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Land at Georges Farm, Crookham Common, Berkshire Application For Minerals Extraction.

Statement of Physical Characteristics December 1997

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STATEMENT OF PHYSICAL CHARACTERISTICS

LAND AT GEORGES FARM, CROOKHAM COMMON, BERKSHIRE APPLICATION FOR MINERALS EXTRACTION

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) and site physical characteristics survey on 10.3 hectares of land to the east of Georges Farm, Crookham Common, Berkshire. The survey was carried out during December 1997.

2. The survey was undertaken by the Farming and Rural Conservation Agency (FRCA) [1] on behalf of the Ministry of Agriculture, Fisheries and Food (MAFF). The work was carried out in order to determine land quality and site physical characteristics of land affected by proposals for gravel extraction and agricultural restoration. This survey supersedes any previous ALC information for this land.

3. The work was conducted by members of the Resource Planning Team in the Eastern Region of FRCA. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.

4. At the time of survey all of the agricultural land was in winter cereals.

SUMMARY

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10,000. It is accurate at this scale, but any enlargement would be misleading.

6. The fieldwork was conducted at an average density of 1 boring per hectare. A total of 10 borings and one soil inspection pit were described.

7. All of the agricultural land on this site has been classified as Subgrade 3b (moderate quality), the key limitation being soil droughtiness. The soils generally comprise well drained medium clay loam topsoils overlying similar or lighter subsoils (medium sandy loam and/or loamy medium sand). The soils are impenetrable to the auger at shallow depths, as they are moderately or very stony. The combination of soil textures, structures, and stone contents acts to restrict the amount of profile available water for crops. As a result the level and consistency of crop yields is likely to be restricted.

[1] FRCA is an executive agency of MAFF and the Welsh Office.

FACTORS INFLUENCING ALC GRADE

Climate

8. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

9. The key climatic variables used for grading this site are given in Table 1 and were obtained from the published 5km grid datasets using the standard interpolation procedures (Met. Office, 1989).

10. The climatic criteria are considered first when classifying land as climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

Table 1: Climatic and altitude data

Factor	Units	Values
Grid reference	N/A	SU 534 642
Altitude	m, AOD	110
Accumulated Temperature	day°C (Jan-June)	1406
Average Annual Rainfall	mm	754
Field Capacity Days	days	160
Moisture Deficit, Wheat	mm	100
Moisture Deficit, Potatoes	mm	91
Overall climatic grade	N/A	Grade 1

11. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (ATO, January to June), as a measure of the relative warmth of a locality.

12. The combination of rainfall and temperature at this site mean that there is no overall climatic limitation. Other local climatic factors such as exposure and frost risk are not believed to have a significant adverse effect on the site. The site is climatically Grade 1.

Site

13. The site lies at an altitude of 105-115m AOD, with the land falling gently towards the south. A small valley feature (running in a north-south direction) occurs in the south-west corner of the site. Nowhere on the site do relief or gradient affect agricultural land quality.

Geology and soils

14. The relevant geological sheet (BGS, 1974) maps the majority of the site as being underlain by plateau gravel deposits. In the south of the site, besides Kenton Wood, a small area of London Clay may extend into the application area.

15. The most detailed published soils information for this area (SSEW, 1983) maps the Sonning 2 association across the entire site. These soils are described as being 'well drained, flinty coarse loamy and gravelly soils. Associated with slowly permeable seasonally waterlogged fine loamy over clayey soils, and coarse loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.' (SSEW, 1983).

16. Upon detailed field examination, soils broadly consistent with the above description were found across the site. They were found to be well drained, flinty and gravelly.

AGRICULTURAL LAND CLASSIFICATION

17. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1.

18. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix II.

Subgrade 3b

19. Land of moderate quality has been mapped across the survey area. The principal limitation is soil droughtiness.

20. The topsoils consist of non-calcareous, moderately stony to very stony,(30-45% total flint, 12-23% > 2cm, 3-10%>6cm) medium clay loam. The upper and lower subsoils generally have the same texture as the topsoil, (but there are occasionally medium sandy loam and /or loamy medium sand textures) and also have similar or higher stone contents (ranging from 30% to 60% total flint). These soils are assessed as Wetness Class I due to their relatively freely draining nature. All of the soils are impenetrable to the auger at depths between 40cm and 68 cm. The pit indicates that this is caused by the high volume of flints which typically range between 50 and 70%. Due to the combination of soil characteristics and the local climate regime, these soils have restricted amounts of water in the profile, such that the land suffers a moderate droughtiness limitation and crop growth and yield will be adversely affected.

