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Gloucester Structure Plan:
Down Hatherley
Agricultural Land Classification

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GLOUCESTERSHIRE STRUCTURE PLAN: DOWN HATHERLEY

AGRICULTURAL LAND CLASSIFICATION

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GLOUCESTERSHIRE STRUCTURE PLAN: DOWN HATHERLEY

AGRICULTURAL LAND CLASSIFICATION SURVEY

SUMMARY

The reconnaissance scale survey was carried out by ADAS on behalf of MAFF as part of its statutory role in the preparation of the Gloucestershire Structure Plan. The fieldwork at Down Hatherley was completed in November 1994 at a scale of 1:25,000. Data on climate, soils, geology and previous ALC Surveys was used and is presented in the report. The distribution of grades is detailed below and illustrated on the accompanying ALC map. Information is correct at this scale but could be misleading if enlarged.

Distribution of ALC grades: Down Hatherley

Grade	Area (ha)	% of Survey Area	% of Agricultural Land (632.9 ha)
2	120.3	13.3	19.0
3a	96.8	10.7	15.3
3b	415.8	46.0	65.7
Urban	71.8	8.0	0.0
Non Agricultural	72.9	8.1	0.0
Agricultural Buildings	0.8	0.1	0.0
Not surveyed	122.8	13.6	0.0
TOTAL	901.2	100.0	100.0

Much of the site comprises poorly drained clays which are limited to Subgrade 3b. In the west, there are lighter textured stony soils. These soils experience draughtiness limitations which restrict the soils to Grade 2 and Subgrade 3a. An area in the east was not surveyed because access was not granted but this area is expected to be Subgrade 3b.

1. INTRODUCTION

A reconnaissance scale Agricultural Land Classification (ALC) Survey was carried out in November 1994 at Down Hatherley on behalf of MAFF as part of its statutory role in the preparation of the Gloucestershire Structure Plan. The fieldwork covering 901 ha of land was conducted by ADAS at a scale of 1:25,000 (approximately one boring per 9 hectares of agricultural land). A total of 99 auger borings were examined and 6 soil profile pits used to assess subsoil conditions.

The published provisional one inch to the mile ALC map of this area (MAFF 1968) shows the grades of the site at a reconnaissance scale. Most of the area is mapped as Grade 3, however some better quality land can also be found. A large area of Grade 2 lies north and south west of Down Hatherley with another area occurring west of Innsworth Camp. Two very small areas of Grade 1 are mapped in the south west of the site. A band of Grade 4 traces the course of the Hatherley Brook.

The area was also surveyed in 1980 at a scale of 1:25,000. This survey showed predominantly Subgrade 3b except in the west where a large area of Grade 2 was mapped with Subgrade 3a around the periphery.

The recent survey supersedes these maps having been carried out using the 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 long-term limitations on agricultural use. The grading takes account of the top 120 cm of the soil profile. A description of the grades used in the ALC system can be found in Appendix 2.

2. CLIMATE

The grade of the land is determined by the most limiting factor present. The overall climate is considered first because it can have an overriding influence on restricting land to a lower grade despite other favourable conditions.

Estimates of climatic variables were interpolated from the published agricultural climate dataset (Meteorological Office 1989). The parameters used for assessing overall climate are accumulated temperature (a measure of the relative warmth of a locality) and average annual rainfall (a measure of overall wetness). The results shown in Table 1 indicate there is no overall climatic limitation.

Table 1: Climatic Interpolations: Down Hatherley

Grid Reference		SO 871 230
Altitude (m)		21
Accumulated Temperature (day °)		1497
Average Annual Rainfall (mm)		630
Overall Climatic Grade		1
Field Capacity Days		138
Moisture deficit (mm):	Wheat	114
	Potatoes	108

Climatic data on Field Capacity Days (FCD) and Moisture Deficits for wheat and potatoes are also shown. These data are used in assessing the soil wetness and droughtiness limitations referred to in later sections.

3. RELIEF AND LANDCOVER

The survey area is gently undulating with a maximum altitude of 30 m AOD in the north east. The lowest area is at 10 m in the south west.

