at least 1.2m. The typical soil profile is consistently Medium Sandy Loam topsoil (occasionally loamy medium sand), overlying Loamy Medium Sand upper subsoil, which sits on Sand and soft sandstone in the Eastern area or slightly to moderately stony sand in the Western area. The geological borehole data confirms that the average soil depth overlying the mineral reserve is 0.7m but it recorded a deeper overburden in the central area which extends between 1.2 to 2.2 m deep.
- 6.2 The variation in the ALC grades is mainly a reflection of the topsoil and subsoil horizon depths, rather than a different soil type. It is, therefore, recommended that the site is treated as a single soil type comprising medium sandy loam topsoil, loamy medium sand upper subsoil and medium sand lower subsoil with variable stone content. If the site is restored to an agricultural profile it should replicate these horizons to a total depth of at least 1.2m as far as practicable. The topsoil and upper subsoil layers are the most important, which can be restored over a lower subsoil of sand, deeper overburden from the centre of the site, inter-

burden or made ground of selected imports.

- 6.3 The soil survey shows an average profile comprising 33cm topsoil, over 27cm of subsoil sitting on 60cm of sand/stony sand. The average overburden depth recorded by the geological survey is 70cm, which has probably discarded the upper layer of sand and gravel as too 'dirty' for processing. It is, therefore, suggested for the purpose of designing a working and restoration scheme that the average soil profile is 33cm of topsoil, 37cm of subsoil and 50cm of sand.
- 6.4 In general the distinction between each soil layer can be made by colour. The topsoil is very dark brown overlying subsoil of dark reddish brown over lighter colour sand of yellowish red and reddish brown.

7. SOIL STORAGE

- 7.1 Topsoil and subsoil should be stored separately to maximum heights of 3m and 5m respectively. It is recommended that the maximum inner and outer side batters are 1 in 2 and 1 in 3 respectively.
- 7.2 If screen bunds are required higher than 5 m they can be constructed either using a basal layer of sand to achieve the required height, or constructed with a core of sand dressed with topsoil and/or subsoil subject to the long term use of the store.
- 7.3 Store footprints should be prepared so that the soils and overburden are stored 'like on like'.
- 7.4 Stores should be grass seeded with a low maintenance mix and regularly cut. Stores should be maintained tidy and free of weeds by regular cutting or spraying as required and should only be travelled on by agricultural equipment.

8. SOIL HANDLING

- 8.1 It is recommended that soils are handled using hydraulic excavators, articulated dump trucks and low ground pressure bulldozers.
- 8.2 This equipment should be used in accordance with MAFF (2000), Good Practice Guide For Handling Soils (version 04/00), FRCA Cambridge, quoting sheets 1, 2, 3, 14 and 19 as follows:-
- Sheet 1- Soil stripping with excavators and dump trucks.
 - Sheet 2- Building soil storage mounds with excavators and dump trucks.
 - Sheet 3- Excavation of soil storage mounds with excavators and dump trucks.
 - Sheet 14- Building soil storage mounds with bulldozers and dump trucks.
 - Sheet 19- Soil decompaction with bulldozer drawn tines.
- Sheet 19 is included to allow for decompaction of the soil bund footprints if required and loosening the restoration platform before soil reinstatement. Sheet 14 is included to allow the grading of soil stores before seeding for agricultural use.
- 8.3 The Good Practice Guide for handling Soils is currently being up-dated to include a process of soil replacement known as the Peninsula or Lateral Heap method. This method is recommended for this site and should be agreed by conditions.
- 8.4 Soils will be transported on specific haul routes, travelling only on the overburden surface, mineral surface or the restoration platform. It is recommended that where practicable, after the initial site development, the land should be worked and restored progressively by direct placement of the soils. The target restored soil profile, based on the survey findings, should be 33cm of topsoil over 37cm of subsoil, but this target should be reviewed following the initial

development and exposure of a section of the in-situ soil profile across the site.

- 8.4 It is recommended that the soils are only handled when they are in a dry and friable condition. The objective is that all soils shall be handled when they are in a reasonably dry and friable state, which is when they will be least susceptible to lasting damage by compaction and smearing.