SOIL RESOURCES

Soil Units : Consideration for Restoration

21. The following section describes the pattern of topsoil and subsoil resources on the site. It should be emphasised that this section is not a soil stripping plan, but merely an illustration of the soil resources available for restoration on the site. Due to the natural variability of soils, the depths and volumes of topsoil and subsoil units given in Table 2 overleaf should be treated with caution. In general terms, all the available existing topsoil and subsoil resources should be retained for restoration purposes down to 120 cm depth. When considering these details, it is important to remember that soils were sampled to a maximum depth of 120 cm during survey work.

22. The entire site is to be treated as one unit. This is because firstly, the site area is small, and secondly, the soils are relatively uniform across the site.

Topsoil:

23. One topsoil unit was identified. It comprises an average 30 cm (range = 30-32 cm) of soil resource and extends across the 10.3 ha agricultural area. The topsoil generally consists of dark to very dark greyish brown (10YR 4/2, 10YR 3/2), medium clay loam which comprise moderately well developed, coarse sub-angular blocky peds of friable consistency. The topsoil is non-calcareous and contains moderate to high amounts of flint stones (30-45% total, 12-23% > 2cm, 3-10%>6cm).

Subsoil 1

24. This unit represents an average 16cm (range = 0-38 cm) of upper subsoil resource extending across the 10.3 ha site area. This unit comprises mainly non-calcareous medium clay loam textures (occasional lighter medium sandy loam and loamy medium sand textures were encountered). Typically, the matrix colours of the upper subsoils range from greyish brown and brown (10YR 4/2, 4/3, 4/4, 5/4) to yellowish brown and ochreous (10YR 4/6, 5/6). These upper subsoils are moderately to very stony, containing between 30% and 60% total flint and possess good to moderate structural conditions depending on the stone content. Typical structure, (where observed), comprises weakly developed, medium sub-angular blocky peds of friable consistence.

Subsoil 2

25. The soils were impenetrable between 40 and 68cm depth over gravelly material. This lower subsoil resource is therefore described on the basis of the pit evidence. An average of 74 cm (ranging from 52 cm to 90 cm of lower subsoil resource is estimated to extend across the 10.3 ha site. Typically, the lower subsoils comprise non-calcareous, poorly structured gravel, (in excess of 70% total flint) with a sandy matrix. The matrix colour is ochreous (7.5YR 5/6).

Table 2: Soil Resource Data (Agricultural Areas)

Unit	Average Depth (cm)	Typical Textures	Area (ha)	Volume (m^3)
Topsoil 1	30	MCL	10.3	30,900
Subsoil 1	16	MCL/MSL/LMS	10.3	16,480
Subsoil 2	74	GRAVEL	10.3	76,220
Total Soil Resource	120			122,600

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SOURCES OF REFERENCE

British Geological Survey (1974) *Sheet No. 268, Reading, Drift Edition, 1:63,360 scale.* BGS: London.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.* MAFF: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification.* Met. Office: Bracknell.

Soil Survey of England and Wales (1983) *Sheet 6, Soils of South East England. 1:250,000 scale.* SSEW: Harpenden.

Soil Survey of England and Wales (1975) *Soils of Berkshire, 1:250,000 scale.* SSEW: Harpenden.

DESCRIPTIONS OF THE GRADES AND SUBGRADES

Grade 1: Excellent Quality Agricultural Land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2: Very Good Quality Agricultural Land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural or horticultural crops can usually be grown but on some land of this grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When more demanding crops are grown, yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a: Good Quality Agricultural Land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b: Moderate Quality Agricultural Land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass, or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4: Poor Quality Agricultural Land

Land with severe limitations which significantly restrict the range of crops and/or the level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5: Very Poor Quality Agricultural Land

Land with severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

SOIL DATA

Contents:

SOIL PROFILE DESCRIPTIONS: EXPLANATORY NOTE

Soil pit and auger boring information collected during ALC fieldwork is held on a computer database. This uses notations and abbreviations as set out below.