At the time of survey the agricultural land was being used for a mix of arable cropping and grazing. A large block of land in the south had been converted into a golf course.

4. GEOLOGY AND SOILS

The geology of the site is shown on the published 1:50,000 scale solid and drift geology map, sheet 216 British Geological Survey 1988.

This shows the geology of the site is dominated by the Blue Lias group (clay derived rocks) with two small areas of Lower Lias Clay occurring at Benges Farm in the north and at Little Innsworth Farm in the south. A narrow band of Alluvium traces the course of the Hatherley Brook, whilst an extensive area of Cheltenham sand occurs north and south west of Down Hatherley. Two further areas of this drift deposit occur just west of Innsworth Camp and in the extreme south west corner of the site.

The soils were mapped by the Soil Survey of England and Wales in 1983 at a reconnaissance scale of 1:250,000 and in 1973 at a scale of 1:25,000.

At Soil Association level the soils broadly follow the pattern of geology. Evesham Association (Evesham, Podimore, Haselor Series) overlie the Blue Lias with some Denchworth Series in the east. These are poorly drained slowly permeable soils. The Cheltenham sand is overlain by soils of the Badsey Association (Isle Abbots Series) described as well drained calcareous fine loamy soils over limestone gravel variably affected by groundwater. Over the alluvium Fladbury 1 Association (Thames Series) are found which are described as stoneless clayey soils which are variably affected by ground water.

The soils found during the recent survey broadly follow the mapped associations, with lighter texture better drained soils in the west and poorly drained clays along the Hatherley Brook and north and east of Down Hatherley.

5. AGRICULTURAL LAND CLASSIFICATION

The distribution of ALC grades is shown in Table 2 and on the accompanying ALC map. The information could be misleading if shown at a larger scale.

Table 2: Distribution of ALC grades: Down Hatherley

Grade	Area (ha)	% of Survey Area	% of Agricultural Land (632.9 ha)
2	120.3	13.3	19.0
3a	96.8	10.7	15.3
3b	415.8	46.0	65.7
Urban	71.8	8.0	0.0
Non Agricultural	72.9	8.1	0.0
Agricultural Buildings	0.8	0.1	0.0
Not surveyed	122.8	13.6	0.0
TOTAL	901.2	100.0	100.0

Grade 2

Several areas of Grade 2 are mapped. These soils are generally well drained and are Wetness Classes I and II (see Appendix 3). The sandy clay loam topsoils lie over sandy loams which sometimes become slightly stony in a loamy medium sand matrix. These soils experience a slight droughtiness limitation restricting them to Grade 2. Some profiles have sandy clay loam topsoils over clays which are slightly wet and are Grade 2 with a slight wetness limitation.

Subgrade 3a

Most of these soils have a moderate droughtiness limitation. The sandy clay loam topsoils lie over sandy loams which become stony (30-40% hard stones) loamy medium sands. Some of these soils also show slight evidence of wetness.

Subgrade 3b

Large areas of poorly drained clays are mapped as 3b. These soils are Wetness Classes III and IV. The heavy clay topsoils are sometimes calcareous and overlie slowly permeable subsoils. The moderate wetness limitation restricts the soils to Subgrade 3b.

Other Land

A golf course and sports areas are mapped as non-agricultural. The urban areas are mapped as such. An area was not surveyed because access was not granted. This area is expected to be Subgrade 3b.

Resource Planning Team
Taunton Statutory Unit
December 1994

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APPENDIX 1

REFERENCES

BRITISH GEOLOGICAL SURVEY (1988) Solid and Drift Edition, Sheet 216, Tewkesbury

MAFF (1968) Agricultural Land Classification Map, Sheet 143, Provisional 1:63,360 scale.

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

METEOROLOGICAL OFFICE (1989) Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND AND WALES (1983) Sheet 5, Soils of South West England, 1:250,000 scale.

SOIL SURVEY OF ENGLAND AND WALES (1973) Sheet SO 82, Norton, 1:25,000 Scale.

