

Front Garden, Swindon
Agricultural Land Classification

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Resource Planning Team
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FRONT GARDEN SWINDON
AGRICULTURAL LAND CLASSIFICATION SURVEY

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FRONT GARDEN SWINDON

AGRICULTURAL LAND CLASSIFICATION SURVEY

INTRODUCTION

1 This report presents the findings of a reconnaissance Agricultural Land Classification (ALC) survey of 299 ha of land at the area known as The Front Garden Swindon. Field survey was based on 45 auger borings and 4 soil profile pits and was completed in October 1998.

2 The survey was conducted by the Resource Planning Team of FRCA Western Region on behalf of MAFF in its statutory role in the preparation of the Swindon Development Appraisal as part of the Wiltshire Structure Plan.

3 Information on climate, geology and soils and from previous ALC surveys was considered and is presented in the relevant section. Apart from the published regional ALC map (MAFF 1977) which shows the site at a reconnaissance scale as mainly Grade 3 with Grade 4 land situated around the River Ray and its major tributaries, the site had not been surveyed previously. However, the current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF 1988) and supersedes any previous ALC survey. Grade descriptions are summarised in Appendix I.

4 At the time of the survey, land cover was primarily grassland with a few fields in arable cropping.

SUMMARY

5 The distribution of ALC grades is shown on the accompanying 1:25 000 scale ALC map. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas. Areas are summarised in the Table 1.

Table 1 Distribution of ALC grades Front Garden Swindon

Grade	Area (ha)	% Surveyed Area (285.4 ha)
3b	285.4	100
Other land	13.6	
Total site area	299.0	

6 All of the site has been mapped as Subgrade 3b. The soils experience a moderate wetness limitation with poorly drained clay subsoils which are slowly permeable.

CLIMATE

7 Estimates of climatic variables for this site were derived from the published agricultural climate dataset Climatological Data for Agricultural Land Classification (Meteorological Office 1989) using standard interpolation procedures. Data for key points around the site are given in Table 2 below.

8 Since the ALC grade of land is determined by the most limiting factor present, overall climate is considered first because it can have an overriding influence by restricting land to a lower grade despite more favourable site and soil conditions. Parameters used for assessing overall climate are accumulated temperature, a measure of relative warmth, and average annual rainfall, a measure of overall wetness. The results shown in Table 2 indicate that there is no overall climatic limitation.

9 Climatic variables also affect ALC grade through interactions with soil conditions. The most important interactive variables are Field Capacity Days (FCD) which are used in assessing soil wetness and potential Moisture Deficits calculated for wheat and potatoes which are compared with the moisture available in each profile in assessing soil droughtiness limitations. These are described in later sections.

Table 2 Climatic Interpolations Front Garden Swindon

Grid Reference	SU 140 828	SU 124 828	SU 135 829
Altitude (m)	100	125	100
Accumulated Temperature (day °C)	1418	1390	1418
Average Annual Rainfall (mm)	721	728	719
Overall Climatic Grade	1	1	1
Field Capacity Days	160	161	160
Moisture deficit (mm)			
Wheat	101	98	101
Potatoes	91	87	91

RELIEF

10 Altitude ranges from 95 metres in the north of the site along the River Ray to 125 metres around Southleaze Farm. The landscape is gently undulating except to the north of Westlecott Farm where there are some steeper slopes which are limited to Subgrade 3b. The slopes are also irregular and a microrelief limitation may exist. The fields to the north of West Leaze Cottages also have irregular surface topography from a medieval settlement. This would cause difficulty for cultivation and microrelief limitation exists limiting the land to Subgrade 3b.

GEOLOGY AND SOILS

11 The underlying geology of the site is shown on the published geology map (IGS 1972) with the majority of the site being underlain by Kimmeridge Clay, although there is a thin band of sand along the north eastern edge. Alluvial deposits are found alongside the River Ray. The presence of clay was observed during the survey and slightly lighter textured

soils were found along the northern boundary suggesting a transition to the underlying sand Alluvial deposits were not distinguished as such during the survey

12 Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1 250 000 (SSEW 1983) as the Denchworth Association to the east of the Mill House with the remainder being the Wickham 3 Association

13 Wickham 3 Association soils are described as slowly permeable seasonally waterlogged fine loamy over clayey and coarse loamy over clayey soils There may be some similar soils with slight waterlogging and some deep coarse loamy soils affected by groundwater Denchworth Association soils are slowly permeable seasonally waterlogged clayey soils with similar fine loamy over clayey soils There may be some fine loamy over clayey soils with only slight seasonal waterlogging and some slowly permeable calcareous clayey soils