Boring Header Information

1. GRID REF: national 100 km grid square and 8 figure grid reference.

2. USE: Land use at the time of survey. The following abbreviations are used:

ARA:	Arable	WHT:	Wheat	BAR:	Barley
CER:	Cereals	OAT:	Oats	MZE:	Maize
OSR:	Oilseed rape	BEN:	Field beans	BRA:	Brassicae
POT:	Potatoes	SBT:	Sugar beet	FCD:	Fodder crops
LIN:	Linseed	FRT:	Soft and top fruit	FLW:	Fallow
PGR:	Permanent pasture	LEY:	Ley grass	RGR:	Rough grazing
SCR:	Scrub	CFW:	Coniferous woodland	OTH	Other
DCW:	Deciduous woodland	BOG:	Bog or marsh	SAS:	Set-Aside
HTH:	Heathland	HRT:	Horticultural crops	PLO:	Ploughed

3. GRDNT: Gradient as estimated or measured by a hand-held optical clinometer.

4. GLEY/SPL: Depth in centimetres (cm) to gleying and/or slowly permeable layers.

5. AP (WHEAT/POTS): Crop-adjusted available water capacity.

6. MB (WHEAT/POTS): Moisture Balance. (Crop adjusted AP - crop adjusted MD)

7. DRT: Best grade according to soil droughtiness.

8. If any of the following factors are considered significant, 'Y' will be entered in the relevant column:

MREL:	Microrelief limitation	FLOOD:	Flood risk	EROSN:	Soil erosion risk
EXP:	Exposure limitation	FROST:	Frost prone	DIST:	Disturbed land
CHEM:	Chemical limitation				

9. LIMIT: The main limitation to land quality. The following abbreviations are used:

OC:	Overall Climate	AE:	Aspect	ST:	Topsoil Stoniness
FR:	Frost Risk	GR:	Gradient	MR:	Microrelief
FL:	Flood Risk	TX:	Topsoil Texture	DP:	Soil Depth
CH:	Chemical	WE:	Wetness	WK:	Workability
DR:	Drought	ER:	Erosion Risk	WD:	Soil Wetness/Droughtiness
EX:	Exposure				

Soil Pits and Auger Borings

1 TEXTURE: soil texture classes are denoted by the following abbreviations:

S:	Sand	LS:	Loamy Sand	SL:	Sandy Loam
SZL:	Sandy Silt Loam	CL:	Clay Loam	ZCL:	Silty Clay Loam
ZL:	Silt Loam	SCL:	Sandy Clay Loam	C:	Clay
SC:	Sandy Clay	ZC:	Silty Clay	OL:	Organic Loam
P:	Peat	SP:	Sandy Peat	LP:	Loamy Peat
PL:	Peaty Loam	PS:	Peaty Sand	MZ:	Marine Light Silts

For the sand, loamy sand, sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of the following prefixes:

F: Fine (more than 66% of the sand less than 0.2mm)
M: Medium (less than 66% fine sand and less than 33% coarse sand)
C: Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content:
M: Medium (<27% clay) H: Heavy (27-35% clay)

2. MOTTLE COL: Mottle colour using Munsell notation.

3. MOTTLE ABUN: Mottle abundance, expressed as a percentage of the matrix or surface described:

F: few <2% C: common 2-20% M: many 20-40% VM: very many 40% +

4 MOTTLE CONT: Mottle contrast:

F: faint - indistinct mottles, evident only on close inspection
D: distinct - mottles are readily seen
P: prominent - mottling is conspicuous and one of the outstanding features of the horizon

5. PED. COL: Ped face colour using Munsell notation.

6. GLEY: If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

7. STONE LITH: Stone Lithology - one of the following is used:

HR:	all hard rocks and stones	FSST:	soft, fine grained sandstone
ZR:	soft, argillaceous, or silty rocks	CH:	chalk
MSST:	soft, medium grained sandstone	GS:	gravel with porous (soft) stones
SI:	soft weathered igneous/metamorphic rock	GH:	gravel with non-porous (hard) stones

Stone contents (>2cm, >6cm and total) are given in percentages (by volume).

8. STRUCT: the degree of development, size and shape of soil peds are described using the following notation:

Degree of development	**WK**:	weakly developed	**MD**:	moderately developed
	ST:	strongly developed		
Ped size	**F**:	fine	**M**:	medium
	C:	coarse		
Ped shape	**S**:	single grain	**M**:	massive
	GR:	granular	**AB**:	angular blocky
	SAB:	sub-angular blocky	**PR**:	prismatic
	PL:	platy		

9. **CONSIST**: Soil consistence is described using the following notation:

L: loose **VF**: very friable **FR**: friable **FM**: firm **VM**: very firm
EM: extremely firm **EH**: extremely hard

10. **SUBS STR**: Subsoil structural condition recorded for the purpose of calculating profile droughtiness: **G**: good **M**: moderate **P**: poor

11. **POR**: Soil porosity. If a soil horizon has less than 0.5% biopores >0.5 mm, a 'Y' will appear in this column.