APPENDIX 2

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.

Descriptions of other land categories used on ALC maps

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 park land, public open spaces, sports fields, allotments and soft-surfaced areas on airports/airfields. Also active mineral workings and refuse tips where restoration conditions to 'soft' after-uses may apply.

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 landcover types, eg buildings in large grounds, and where may be shown separately. Otherwise, the most extensive cover type will usually be shown.

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

APPENDIX 3

DEFINITION OF SOIL WETNESS CLASSES

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 (in preparation), Soil Survey Field Handbook (revised edition).

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Down Hatherley	Pit 1	0°	Cereal	Av Rainfall: 630 mm ATO: 1497 day °C FC Days: 138 Climatic Grade: 1 Exposure Grade: 1	Blue Lias
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
119/94	9/11/94	SO 8707 2362	GMS		RPT/GMS 456

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	20	C	2.5Y42	<1% HR	None	None	-	-	-	Good	CF	Yes	Clear smooth
2	40	C	2.5Y53	<1% HR	CDFOG 2.5Y50 10YR56	None	WCSAB	Firm	Poor	Poor	CVF	Yes	Clear smooth
3	60	C	2.5Y64	5% SLST (visual)	MDFG 2.5Y60 CDFO 10YR56	None	WCSAB	Firm	Poor	Boarderline	CVF	Yes	

Profile Gleyed From: 20 cm

Depth to Slowly Permeable Horizon: 20 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water	Wheat:	120 mm
	Potatoes:	98 mm
Moisture Deficit	Wheat:	114 mm
	Potatoes:	108 mm
Moisture Balance	Wheat:	6 mm
	Potatoes:	-10 mm

Droughtiness Grade: 3A (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

Topsoil clay 52%.

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SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Down Hatherley	Pit 2	0°	Permanent Grass	Av Rainfall: 630 mm ATO: 1497 day °C FC Days: 138 Climatic Grade: 1 Exposure Grade: 1	Cheltenham Sand
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
119/94	14/11/94	ASP 37 SO 8610 2310	PRW		RPT/PRW 124

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	32	SCL	10YR43	None	None	None	-	Friable	Moderate	Many	Many Fine	Weakly Calcareous	Clear smooth
2	46	MSC	10YR33	None	None	None	Weak Coarse Subangular Blocky	Friable	Good	Many	Common Fine	Weakly Calcareous	Clear smooth
3	93	HSCL	10YR42	2% Hard rock - visual estimate	Few medium distinct 2.5YR48	None	Moderate Medium Subangular Blocky	Friable	Good	Many	Common Fine declining with depth	Weakly Calcareous	Abrupt smooth
4	115+	MS LMS lenses (30%)	10YR58 10YR51	None	None	None	Weak Coarse Subangular Blocky	Very Friable	Moderate	Many	None	Strongly Calcareous	-

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: 1

Wetness Grade: 1

Available Water Wheat: 155 mm

Potatoes: 123 mm

Moisture Deficit Wheat: 114 mm

Potatoes: 108 mm

Moisture Balance Wheat: 41 mm

Potatoes: 15 mm

Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 1

Main Limiting Factor(s): -

Remarks:

Grade 2 Unit

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SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Down Hatherley	Pit 3	0°	Permanent Grass	Av Rainfall: 630 mm ATO: 1497 day °C FC Days: 138 Climatic Grade: 1 Exposure Grade: 1	Cheltenham Sand
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
119/94	16/11/94	SO 8680 2238	PRW		RPT/PRW 123

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	25	SCL	10YR44	None	None	None	-	Friable	Moderate	Many	Many Fine	No	Abrupt smooth
2	48	MSL	10YR56	None	None	None	Weak Moderate SAB	Friable	Good	Many	Common Fine	No	Abrupt smooth
3	90+	LCS	10YR66	44% Hard rock <2cm	None	None	Single grain	Loose	Moderate	Many	Few Fine	No	-

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 1

Available Water Wheat: 102 mm

Potatoes: 90 mm

Moisture Deficit Wheat: 114 mm

Potatoes: 108 mm

Moisture Balance Wheat: -12 mm

Potatoes: -18 mm

Droughtiness Grade: 3a (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Droughtiness