14 The soils found during the recent survey were typical of the Wickham 3 and Denchworth Associations being slowly permeable clayey soils

AGRICULTURAL LAND CLASSIFICATION

15 The distribution of ALC grades found by the current survey is shown on the accompanying 1 25 000 scale map and areas are summarised in Table 1 The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas

Subgrade 3b

16 All of the agricultural land survey has been mapped as Subgrade 3b moderate quality agricultural land A variety of textures for the topsoils were observed around the site ranging from medium clay loam heavy silty clay loam and occasionally clayey

17 The topsoils were generally thin with occasional heavy clay loam subsoils before clayey subsoil was encountered If the topsoil was not gleyed then gleying was generally soon observed in the subsoil Two types of soil were found around the site The first where the slowly permeable layer was encountered high in the profile these soils were assessed as Wetness Class IV (see Appendix II) The second soil observed had the slowly permeable layer starting lower in the profile and these soils were either Wetness Class IV or III depending on the actual depth at which the slowly permeable layer and gleying started Four soil profile pits were dug in these soils to describe the variety of situations observed The combination of topsoil textures and wetness classes meant that in virtually all situations the soils were graded as Subgrade 3b with a moderate wetness limitation To the north of

Westlecott Farm at the break of slope slightly better drained soils were found with medium clay loam topsoils. At the scale of survey there were insufficient observations to map out a slightly better grade of soil. It is likely that any better land would only form a narrow band between the Subgrade 3b slopes to the north and the poorly drained Subgrade 3b land to the south.

G M SHAW
Resource Planning Team
FRCA Bristol
October 1998

REFERENCES

**INSTITUTE OF GEOLOGICAL SCIENCES (1972) Sheet 252 Swindon 1 63 360 series
Solid and Drift edition IGS London**

**HODGSON J M (Ed) (1997) Soil Survey Field Handbook Soil Survey Technical
Monograph No 5 Silsoe**

**MAFF (1977) 1 250 000 series Agricultural Land Classification South West Region MAFF
Publications Alnwick**

**MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines
and Criteria for grading the quality of agricultural land MAFF Publications Alnwick**

**METEOROLOGICAL OFFICE (1989) Climatological Data for Agricultural Land
Classification Meteorological Office Bracknell**

**SOIL SURVEY OF ENGLAND AND WALES (1983) Sheet 5 Soils of South West England
1 250 000 scale SSEW Harpenden**

**SOIL SURVEY OF ENGLAND AND WALES (1984) Soils and Their Use in South West
England Bulletin No 14 SSEW Harpenden**

APPENDIX I

DESCRIPTION OF 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 include 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 and horticultural crops can usually be grown but on some land in the 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.

Grade 3 good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where 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 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 most 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 very severe limitations which restrict use to permanent pasture or rough grazing except for occasional pioneer forage crops

Source MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land MAFF Publications Alnwick

APPENDIX II

DEFINITION OF SOIL WETNESS CLASSES

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile

Wetness Class I

The soil profile is not wet within 70 cm depth for more than 30 days in most years

Wetness Class 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 not wet within 40 cm depth for more than 30 days in most years

Wetness Class 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 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 and 90 days in most years

Wetness Class IV

The soil profile is wet within 70 cm depth for more than 180 days but not within 40 cm depth for more than 210 days in most years or if there is no slowly permeable layer within 80 cm depth it is wet within 40 cm depth for 91-210 days in most years

Wetness Class V

The soil profile is wet within 40 cm depth for 211-335 days in most years

Wetness Class VI

The soil profile is wet within 40 cm depth for more than 335 days in most years

Notes The number of days specified is not necessarily a continuous period

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

Source Hodgson J M (Ed) (1997) Soil Survey Field Handbook Soil Survey Technical Monograph No 5 Silsoe

APPENDIX III

ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report. Terms used and abbreviations are set out below. These conform to definitions contained in the Soil Survey Field Handbook (Hodgson 1997)

1 Terms used on computer database in order of occurrence

GRID REF National 100 km grid square and 8 figure grid reference

LAND USE At the time of survey

WHT	Wheat	SBT	Sugar Beet	HTH	Heathland
BAR	Barley	BRA	Brassicas	BOG	Bog or Marsh
OAT	Oats	FCD	Fodder Crops	DCW	Deciduous Wood
CER	Cereals	FRT	Soft and Top Fruit	CFW	Coniferous Woodland
MZE	Maize	HRT	Horticultural Crops	PLO	Ploughed
OSR	Oilseed Rape	LEY	Ley Grass	FLW	Fallow (inc Set aside)
POT	Potatoes	PGR	Permanent Pasture	SAS	Set Aside (where known)
LIN	Linseed	RGR	Rough Grazing	OTH	Other
BEN	Field Beans	SCR	Scrub		