APPENDIX 1

Schedule of Auger Borings and Soil Profile Pit Descriptions

KEY

Colour

		Munsell Colour
vdb	very dark brown	7.5yr2.5/3
db	dark brown	7.5yr3/2
drb	dark reddish brown	5yr3/4 and 2.5yr3/4
rb	reddish brown	5yr4/4 and 2.5yr5/4
yr	yellowish red	5yr5/6
r	red	2.5yr4/6 and 4/8
dr	dark red	2.5yr3/6
ry	reddish yellow	5yr6/8
sb	strong brown	7.5yr5/6

Munsell Colour

Mottling and Gleying

0	none
x	few and faint
xx	common
xxx	many

Texture

msl	medium sandy loam
lms	loamy medium sand
ms	medium sand

Observations

nc	non calcareous
calc	calcareous
sgmc	severe gley and manganese concretions
mn	manganese

Moisture balance (mb mm)

W	Moisture balance under wheat in mm
P	Moisture balance under potatoes in mm

SCHEDULE OF AUGER BORINGS AND PROFILE PITS

LEA CASTLE FARM

Auger No	Grid Ref SO	Depth cm	Colour	Texture	gley	Stone %	Obs	mb mm	ALC Grade
1	83998 79103	0-35 35-75 75-90 90	vdb db rb	mssl mssl lms	0 0 0	1 1		W +60 P +15	1
2	84097 79087	0-40 40-64 64-120	vdb rb yr	mssl lms ms	0 0 0	1 5 0		W +9 P +4	2
3	84194 79072	0-34 34-50 50-64 64-120	vdb drb drb r	mssl lms lms ms	0 0 0 0	1 1 0 0		W +6 P +2	2
4	84293 79058	0-32 32-55 55-75 75-120	vdb/db drb r r	mssl lms lms ms	0 0 0 0	1 4 4 0		W -11 P +1	3a
5	84399 79041	0-34 34-55 55-120	vdb drb drb	lms/mssl lms ms	0 0 0	0 0 0		W +3 P -1	3a
6	84494 79024	0-36 36-40 40-60 60	vdb drb dr	mssl lms ms	0 0 0	1 0 0	very firm sandstone	W -1 P -7	3a
7	84591 79010	0-34 34-45 45-70 70	vdb drb dr	mssl ms/lms ms	0 0 0	0 0 0	very firm sandstone	W -4 P -10	3a
8	84617 78906	0-30 30-47 47	vdb dr	mssl/lms ms	0 0	0 0	very firm sandstone	W -9 P -13	3a
9	84530 78922	0-30 30-47 47	vdb dr	mssl/lms ms	0 0	0 0	very firm sandstone		3a
10	84426 78939	0-25 25-45 45-55 55-75 75-120	vdb drb rb rn r	mssl/lms mssl/lms lms lms ms	0 0 0 0 0	1 1 0 0 0		W +10 P +4	2
11	84322 78956	0-32 32-45 45-64 64	vdb rb r	mssl lms ms	0 0 0	0 0 0	very firm sandstone	W -1 P -7	3a

