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West Sussex Minerals Plan
Objector Site 58: Burton Hill
Agricultural Land Classification
ALC Map and Report
June 1995

AGRICULTURAL LAND CLASSIFICATION REPORT

WEST SUSSEX MINERALS PLAN OBJECTOR SITE 58: BURTON HILL.

1. Summary

- 1.1 ADAS was commissioned by MAFF's Land Use Planning Unit to provide information on land quality for a number of objector sites in West Sussex. The work forms part of MAFF's statutory input to the West Sussex Minerals Plan.
- 1.2 The site comprises approximately 15 hectares of land at Burton Hill to the south-east of Heath End in West Sussex. An Agricultural Land Classification (ALC) survey was carried out during June 1995. The survey was undertaken at a detailed level of approximately one boring per hectare. A total of 14 borings and one soil inspection pit were described in accordance with MAFF's revised guidelines and criteria for grading the quality of agricultural land (MAFF, 1988). These guidelines provide a framework for classifying land according to the extent to which its physical or chemical characteristics impose a long term limitation on its use for agriculture.
- 1.3 The work was carried out by members of the Resource Planning Team in the Guildford Statutory Group of ADAS.
- 1.4 At the time of survey, the land on the site comprised barley and permanent grassland.
- 1.5 The distribution of grades and subgrades is shown on the attached ALC map, the areas and extent are given in the table below. The map has been drawn at a scale of 1:10,000. It is accurate at this scale, but any enlargement would be misleading.

Table 1: Distribution of Grades and Subgrades

Grade	Area (ha)	% of Agricultural Land
3a	10.0	66.2
3b	<u>5.1</u>	<u>33.8</u>
Total area of site	15.1	100%

- 1.6 Appendix I gives a general description of the grades, subgrades and land use categories identified in the survey. The main classes are described in terms of the type of limitation that can occur, the typical cropping range and the expected level and consistency of yield.
- 1.7 Land towards the north of the site has been classified as Subgrade 3b, moderate quality land, with soil droughtiness and slope as the main limitations. Soils in this mapping unit typically comprise coarse sandy textured topsoils which become more sandy with depth. Consequently, these soils show a significant restriction on profile available water which can affect the level and consistency of crop yields. Therefore a classification of Subgrade 3b due to droughtiness is appropriate. Furthermore, gradients of 8.5° have also been measured in this mapping unit. Steep slopes such as these can significantly restrict the safe and efficient use of agricultural machinery.
- 1.8 Towards the south of the site, soils within the Subgrade 3a mapping unit tend to be less sandy than elsewhere on the site, and therefore any restriction upon profile available water

is lessened. Consequently the aforementioned droughtiness limitation is sufficiently diminished for a classification of Subgrade 3a to be appropriate.

2. Climate

- 2.1 The climatic criteria are considered first when classifying land as climate can be overriding in the sense that severe climatic limitations will restrict land to low grades irrespective of favourable site or soil conditions.
- 2.2 The main parameters used in the assessment of an overall climatic limitation are average annual rainfall, as a measure of overall wetness, and accumulated temperature as a measure of the relative warmth of a locality.
- 2.3 A detailed assessment of the prevailing climate was made by interpolation from a 5km gridpoint dataset (Met. Office 1989). The details are given in the table below and these show that there is no overall climatic limitation affecting the site.
- 2.4 However, climatic factors do interact with soil factors to influence soil wetness and droughtiness limitations. At this location, the field capacity days are relatively high in a regional context and therefore the likelihood of any soil wetness problems may be increased.
- 2.5 No local climatic factors such as exposure or frost risk are believed to affect the site.

Table 2 : Climatic Interpolations

Grid Reference	SU 973 182
Altitude (m)	25
Accumulated Temperature (Day °C, Jan-June)	1513
Average Annual Rainfall (mm)	908
Field Capacity (days)	192
Moisture Deficit, Wheat (mm)	101
Moisture Deficit, Potatoes (mm)	94
Overall Climatic Grade	1

3. Relief

- 3.1 The site slopes downwards from north to south, lying at an altitude of approximately 25-40m AOD. Towards the south-west of the site, slopes measured with an optical reading clinometer were found to be 8.5°, being sufficiently steep as to cause a limitation upon agricultural use.