Remarks:

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SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE			PARENT MATERIAL
Down Hatherley	Pit 4	0°	Permanent Grass	Av Rainfall:	630 mm	Cheltenham Sand
				ATO:	1497 day °C	
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days:	138	SOIL SAMPLE REFERENCES
119/94	22/11/94	ASP 75 SO 8535 2175	PRW	Climatic Grade:	1	RPT/PRW 125
				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	28	SCL	10YR42	None	None	None	-	Friable	Moderate	Many	Many Fine	Weakly Calcareous	Abrupt smooth
2	63	MSL	10YR54	1% Hard rock visual	None	None	Moderate Medium Subangular Blocky	Friable	Good	Many	Common Fine	Weakly Calcareous	Abrupt smooth
3	78	LMS	2.5Y56	36% Hard rock sieved	None	None	Weak Fine Subangular Blocky	Very Friable	Moderate	Many	None	Strongly Calcareous	Abrupt smooth
4	100	C	2.5Y64 56	None	Common Distinct 10YR56	None	Moderate Medium Angular Blocky	Firm	Moderate	<0.5% biopores	None	Strongly Calcareous	-

Profile Gleyed From: 78 cm

Depth to Slowly Permeable Horizon: 78 cm

Wetness Class: II

Wetness Grade: 2

Available Water	Wheat:	140 mm
	Potatoes:	110 mm
Moisture Deficit	Wheat:	114 mm
	Potatoes:	108 mm
Moisture Balance	Wheat:	26 mm
	Potatoes:	2 mm
Droughtiness Grade:		2 (Calculated to 120 cm)

Final ALC Grade: 2

Main Limiting Factor(s): Droughtiness/Wetness

Remarks:

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SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Down Hatherley	Pit 5	0°	Winter Cereals	Av Rainfall: 630 mm ATO: 1497 day °C FC Days: 138 Climatic Grade: 1 Exposure Grade: 1	Cheltenham Sand
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
119/94	22/11/94	SO 8599 2149	PRW		

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	25	MSL	10YR43	None	None	None	-	Friable	Moderate	Many	Common Fine	None	Abrupt smooth
2	58	MSL	10YR46	None	None	None	Moderate Coarse Subangular Blocky	Friable	Moderate	Many	Few Fine	None	Abrupt smooth
3	100+	LMS	10YR56	40% HR sieved	None	None	Single grain	Loose	Moderate	Many	None	None	-

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: 1

Wetness Grade: 1

Available Water	Wheat:	108 mm
	Potatoes:	98 mm
Moisture Deficit	Wheat:	114 mm
	Potatoes:	108 mm
Moisture Balance	Wheat:	-6 mm
	Potatoes:	-10 mm
Droughtiness Grade:		3A (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Droughtiness

Remarks:

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SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Down Hatherley	Pit 6	0°	PGR	Av Rainfall: 630 mm ATO: 1497 day °C	Blue Lias
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 138 Climatic Grade: 1 Exposure Grade: 1	SOIL SAMPLE REFERENCES
119/94	22/11/94	SO 8840 2318	PRW		RPT/PRW 126

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	25	C	10YR32	None	None	None	-	Friable	Moderate	Many	Common Fine	Calcareous	Abrupt smooth
2	52	C	2.5Y64	10% Hard rock visual estimate	Common distinct 10YR58	None	Moderate coarse angular blocky	Firm	Moderate	<.5% biopores	Few Fine	Calcareous	Abrupt smooth
3	90	C	2.5Y52	None	Many distinct 10YR58	None	Moderate coarse prismatic	Firm	Poor	<.5% biopres	None	Calcareous	-

Profile Gleyed From: 25

Depth to Slowly Permeable Horizon: 25

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 128 mm

Potatoes: 105 mm

Moisture Deficit Wheat: 114 mm

Potatoes: 108 mm

Moisture Balance Wheat: 14 mm

Potatoes: -3 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

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