Auger No	Grid Ref SO	Depth cm	Colour	Texture	gley	Stone %	Obs	mb mm	ALC Grade
12	84305 78854	0-33 33-50 50-75 75	vdb drb r	msh lms ms	0 0 0	1 1 0	very firm sandstone	W 0 P -5	3a
13	84398 78838	0-33 32-64 64	vdb drb	msh/lms lms	0 0	1 0	very firm sandstone	W +5 P +1	2
14	84490 78824	0-35 35-75 75	vdb drb	msh ms/lms	0 0	1 0	very firm sandstone	W + 8 P +4	2
15	84588 78807	0-30 30-65 65-120	vdb drb dr	msh lms ms	0 0 0	1 1 0		W +3 P -1	3a
16	84213 78976	0-30 30-120	vdb ry	lms ms	0 0	3 0		W -22 P -28	3b
17	84123 78991	0-30 30-120	vdb r	msh ms	0 0	5 0		W -11 P -17	3a
18	84031 79005	0-35 35-64 64-95 95-120	vdb drb rb rb	msh msh/lms ms ms	0 0 0 0	3 3 0 0		W +16 P +2	2
19	84161 79169	0-32 32-50 50-60 60-75 75	vdb drb rb rb	msh lms lms/ms ms	0 0 0 0	1 5 1 0	near Pit A very firm sandstone	W +3 P +2	3a
20	84253 79169	0-30 30-45 45-60 60-120	vdb drb drb r	msh msh lms ms	0 0 0 0	1 5 0 0		W +6 P +1	2
21	84340 79176	0-38 38-70 70-120	vdb drb yr	msh lms ms	0 0 0	2 1 0		W +10 P +6	2
22	84404 79126	0-40 40-80 80-120	vdb drb rb	lms lms ms	0 0 0	0 0 0		W 0 P -7	3a
23	84413 79210	0-32 32-50 50-65 65-120	vdb drb r r	msh lms lms ms	0 0 0 0	2 2 0 0		W +4 P 0	3a
24	84421 79276	0-35 35-120	vdb drv	msh lms	0 0	1 0		W +24 P +4	2

Auger No	Grid Ref SO	Depth cm	Colour	Texture	gley	Stone %	Obs	mb mm	ALC Grade
25	84322 79258	0-33 33-55 55-120	vdb drb r	mssl lms ms	0 0 0	2 2 0		W +2 P -4	3a
26	84066 78885	0-35 35-75 75-120	vdb drb sb	mssl lms ms	0 0 0	2 2 0		W +9 P +3	2
27	84158 78885	0-35 35-60 60-120	vdb drb r	mssl lms lms	0 0 0	2 2 0		W +23 P +3	2
28	84236 78884	0-35 35-62 62-120	vdb drb sb	mssl lms ms	0 0 0	2 2 0		W +5 P 0	2
29	83977 79208	0-33 33-50 50-70 70-90+	vdb rb/drb yr yr	mssl lms lms ms	0 0 0 0	2 2 7 7		W +4 P +1	3a
30	83958 79045	0-33 33-50 50-70 70-90+	vdb rb/drb yr yr	mssl lms lms ms	0 0 0 0	2 2 7 7		W +4 P +1	3a
31	83940 79045	0-30 30-60 60-75 75	vdb drb ry	mssl lms ms	0 0 0	2 5 10	impenetrable	W -8 P -5	3a
32	83921 78963	0-32 32-60 60	vdb rb	mssl lms	0 0	2 2	impenetrable	W -8 P -5	3a
33	83902 78876	0-32 32-70 70-85 85	vdb rb yr	mssl lms ms	0 0 0	2 5 7	impenetrable	W -8 P 0	3a
34	83796 78906	0-32 32-65 65-100 100	vdb drb yr	mssl lms ms	0 0 0	2 2 5	struck stone	W +3 P +1	3a
35	83816 78994	0-33 33-50 50-120	vdb rb yr	mssl lms ms	0 0 0	2 2 0	see Pit B	W 0 P -6	3a
36	83836 79078	0-35 35-60 60-90 90	vdb rb yr	mssl lms ms	0 0 0	2 2 5	impenetrable	W -1 P -1	3a