4. Geology and Soils

- 4.1 The published geological map (BGS, 1972) shows the underlying geology of the site to comprise Folkestone Beds.
- 4.2 The published Soil Survey map (SSEW, 1983) shows the soils over the majority of the site to comprise those of the Shirrell Heath association. These are described as well drained acid sandy soils with a bleached subsurface horizon. Some similar soils with slowly

permeable subsoils and slight seasonal waterlogging. Some sandy and coarse loamy soils affected by groundwater often with humose surface horizon' (SSEW 1983).

- 4.3 Detailed field examination broadly confirms the published map. Soils across the site typically comprise sandy textures, although the proportions of sand in the profile was found to vary.

5. Agricultural Land Classification

- 5.1 The location of the soil observation points are shown on the attached sample point map.

Subgrade 3a

- 5.2 The majority of the land on the site has been classified as Subgrade 3a, good quality land, with soil droughtiness as the main limitation. Soils within this mapping unit tend to be stoneless, typically comprising medium sandy loam topsoils which become sandier with depth, eventually passing into pure sand. A combination of soil textures, structures and the local climatic regime means that there is a moderate restriction on the amount of profile available water for crop growth. This can affect the level and consistency of crop yields, such that classification of Subgrade 3a due to this droughtiness limitation is appropriate.

Subgrade 3b

- 5.8 An area of land in the south-west of the site was found to comprise slopes measuring 8.5°, being sufficient to restrict the safe and efficient use of agricultural machinery. Gradient has a significant effect on mechanised farm operations since most conventional agricultural machinery performs best on level ground.
- 5.9 The remainder of the land within this mapping unit is restricted by a significant droughtiness limitation. Profiles tend to be more sandy than elsewhere on the site, typically comprising loamy medium sand topsoils over sand. A soil inspection pit was dug within this mapping unit to investigate the nature of these soils, and the severity of the droughtiness limitation. At the location of the pit, a slightly stony (2% total flints) loamy medium sand topsoil was found to overlie a medium sand upper subsoils extending to a depth of 54cm. This was found to rest upon a loamy medium sand lower subsoil, passing into medium sand at a depth of 100cm. The profile was found to be well drained and assigned to Wetness Class I. Yet a combination of the sandy soil textures, moderate substructural conditions and the local climatic regime, means that there is a significant restriction upon the amount of profile available water for plant growth. This in turn will affect the level and consistency of crop yields, such that a classification of Subgrade 3b is appropriate.

ADAS Ref: 4203/131/95
MAFF Ref: EL 42/228

Resource Planning Team
Guildford Statutory Group
ADAS Reading

SOURCES OF REFERENCE

British Geological Survey (1972), Sheet No. 317, Chichester, 1:50,000 Series (drift edition).

MAFF (1988), Agricultural Land Classification of England and Wales : Revised guidelines and criteria for grading the quality of agricultural land.

Meteorological Office (1989), Climatological Data for Agricultural Land Classification.

Soil Survey of England and Wales (1983), Sheet 6, Soils of South East England, 1:250,000 and accompanying legend.

APPENDIX I

DESCRIPTION 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 (eg. 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.

Urban

Built-up or 'hard' uses with relatively little potential for a return to agriculture including: housing, industry, commerce, education, transport, religious buildings, cemeteries. Also, hard-surfaced sports facilities, permanent caravan sites and vacant land; all types of derelict land, including mineral workings which are only likely to be reclaimed using derelict land grants.

Non-agricultural

'Soft' uses where most of the land could be returned relatively easily to agriculture, including: private parkland, public open spaces, sports fields, allotments and soft-surfaced areas on airports. Also active mineral workings and refuse tips where restoration conditions to 'soft' after-uses may apply.

Woodland

Includes commercial and non-commercial woodland. A distinction may be made as necessary between farm and non-farm woodland.

Agricultural Buildings

Includes the normal range of agricultural buildings as well as other relatively permanent structures such as glasshouses. Temporary structures (eg. polythene tunnels erected for lambing) may be ignored.

Open Water

Includes lakes, ponds and rivers as map scale permits.