GRDNT Gradient as estimated or measured by hand held optical clinometer

GLEYSPL Depth in centimetres to gleying or slowly permeable layer

AP (WHEAT/POTS) Crop adjusted available water capacity

MB (WHEAT/POTS) Moisture Balance (Crop adjusted AP - crop potential MD)

DRT Best grade according to soil droughtiness

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				

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				

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)

MOTTLE COL Mottle colour using Munsell notation

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%+

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

PED COL Ped face colour using Munsell notation

GLEYS If the soil horizon is gleyed a **Y** will appear in this column If slightly gleyed an **S** will appear

STONE LITH Stone Lithology One of the following is used

HR	All hard rocks and stones	SLST	Soft oolitic or dolimitic limestone
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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 or metamorphic rock		

Stone contents are given in % by volume for sizes >2cm >6cm and total stone >2mm

STRUCT The degree of development size and shape of soil peds are described using the following notation

<u>Degree of development</u>	WA	Weakly developed Adherent	WK	Weakly developed
	MD	Moderately developed	ST	Strongly developed
<u>Ped size</u>	F	Fine	M	Medium
	C	Coarse	VC	Very coarse
<u>Ped Shape</u>	S	Single grain	M	Massive
	GR	Granular	AB	Angular blocky
	SAB	Sub angular blocky	PR	Prismatic
	PL	Platy		

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		

SUBS STR Subsoil structural condition recorded for the purpose of calculating profile droughtiness **G** Good **M** Moderate **P** Poor

POR Soil porosity If a soil horizon has poor porosity with less than 0.5% biopores >0.5mm a **Y** will appear in this column

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

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

CALC If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a **Y** will appear this column

2 Additional terms and abbreviations used mainly in soil pit descriptions

STONE ASSESSMENT

VIS Visual **S** Sieve **D** Displacement

MOTTLE SIZE

EF	Extremely fine <1mm	M	Medium 5-15mm
VF	Very fine 1-2mm	C	Coarse >15mm
F	Fine 2-5mm		

MOTTLE COLOUR May be described by Munsell notation or as ochreous (OM) or grey (GM)

ROOT CHANNELS In topsoil the presence of rusty root channels should also be noted

MANGANESE CONCRETIONS Assessed by volume

N	None	M	Many	20-40%
F	Few <2%	VM	Very Many	>40%
C	Common 2-20%			

POROSITY

P	Poor	less than 0.5% biopores at least 0.5mm in diameter
G	Good	more than 0.5% biopores at least 0.5mm in diameter

ROOT ABUNDANCE

The number of roots per 100cm ²		Very Fine and Fine	Medium and Coarse
F	Few	1-10	1 or 2
C	Common	10-25	2-5
M	Many	25-200	>5
A	Abundant	>200	

ROOT SIZE

VF	Very fine	<1mm	M	Medium	2-5mm
F	Fine	1-2mm	C	Coarse	>5mm

HORIZON BOUNDARY DISTINCTNESS

Sharp	<0.5cm	Gradual	6-13cm
Abrupt	0.5-2.5cm	Diffuse	>13cm
Clear	2.5-6cm		

HORIZON BOUNDARY FORM Smooth wavy irregular or broken *

* See Soil Survey Field Handbook (Hodgson 1997) for details

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	719 mm	PARENT MATERIAL	
Front Garden Swindon		Pit 1	0	Cereal stubble	ATO	1418 day C	Kimmeridge Clay	
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	160	PSD SAMPLES TAKEN	
92/98		7/10/98	SU 1460 8265	GMS	Climatic Grade	1	None	
					Exposure Grade	1		

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Motthing Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	27	HCL	10YR42	N	None	None					CVF		Abrupt Smooth
2	43	HCL	10YR52.53	No e	CDFO 10YR56	None	MDCSAB	Friable	Mod	Good	CVF		Clear Smooth
3	70+	C	2.5Y62	N	MDFO 10YR68	None	WKCAB and SAB with prismatic tendencies lower in the profile	Friable	Mod	Low (Borderline)	FVF		

Profile Gleyed From 27 cm
 Slowly Permeable Horizon From 43 cm
 Wetness Class IV
 Wetness Grade 3b

Available Water Wheat 101 mm
 Potatoes 117 mm
 Moisture Deficit Wheat 101mm
 Potatoes 91 mm
 Moisture Balance Wheat 0 mm
 Potatoes 26 mm
 Droughtiness Grade 3a (Calculated to 70 cm)