12. **IMP**: If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropriate horizon.

13. **SPL**: Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

14. CALC: If the soil horizon is calcareous, a 'Y' will appear in this column.

15. Other notations:

APW: available water capacity (in mm) adjusted for wheat
APP: available water capacity (in mm) adjusted for potatoes
MBW: moisture balance, wheat
MBP: moisture balance, potatoes

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES----- COL	ABUN	CONT	PED COL.	GLEY	----STONES---- >2	>6	LITH	TOT	STRUCT/ CONSIST	SUBS STR	POR	IMP	SPL	CALC	
1P	0-32	MCL	10YR32						13	5	HR	35	WKCSAB	FR	M				Well rooted
	32-55	MCL	10YR44						0	0	HR	50	WKMSAB	FR	G				Border msl
	55-60	MSL	75YR46						0	0	HR	55			M				Roots
	60-120	GH	75YR56						0	0		0			P				Loose

SAMPLE NO.	GRID REF	USE	ASPECT	GRDNT	GLEY	SPL	--WETNESS-- CLASS	GRADE	-WHEAT- AP	MB	-POTS- AP	MB	M.REL DRT	FLOOD	EROSN EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
1	SU53406430	CER					1	1	49	-51	49	-42					DR	3B	I45 see pit1
2	SU53506430	CER					1	1	44	-56	44	-47					ST	3B	I42 see pit1
3	SU53206420	CER	S	2			1	1	60	-40	60	-31					DR	3B	I50 see pit1
4	SU53306420	CER					1	1	49	-51	49	-42					ST	3B	I46 see pit1
5	SU53406420	CER	S	1			1	1	50	-50	50	-41					ST	3B	I45 see pit1
6	SU53506420	CER					1	1	65	-35	69	-22					ST	3B	I68 see pit1
7	SU53206410	CER					1	1	42	-58	39	-52					DR	3B	I40 see pit1
8	SU53306410	CER	S	3			1	1	44	-56	44	-47					ST	3B	I42 see pit1
9	SU53406410	CER	S	3			1	1	44	-56	44	-47					ST	3B	I40 see pit1
10	SU53506410	CER	S	1			1	1	63	-37	64	-27					ST	3B	I52 see pit1
1P	SU53306420	CER					1	1	73	-27	72	-19					DR	3B	Gravel 60cm

SAMPLE	DEPTH	TEXTURE	COLOUR	MOTTLES COL	MOTTLES ABUN	MOTTLES CONT	PED COL.	GLEY	STONES >2	STONES >6	STONES LITH	STONES TOT	STRUCT/ CONSIST	SUBS STR	SUBS POR	SUBS IMP	SUBS SPL	SUBS CALC	
1	0-30	MCL	10YR32						23	10	HR	35							
	30-40	MCL	10YR42						0	0	HR	45		G					
	40-45	MCL	10YR42						0	0	HR	60		M					Imp gravelly
2	0-32	MCL	10YR32						23	10	HR	35							
	32-42	MCL	75YR46						0	0	HR	60		M					Imp gravelly
3	0-30	MCL	10YR42						12	3	HR	30							
	30-50	MCL	10YR43						0	0	HR	35		G					Imp gravelly
4	0-30	MCL	10YR42						17	5	HR	35							
	30-40	MCL	10YR46						0	0	HR	45		G					
	40-46	MCL	10YR56						0	0	HR	65		M					Imp gravelly
5	0-30	MCL	10YR32						23	10	HR	35							
	30-45	MCL	10YR42						0	0	HR	45		G					Imp gravelly
6	0-30	MCL	10YR32						17	4	HR	35							
	30-55	MSL	10YR44						0	0	HR	30		G					
	55-68	LMS	10YR46						0	0	HR	60		M					Imp gravelly
7	0-30	MCL	10YR32						23	10	HR	45							
	30-120	GH	10YR54						0	0		0		P					Imp gravelly
8	0-30	MCL	10YR32						23	8	HR	40							
	30-42	MCL	10YR54						0	0	HR	50		M					Imp gravelly
9	0-32	MCL	10YR32						23	10	HR	35							
	32-40	MCL	10YR46						0	0	HR	60		M					Imp gravelly
10	0-30	MCL	10YR32						17	5	HR	30							
	30-52	MCL	10YR5446						0	0	HR	30		G					Imp gravelly