Auger No	Grid Ref SO	Depth cm	Colour	Texture	gley	Stone %	Obs	mb mm	ALC Grade
37	83870 79140	0-35 35-65 65-75 75	vdb drb yr	msh lms ms	0 0 0	2 2 7	impenetrable	S -11 P -1	3a
38	83875 79245	0-35 35-70 70-90 90	vdb rb yr	msh lms ms	0 0 0	2 5 5	struck stone	W -1 P +2	3a
39	83895 79333	0-35 35-50 50	vdb drb	msh lms	0 0	2 5	impenetrable	W -11 P -9	3a
40	83793 79429	0-30 30-55 55-75 75	vdb drb yr	msh lms ms	0 0 0	2 5 5	struck stone	W -9 P -7	3a
41	83774 79342	0-30 30-45 45-50 50	vdb drb yr	msh lms ms	0 0 0	2 5 7	impenetrable	W -16 P -10	3a
42	83753 79245	0-35 35-50 50-120	vdb rb yr	msh lms ms	0 0 0	1 1 0		W +2 P -3	3a
43	83730 79154	0-31 31-40 40-120	vdb rb yb	msh lms ms	0 0 0	1 1 0		W -5 P -10	3a
44	83712 79064	0-35 35-45 45	vdb rb	msh lms/ms	0 0 0	2 7	impenetrable see Pit C	W -14 P -10	3a
45	83690 78974	0-35 35-55 55-75 75	vdb rb yr	msh lms ms	0 0 0	2 5 7	impenetrable	W -14 P -3	3a

SOIL PROFILE PITS

Pit A Auger 19 SO 84193 79163	0-30	very dark brown (7.5yr2.5/3) medium sandy loam. Few earthworms. Good rooting. Occasional 100mm cobble. No gley. Moderate fine and medium granular. Non calcareous.
	30-55	dark reddish brown (5yr3/4) loamy medium sand. No earthworms. No stone. No gley. Friable, weak coarse subangular blocky.
	55-90	red to dark red (2.5yr3/6) medium sand. No stone. very occasional fine fibrous root. Weak coarse prismatic breaking to weak coarse angular blocky and much unaggregated material.
	90	Pit ends
	Wetness Drought	<i>No slowly permeable layer is assigned wetness class I. medium sandy loam topsoil, 156 FCD. grade 1</i> <i>mb wheat 0mm, mb potatoes -6mm</i> <i>Drought grade 3a</i> <i>Overall Grade 3a</i>

Pit B Auger 35 SO 83816 78994	0-33	very dark brown (7.5yr2.5/3) medium sandy loam. Few earthworms. Good rooting. 2% stone negligible. No gley. Moderate fine and medium granular. Non calcareous.
	33-55	reddish brown (5yr4/4) loamy medium sand. No earthworms. 2% stone negligible. No gley. Remnant roots. Friable, weak medium subangular blocky.
	55-90	yellowish red (5yr5/6) medium sand. No stone. Friable single grain.
	90	Pit ends
	Wetness Drought	<i>No slowly permeable layer is assigned wetness class I. medium sandy loam topsoil, 156 FCD. grade 1</i> <i>mb wheat +1.6mm, mb potatoes -2mm</i> <i>Drought grade 3a</i> <i>Overall Grade 3a</i>

Pit C Auger 44 SO 83712 79064	0-35	very dark brown (7.5yr2.5/3) medium sandy loam. Few earthworms. Good rooting. Very slight stone (est. 2%). No gley. Moderate fine and medium granular. Non calcareous.
	35-45	reddish brown (2.5yr5/4) loamy medium sand. No earthworms. Occasional 75mm cobble. No gley. Friable, weak coarse subangular blocky, easily breaking to smaller units.
	45-70	yellowish red (5yr5/6) medium sand. Occasional stone. Very weak coarse angular blocky and much unaggregated material.
	70-85	yellowish red (5yr5/6) medium sand. 10% stone (est). Single grain.
	85	Pit ends
	Wetness	<i>No slowly permeable layer is assigned wetness class I. medium sandy loam topsoil, 156 FCD. grade 1</i>
Drought	<i>mb wheat -15mm, mb potatoes -6mm Drought grade 3a</i>	
		<i>Overall Grade 3a</i>

PLANS

- 1. Soil Survey Locations (W25/1)**
- 2. Agricultural Land Classification (W25/2)**