Final ALC Grade 3b
 Main Limiting Factor(s) Wetness

Remarks SPL in H3 not convincing in terms of structure but extent of mottling suggests a wet profile Patches of more clayey material within H3

SITE NAME		PROFILE NO	SLOPE AND ASPECT		LAND USE		Av Rainfall		719 mm		PARENT MATERIAL		
Front Garden Swindon		Pit 2	0		PGR		ATO		1418 day C		Kimmeridge Clay		
JOB NO		DATE	GRID REFERENCE		DESCRIBED BY		FC Days		160		PSD SAMPLES TAKEN		
92/98		8/10/98	SU 1240 8255		GMS		Climatic Grade		1		None		
							Exposure Grade		1				

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Motting Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	20	HCL	10YR41	N	CDFO 7 5YR56	None					MVF		Clear Smooth
2	45	C	2.5Y52	N	CDF + MO 10YR56	None	WKCAB with patches of MDCAB	Firm	Poor	Low	CVF		Clear Smooth
3	70+	C	2.5Y62	No e	MDFO 10YR68	None	WKCAB	Firm	Poor	Low	FVF		

Profile Gleyed From Surface
 Slowly Permeable Horizon From 20 cm
 Wetness Class IV
 Wetness Grade 3b

Available Water Wheat 89 mm
 Potatoes 101 mm
 Moisture Deficit Wheat 101mm
 Potatoes 91 mm
 Moisture Balance Wheat 12 mm
 Potatoes 10 mm
 Droughtiness Grade 3a (Calculated to 70 cm)

Final ALC Grade 3b
 Main Limiting Factor(s) Wetness

Remarks

SITE NAME		PROFILE NO		SLOPE AND ASPECT		LAND USE		Av Rainfall		PARENT MATERIAL	
Front Garden Swindon		Pit 3		0		Maize		719 mm		Kimmeridge Clay	
JOB NO		DATE		GRID REFERENCE		DESCRIBED BY		ATO		PSD SAMPLES TAKEN	
92/98		8/10/98		SU 1330 8270		GMS		1418 day C		None	
								FC Days			
								160			
								Climatic Grade			
								1			
								Exposure Grade			
								1			

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Mottling Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	18	HZCL	10YR42	N	CDFO 10YR44	None					FF+VF		Abrupt Smooth
2	33	HCL	10YR53	N	CDFO 10YR58	None	MDCSAB	Friable	Mod	Good	FVF		Clear Smooth
3	48	C	10YR52	N	CDFO 10YR58	None	WKCAB and MPt	Friable	Mod	Low	FVF		Clear Smooth
4	70+	C	2 5Y62	No	MDFO 10YR68	None	MDCAB	Firm	Poor	Low	FVF		

Profile Gleyed From Surface
Slowly Permeable Horizon From 33 cm
Wetness Class IV
Wetness Grade 3b

Available Water Wheat 99 mm
Potatoes 111 mm
Moisture Deficit Wheat 101mm
Potatoes 91 mm
Moisture Balance Wheat 2 mm
Potatoes 20 mm
Droughtiness Grade 3a (Calculated to 70 cm)

Final ALC Grade 3b
Main Limiting Factor(s) Wetness

Remarks Structure in H3 could be Mod developed in places

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	719 mm	PARENT MATERIAL	
Front Garden Swindon		Pit 4	0	PGR	ATO	1418 day C	Kimmeridge Clay	
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	160	PSD SAMPLES TAKEN	
92/98		8/10/98	SU 1355 8315	GMS	Climatic Grade	1	None	
					Exposure Grade	1		

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Motling Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	22	HZCL	10YR41 42 10YR51 52	N	CDFO 10YR56	None					MF+VF		Clear Smooth
2	60+	C	2.5Y52	Odd fl ts	MDMO 10YR68	Few	MDCPr	Firm	Poor	Low	CVF		

Profile Gleyed From	Surface	Available Water	Wheat	85 mm	Final ALC Grade	3b
Slowly Permeable Horizon From	22 cm		Potatoes	91 mm	Main Limiting Factor(s)	Wetness
Wetness Class	IV	Moisture Deficit	Wheat	101mm		
Wetness Grade	3b		Potatoes	91 mm		
		Moisture Balance	Wheat	16 mm	Remarks	H1 quite a variable horizon around sides of pit In places a single horizon others split into two Description reflects all elements
			Potatoes	0 mm		
		Droughtiness Grade	3a	(Calculated to 60 cm)		