

AGRICULTURAL LAND CLASSIFICATION

Integrum SPV 21004 Limited (Integrum)

*Fendyke Solar Farm, Sutton St James
Spalding*



Client:

Integrum SPV 21004 Limited (Integrum)
120 New Cavendish Street
London
W1W 6XX

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Spalding*

A report prepared on behalf of **Soil Environment Services** by:

Louise Tavasso BSc (Hons) M.I.SoilSci
Environmental Consultant

Approved by:

Dr Robin S Davies BSc PhD F.I.SoilSci PGC *Contaminated Land Management*
Managing Director

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Soil Environment Services

Agricultural Land Classification, Contaminated Land
Risk Assessment, Mineral Extraction Soil Planning
Unit 8, Stocksfield Hill, Stocksfield, Northumberland, NE43 7TN
Tel: 01661 844 827, Email: rd@soilenvironmentservices.co.uk
www.soilenvironmentservices.co.uk

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1. INTRODUCTION

An Agricultural Land Classification (ALC) has been carried out on 41.73 ha of land at Fendyke Solar Farm (Drawing 1). Roads, access areas and non-agricultural land has been excluded within the redline boundary. The site is centred on OS Grid Ref. 537357, 317446.

The survey was conducted in March 2022 and September 2023 and classified the land into one or more of the below grades (see Drawing 1). On the survey dates, the site was in agricultural use.

1.1 Methodology

Agricultural land is classified into the following grades according to the 1988 guidelines¹.

Grade	Description
1	Excellent quality agricultural land with no or very minor limitations to agricultural use.
2	Very good quality agricultural land with minor limitations which affect crop yield, cultivation or harvesting.
3a	Good quality agricultural land capable of producing moderate to high yields of a narrow range of arable crops or moderate yields of a wider range of crops.
3b	Moderate quality agricultural land capable of producing moderate yields of a narrow range of crops or lower yields of a wider range of crops.
4	Poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields.
5	Very poor quality agricultural land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

The classification includes an initial desktop investigation to examine previously mapped soil types and to note the drift and solid geology followed by the field survey consisting of auger borings at one every 100 m in general and a pit excavated in each of the main soil types to confirm the structures and stone content if needed. Laboratory analysis of soil textures is undertaken if needed in order to confirm textures such the *heavy/medium* clay and *medium/fine* sand categories or stone content. All site survey profile data is listed in Appendix A.

All of the potential limitations are assessed and then the most limiting factor dictating the ALC grade was determined for this site and is detailed in Table 2.

1.2 Previous ALC gradings

Grading on the MAFF (1983) 1: 250 000 provisional map indicated the site is mapped as Grade 2 land. The ALC survey broadly aligns with a former detailed survey undertaken for the south of the site indicated Grades 2, 3a and 3b land (ref: Rodney Burton Contract, No. 14.03.100; P O No. 5, March 2014).

2. CLIMATIC LIMITATIONS

2.1 Overall climate

The climatological data for the site centre is detailed in Table 1.

Table 1 North-East area Climatological information ³		
Factor	Units	Value
Altitude AOD	m	0
Accumulated temperature	day°C (Jan-June)	1444.2
Average Annual Rainfall	mm	563.7
Field Capacity Days	days	98.9
Moisture Deficit Wheat	mm	121.4
Moisture Deficit Potatoes	mm	117.6
Overall climate ALC Grade	Grade 1	

Climate will not result in the most significant limiting factor for the site.

2.2. Local climate

Local climate will not result in a significant limiting factor for this site.

3 SITE LIMITATIONS

3.1 Gradient

The gradient will not result in a significant limiting factor for this site.

3.2 Microrelief

The microrelief will not result in a significant limiting factor for this site.

3.3 Flooding

The site falls within Flood Zone 3 which means there is a high probability of flooding from rivers and the sea [GOV.UK \(flood-map-for-planning.service.gov.uk\)](https://www.gov.uk/flood-map-for-planning.service.gov.uk)

Drainage channels had been implemented throughout the site. Some waterlogging was noted on the south-west of the site (Photos 1 & 2):

PHOTO 1 Near boring 40



PHOTO 2 Near boring 39



4 SOIL LIMITATIONS

4.1 Texture and structure

The textures noted across the site were mainly silty clay over silty clay subsoils. Subsoil structure was mainly moderate coarse angular blocky or coarse prismatic.

The site has previously been mapped as having soils of the Wallasea Association. Field survey observations broadly confirmed these findings.

The Wallasea Association soils are mapped as: *Deep stoneless clayey soils. Calcareous in places. Seasonally waterlogged soils affected by a shallow fluctuating groundwater-table. They are developed mainly within or over permeable material and have prominently mottled or greyish coloured horizons within 40 cm depth Most occupy low-lying or depressional sites.* (www.landis.org.uk).