APPENDIX 2

**Soil Analysis
(P, K, Mg, pH)**

**Sheet 1 – Western Area
north, central, south**

**Sheet 2 – Eastern Area
pots west, pots east,
grass north, grass south**



Contact : RICHARD STOCK
SOILS AND AGRICULTURE
17 KINGS ROAD
HUNSTANTON
NORFOLK
PE36 6ET
Tel. : 01485 534 503

T465

Please quote the above code for all enquiries

Client :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 74703/18

Date Received 21-May-18

Date Reported 22-May-18

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details			P	K	Mg	P	K	Mg
521783/18	1	W25 POTS WEST <i>No cropping details given</i>		4.9	4	2+	1	47.4	214	42
521784/18	2	W25 POTS EAST <i>No cropping details given</i>		5.1	4	2-	1	60.0	160	44
521785/18	3	W25 GRASS NORTH <i>No cropping details given</i>		5.4	1	1	1	12.8	71	50
521786/18	4	W25 GRASS SOUTH <i>No cropping details given</i>		5.6	1	1	1	11.0	72	41

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the DEFRA Fertiliser Recommendations RB209 9th Edition.

Released by J Doyle On behalf of NRM Ltd Date 22/05/18

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS

Tel: +44 (0) 1344 886338 Fax: +44 (0) 1344 890972 Email: enquiries@nrm.uk.com www.nrm.uk.com



DATE 22nd May 2018
 SAMPLES FROM

RICHARD STOCK
 SOILS AND AGRICULTURE
 17 KINGS ROAD
 HUNSTANTON
 NORFOLK
 PE36 6ET
 Tel: 01485 534 503
 Fax:

SAMPLED BY

Report reference 74703/18

Fertiliser Recommendations

The phosphate and potash recommendations shown below, are those required to replace the offtake and maintain target soil indices. The larger recommended applications for soils below target index will allow the soil to build up to this target index over a number of years. Not applying fertiliser to soils which are above target index will allow the soil to run down over a number of years to the target index.

The recommendation should be increased or decreased where yields are substantially more or less than that specified. The amount to apply can be calculated using the expected yield and values for the offtake of phosphate and potash per tonne of yield given in the RB209 9th edition.

All recommendations are given for the mid-point of each Index.

Where a soil analysis value (as given by the laboratory) is close to the range of an adjacent Index, the recommendation may be reduced or increased slightly taking account of the recommendation given for the adjacent Index. Small adjustments of less than 10 kg/ha are generally not justified.

Don't forget to deduct nutrients applied as organic manures.

For Nitrogen recommendations please refer to the RB209 9th edition or seek advice from an FACTS qualified adviser.

Target Indices:

Arable, Forage, Grassland and Potato Crops: P Index 2, K Index 2-

Vegetables and Bulbs: P Index 3, K Index 2-

Fruit Vines and Hops: P Index 2, K Index 2, Mg Index 2

(Note: Cider apples respond to K Index 3, Mg Index 3)

<i>Field Name / Ref / Soil Type</i>	<i>Last Crop / Next Crop</i>		<i>P2O5</i>	<i>K2O</i>	<i>MgO</i>		<i>Lime (Arable)</i>	<i>(Grass)</i>
W25 POTS WEST	Not Given / Not Given	<i>Units/Acre</i>				<i>T/Ac</i>	5.1	2.8
521783 /		<i>Kg/Ha</i>				<i>Te/Ha</i>	12.6	6.8

<i>Field Name / Ref / Soil Type</i>	<i>Last Crop / Next Crop</i>		<i>P2O5</i>	<i>K2O</i>	<i>MgO</i>		<i>Lime (Arable)</i>	<i>(Grass)</i>
W25 POTS EAST	Not Given / Not Given	<i>Units/Acre</i>				<i>T/Ac</i>	4.5	2.3
521784 /		<i>Kg/Ha</i>				<i>Te/Ha</i>	11.2	5.8

<i>Field Name / Ref / Soil Type</i>	<i>Last Crop / Next Crop</i>		<i>P2O5</i>	<i>K2O</i>	<i>MgO</i>		<i>Lime (Arable)</i>	<i>(Grass)</i>
W25 GRASS NORTH	Not Given / Not Given	<i>Units/Acre</i>				<i>T/Ac</i>	3.7	1.7
521785 /		<i>Kg/Ha</i>				<i>Te/Ha</i>	9.1	4.2

<i>Field Name / Ref / Soil Type</i>	<i>Last Crop / Next Crop</i>		<i>P2O5</i>	<i>K2O</i>	<i>MgO</i>		<i>Lime (Arable)</i>	<i>(Grass)</i>
W25 GRASS SOUTH	Not Given / Not Given	<i>Units/Acre</i>				<i>T/Ac</i>	3.1	1.3
521786 /		<i>Kg/Ha</i>				<i>Te/Ha</i>	7.7	3.1

Fertiliser recommendations are based on (Ninth Edition - 2017). If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne.