Land Not Surveyed

Agricultural land which has not been surveyed.

Where the land use includes more than one of the above, eg. buildings in large grounds, and where map scale permits, the cover types may be shown separately. Otherwise, the most extensive cover type will be shown.

APPENDIX II

FIELD ASSESSMENT OF SOIL WETNESS CLASS

SOIL WETNESS CLASSIFICATION

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six soil wetness classes are identified and are defined in the table below.

Definition of Soil Wetness Classes

Wetness Class	Duration of Waterlogging ¹
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years. ²
II	The soil profile is wet within 70 cm depth for 31-90 days in most years or, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but only wet within 40 cm depth for 30 days in most years.
III	The soil profile is wet within 70 cm depth for 91-180 days in most years or, if there is no slowly permeable layer present within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31-90 days in most years.
IV	The soil profile is wet within 70 cm depth for more than 180 days but not wet within 40 cm depth for more than 210 days in most years or, if there is no slowly permeable layer present within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

Soils can be allocated to a wetness class on the basis of quantitative data recorded over a period of many years or by the interpretation of soil profile characteristics, site and climatic factors. Adequate quantitative data will rarely be available for ALC surveys and therefore the interpretative method of field assessment is used to identify soil wetness class in the field. The method adopted here is common to ADAS and the SSLRC.

¹The number of days specified is not necessarily a continuous period.

²'In most years' is defined as more than 10 out of 20 years.

APPENDIX III

SOIL PIT AND SOIL BORING DESCRIPTIONS

Contents :

Soil Abbreviations - Explanatory Note

Soil Pit Descriptions

Database Printout - Boring Level Information

Database Printout - Horizon Level Information

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	DCW : Deciduous Wood
HTH : Heathland	BOG : Bog or Marsh	FLW : Fallow
PLO : Ploughed	SAS : Set aside	OTH : Other
HRT : Horticultural Crops		

3. **GRDNT** : Gradient as estimated or measured by a hand-held optical clinometer.
4. **GLEYSPL** : 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	EX : Exposure
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
ST : Topsoil Stoniness		

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. **GLEYS** : 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	SLST :	soft oolitic or dolimitic limestone
CH :	chalk	FSST :	soft, fine grained sandstone
ZR :	soft, argillaceous, or silty rocks	GH :	gravel with non-porous (hard) stones
MSST :	soft, medium grained sandstone	GS :	gravel with porous (soft) stones
SI :	soft weathered igneous/metamorphic rock		

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 **VC** : very 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

SOIL PIT DESCRIPTION

Site Name : BURTON HILL

Pit Number : 1P

Grid Reference: SU97301830 Average Annual Rainfall : 908 mm
 Accumulated Temperature : 1513 degree days
 Field Capacity Level : 192 days
 Land Use : Permanent Grass
 Slope and Aspect : 03 degrees S

HORIZON	TEXTURE	COLOUR	STONES >2	TOT.STONE	LITH	MOTTLES	STRUCTURE	CONSIST	SUBSTRUCTURE	CALC
0- 30	LMS	10YR31 00	0	2	HR					
30- 54	MS	10YR71 00	0	0			WKMSAB	VF	M	
54-100	LMS	10YR32 66	0	0			WKCSAB	VF	M	
100-120	MS	10YR71 00	0	0			WKMSAB	VF	M	