Superficial Geology 1:50 000 scale superficial deposits description:

Tidal Flat Deposits - Clay and Silt

Bedrock Geology 1:50 000 scale bedrock geology description:

West Walton Formation - Mudstone and Siltstone

4.2 Depth

Soil depth will not result in a significant limiting factor for this site.

4.3 Stoniness

Stoniness is not a direct significant limiting factor for soils noted on site.

4.4 Chemical

Chemical contamination will not result in a significant limiting factor for this site.

5. INTERACTIVE LIMITATIONS

5.1 Wetness

Mottling and gleying was noted within the soils from around 25 cm depth.

Reed and drainage channels were noted across the site. Due to the presence of reed channels within the subsoil these profiles are permeable and free draining and are assessed mainly as Wetness Class II (ref: Maff report, 1991 for Postlands Estate, Crowland - magic.gov.uk). The Wallasea Association also states '*Drained soils are occasionally waterlogged (Wetness Class II) but undrained soils are waterlogged for long periods in winter (Wetness Class III or IV)*'. Observations on site and soil parameters indicated Wetness Class III in some areas.

The combination of a Wetness Class of III for some of the soils (see Appendix A) with Field Capacity Days of 98.9 and a topsoil texture of non-calcareous silty clay results in an ALC Grade of 3b. If the soil is Wetness Class II, this results in Grade 3a. If the topsoil is calcareous, the grade is 2. Depth to the Slowly Permeable Layer affects the Wetness Class considerably at the site.

It should be noted that some isolated borings gave rise to varying classification for wetness and hence ALC grade within relatively large areas of the same grade. As these were isolated locations they did not warrant a separate ALC delineation for mapping.

5.2. Droughtiness

The Available Water Capacity which subsequently when considered with respect to the Moisture Deficit for wheat and potatoes resulted in some slight droughtiness limitation for parts of the site.

5.3 Erosion

Erosion will not result in a significant limiting factor for this site.

6. AGRICULTURAL LAND CLASSIFICATION

6.1 Most limiting factors

Grade 3b land – Wetness Limitation

The combination of a Wetness Class of III for the soils (see Appendix A) with Field Capacity Days of 98.9 and a topsoil texture of non-calcareous silty clay results in an ALC Grade of 3b.

Grade 3a land – Wetness and droughtiness Limitation

The combination of a Wetness Class of II or III for the soils (see Appendix A) with Field Capacity Days of 98.9 and a topsoil texture of non-calcareous silty clay results in an ALC Grade of 3a. The Available Water Capacity which subsequently when considered with respect to the Moisture Deficit for wheat and potatoes resulted in some slight droughtiness limitation for parts of the site.

Grade 2 land – Wetness and droughtiness Limitation

The combination of a Wetness Class of II for the soils (see Appendix A) with Field Capacity Days of 98.9 and a topsoil texture of calcareous silty clay on the north of the site results in an ALC Grade of 2. The Available Water Capacity which subsequently when considered with respect to the Moisture Deficit for wheat and potatoes resulted in some slight droughtiness limitation for small areas of the site.

6.2 Current grading

This survey has resulted in an Agricultural Land Classification of the following grades (Drawing 1):

Table 2. ALC gradings and limitations			
Grade	ha	%	Limitation
1			
2	2.0	4.84	Wetness and droughtiness
3a	25.6	61.98	Wetness/droughtiness
3b	13.7	33.18	Wetness
4			
5			
Non-agricultural land			
Total	41.3	100%	

Wider Considerations beyond ALC

The grading does not necessarily reflect the current economic value of land, land use, range of crops, suitability for specific crops or level of yield. Likewise, the size, structure and location of farms, the standard of fixed equipment and the accessibility of land do not affect grading although they may influence land-use decisions.

Whereas many developments may permanently remove land from agriculture in what is termed ‘hard’ uses with little potential for return to agriculture. Establishment of a pv-panel solar farm represents a ‘soft’ use of the land which could be returned relatively easily to agriculture.

7. Mitigation Statement

There are several key points to consider with respect to the overall impact of the Development on the agricultural land in terms of the soil quality.

Modern Agricultural Practices

Modern agriculture generally relies on more mineral fertilisers than in the past and uses large heavy machinery. Consequently, the soil structure can be damaged by modern agriculture which can be exacerbated in part due to organic matter loss as inputs such as traditional farmyard manure does not occur or is reduced.

The Applicant considers this is a result of ever challenging pressures on farming businesses, not a reflection on the landowners who are custodians of rural areas. The introduction of a solar farm on the Site is a form of farm diversification that ensures landowners' businesses remain resilient as well as helping maintain - soils for future generations; notwithstanding the benefits of renewable energy and tackling climate change.

Mitigation Measures

The following measures will be applied and arise from the Development at various stages to address the matter of ALC and soil quality –

Operational

- The Development will introduce a meadow grassland which would be in place for the proposed lifetime of the Development i.e. 40 years.
- This meadow grassland is reflective of a traditional grass ley, which acts to help restore the organic matter in soils. In this instance, given the nature of the Development, there is the opportunity to combine this with livestock grazing which again supports the restoration of organic matter input into the soil.
- Research at Rothamsted (<https://www.rothamsted.ac.uk/long-term-experiments>) has shown that many decades within a grass ley are needed to significantly increase the soil organic matter and a year or two in a rotation is only an absolute minimum to reduce long term damage. Consequently, the temporary 40 year period of the Development will increase the value to the soil.