NRM is a UKAS accredited laboratory to ISO/IEC 17025:2005



Contact : RICHARD STOCK
SOILS AND AGRICULTURE
17 KINGS ROAD
HUNSTANTON
NORFOLK
PE36 6ET
Tel. : 01485 534 503

T465

Please quote the above code for all enquiries

Client :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 74704/18

Date Received 21-May-18

Date Reported 22-May-18

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
521787/18	1	W25 WEST NORTH <i>No cropping details given</i>	5.6	2	0	0	18.8	54	25
521788/18	2	W25 WEST CENTRAL <i>No cropping details given</i>	6.0	2	1	1	24.2	70	28
521789/18	3	W25 WEST SOUTH <i>No cropping details given</i>	5.8	2	1	1	24.0	75	29

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the DEFRA Fertiliser Recommendations RB209 9th Edition.

Released by J Doyle On behalf of NRM Ltd Date 22/05/18

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS

Tel: +44 (0) 1344 886338 Fax: +44 (0) 1344 890972 Email: enquiries@nrm.uk.com www.nrm.uk.com



DATE 22nd May 2018
 SAMPLES FROM

RICHARD STOCK
 SOILS AND AGRICULTURE
 17 KINGS ROAD
 HUNSTANTON
 NORFOLK
 PE36 6ET
 Tel: 01485 534 503
 Fax:

SAMPLED BY

Report reference 74704/18

Fertiliser Recommendations

The phosphate and potash recommendations shown below, are those required to replace the offtake and maintain target soil indices. The larger recommended applications for soils below target index will allow the soil to build up to this target index over a number of years. Not applying fertiliser to soils which are above target index will allow the soil to run down over a number of years to the target index.

The recommendation should be increased or decreased where yields are substantially more or less than that specified. The amount to apply can be calculated using the expected yield and values for the offtake of phosphate and potash per tonne of yield given in the RB209 9th edition.

All recommendations are given for the mid-point of each Index.

Where a soil analysis value (as given by the laboratory) is close to the range of an adjacent Index, the recommendation may be reduced or increased slightly taking account of the recommendation given for the adjacent Index. Small adjustments of less than 10 kg/ha are generally not justified.

Don't forget to deduct nutrients applied as organic manures.

For Nitrogen recommendations please refer to the RB209 9th edition or seek advice from an FACTS qualified adviser.

Target Indices:

Arable, Forage, Grassland and Potato Crops: P Index 2, K Index 2-

Vegetables and Bulbs: P Index 3, K Index 2-

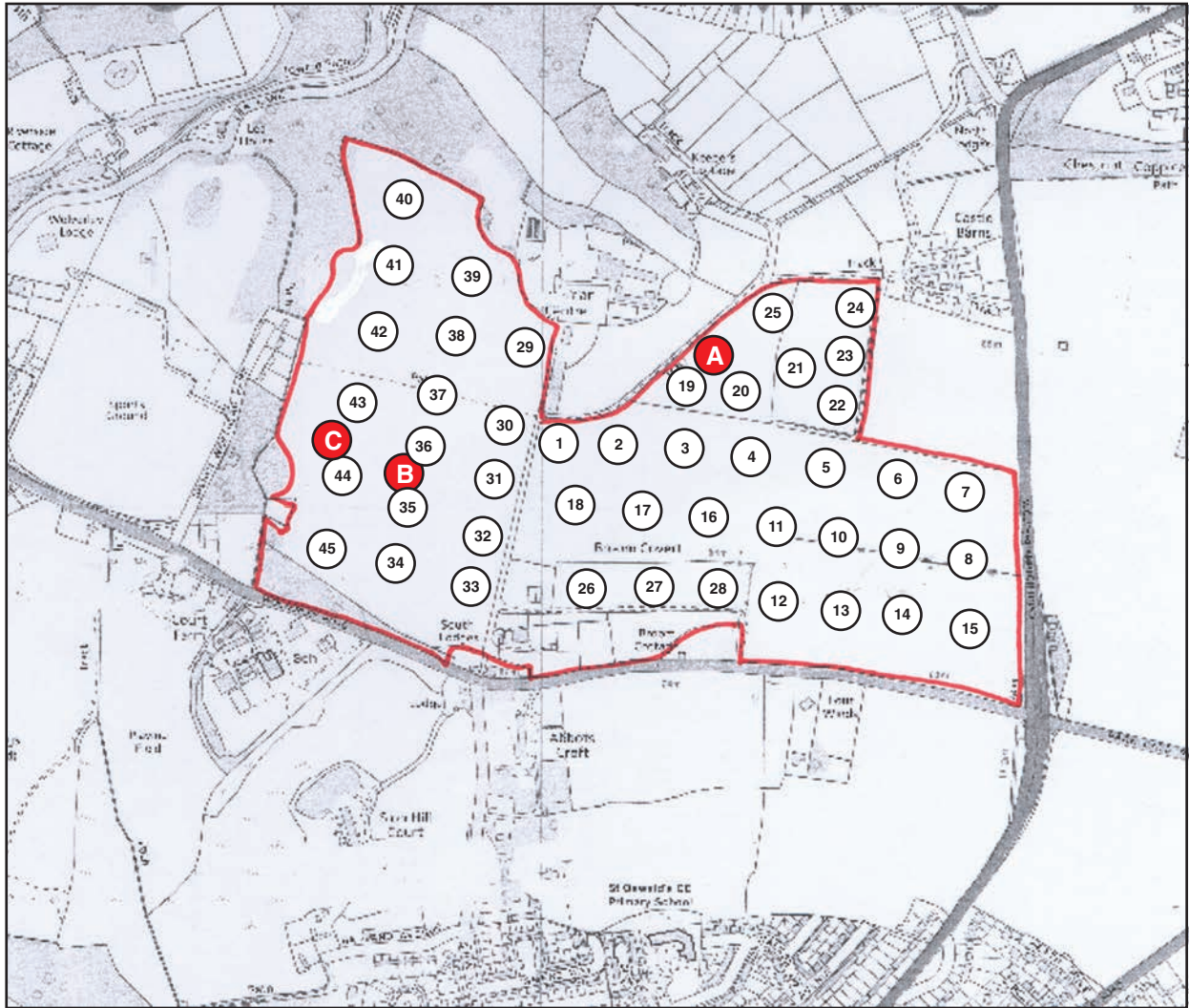
Fruit Vines and Hops: P Index 2, K Index 2, Mg Index 2

(Note: Cider apples respond to K Index 3, Mg Index 3)

Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable)	(Grass)
W25 WEST NORTH	Not Given / Not Given				T/Ac	3.1
521787 /		Units/Acre			Te/Ha	7.7
		Kg/Ha				3.1
W25 WEST CENTRAL	Not Given / Not Given				T/Ac	2.0
521788 /		Units/Acre			Te/Ha	4.9
		Kg/Ha				0
W25 WEST SOUTH	Not Given / Not Given				T/Ac	2.5
521789 /		Units/Acre			Te/Ha	6.3
		Kg/Ha				0.8
						2.1

Fertiliser recommendations are based on (Ninth Edition - 2017). If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne.

NRM is a UKAS accredited laboratory to ISO/IEC 17025:2005



LEGEND	
Auger Location	①
Pit	ⓐ
Survey boundary	—

CLIENT	Kedd Development Ltd
SITE	Lea Castle Farm
TITLE	Soil Survey Locations
SCALE	NTS
DATE	May 2018
REF	W25/1

N