Wetness Grade : 1 Wetness Class : I
 Gleying : cm
 SPL : No SPL

Drought Grade : 3B APW : 081mm MBW : -20 mm
 APP : 063mm MBP : -31 mm

FINAL ALC GRADE : 3B
 MAIN LIMITATION : Droughtiness

SAMPLE NO.	GRID REF	ASPECT USE	GRDNT	--WETNESS--		-WHEAT-		-POTS-		M. REL		EROSN EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
				SPL	CLASS	GRADE	AP	MB	AP	MB	DRT					
1	SU97101840	BAR S	04		1	1	082	-19	066	-28	3A			DR	3A	
1P	SU97301830	PGR S	03		1	1	081	-20	063	-31	3B			DR	3B	
2	SU97001830	BAR S	03		1	1	080	-21	063	-31	3B			DR	3B	
3	SU97101830	BAR S	04		1	1	051	-50	051	-43	4			DR	3B	I50 SEE1P
4	SU97201830	BAR S	04		1	1	094	-7	078	-16	3A			DR	3A	
5	SU97301830	PGR			1	1	081	-20	065	-29	3A			DR	3A	
6	SU97001820	BAR S	05		1	1	090	-11	074	-20	3A			DR	3A	
7	SU97101820	BAR S	03		1	1	102	1	086	-8	3A			DR	3A	
8	SU97201820	BAR S	03		1	1	093	-8	076	-18	3A			DR	3A	
9	SU97301820	PGR S	04		1	1	106	5	087	-7	3A			DR	3A	
10	SU97401820	PGR S	03		1	1	113	12	099	5	2			DR	2	
11	SU97501820	PGR			1	1	051	-50	051	-43	3B			DR	3B	I 30
12	SU97201810	BAR S	03		1	1	093	-8	076	-18	3A			DR	3A	
13	SU97301810	PGR S	04		1	1	089	-12	073	-21	3A			DR	3A	
14	SU97401810	PGR S	01		1	1	142	41	095	1	2			DR	2	

SAMPLE	DEPTH	TEXTURE	COLOUR	-----MOTTLES-----			PED	-----STONES-----			STRUCT/	SUBS		
				COL	ABUN	CONT	COL.	GLE	>2	>6	LITH	TOT	CONSIST	STR
1	0-30	1ms	10YR31 32					0	0	0				
	30-60	1ms	10YR31 00					0	0	0		M		
	60-120	ms	10YR71 66					0	0	0		M		
1P	0-30	1ms	10YR31 00					0	0	HR	2			
	30-54	ms	10YR71 00					0	0	0	WKMSAB	VF	M	
	54-100	1ms	10YR32 66					0	0	0	WKCSAB	VF	M	
	100-120	ms	10YR71 00					0	0	0	WKMSAB	VF	M	
2	0-30	1ms	10YR32 00					0	0	0				
	30-40	1ms	10YR31 00					0	0	0		M		
	40-120	ms	10YR71 00					0	0	0		M		
3	0-25	1ms	10YR62 00					0	0	0				
	25-50	1ms	10YR31 00					0	0	0		M		
4	0-30	ms1	10YR31 00					0	0	0				
	30-60	1ms	10YR43 00					0	0	0		M		
	60-120	ms	10YR71 00					0	0	0		M		
5	0-30	1ms	10YR31 32					0	0	0				
	30-50	1ms	10YR31 00					0	0	0		M		
	50-120	ms	10YR71 56					0	0	0		M		
6	0-25	ms1	10YR32 00					0	0	0				
	25-50	1ms	10YR31 00					0	0	0		M		
	50-65	1ms	10YR56 00					0	0	0		M		
	65-120	ms	10YR71 00					0	0	0		M		
7	0-30	ms1	10YR31 00					0	0	0				
	30-40	ms1	10YR31 00					0	0	0		M		
	40-60	1ms	10YR54 00					0	0	0		M		
	60-120	ms	10YR71 00					0	0	0		M		
8	0-50	1ms	10YR31 00					0	0	0				
	50-120	ms	10YR54 00					0	0	0		M		
9	0-30	ms1	10YR31 00					0	0	HR	2			
	30-40	ms1	10YR31 00					0	0	0		M		
	40-120	1ms	10YR54 66					0	0	0		M		
10	0-30	1ms	10YR31 00					0	0	0				
	30-90	ms1	10YR42 00					0	0	0		M		
11	0-30	ms1	25YR53 00					0	0	0				
12	0-50	1ms	10YR31 00					0	0	0				
	50-120	ms	10YR41 00					0	0	0		M		

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES----			PED COL.	----STONES----			STRUCT/ CONSIST	SUBS STR POR IMP SPL	CALC
				COL	ABUN	CONT		GLEY >2	>6	LITH TOT			
13	0-25	ms1	10YR32 00					0	0	0			
	25-55	1ms	10YR31 00					0	0	0	M		
	55-120	ms	10YR71 00					0	0	0	M		
14	0-50	1ms	10YR31 00					0	0	0			
	50-120	ms1	10YR43 00					0	0	0	M		