- The meadow grassland also acts to improve the soil structural development which in turn improves drainage. This leads to increased aeration and nutrient uptake as plant roots can function more efficiently.

Construction / Decommissioning

- During construction the DEFRA Code of practice for the sustainable use of soils on construction sites will be applied. Such practices include avoiding construction in wetter periods to reduce the risk of soil compaction, protecting the quality of soil.

Wider Benefits

Within the wider agricultural holding, the Site is the least productive land, by virtue of it being subject to an ongoing and persistent blackgrass problem. Blackgrass is a native annual grass weed that occurs throughout the UK but is found mainly in the cereal growing areas of southern and eastern England. It is one of the most problematic and damaging agricultural weeds in Western Europe. It thrives on heavy land, particularly where drainage is poor. It undermines crops by occurring at high densities and competing with the crop. It has developed resistance to a range of herbicides used to control it.

Turning over arable fields to grass can be a highly effective way of reducing the black-grass burden on a field. Black-grass seed is relatively short-lived in the soil, with seed number declining by approximately 70% each year. Therefore, if black-grass seed return is prevented by cutting or grazing a grass ley, the seed bank declines rapidly.

Conclusion

On this basis, the ALC as a factor in the production of food will be maintained, protected and rested for use by future generations to produce their food. The 'asset' of the soil will not be lost or negatively impacted overall, and evidence suggests there would instead be an improvement.

DRAWING 1

ALC Grade

Key

ALC Grades

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Non agricultural land

- Boring
- Pit

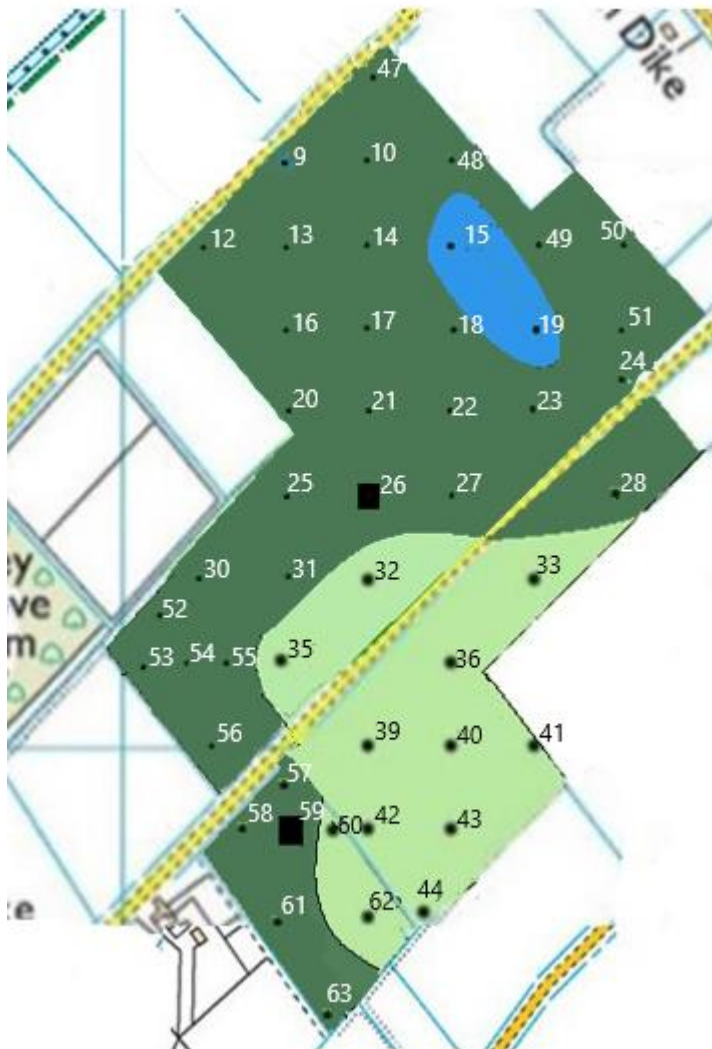
Soil Environment Services

Drawing Title: ALC Grade

Drawing No.: 1

Scale: 1:10000

Date: March 2022/ September 2023



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APPENDIX A

Soil profile data

Notes

1. All abbreviations relating to soil parameters are standard and derived from the guidance documents:

Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land. MAFF. 1988.
Soil Survey Field Handbook. Technical Monograph No.5. Soil Survey of England and Wales.1976.
2. The pit data is detailed in this table and information on structure and stone content copied to the appropriate boring profiles.
3. Any blanks or zeros in the cells indicate the data is not needed or appropriate for that cell.
4. If 'NA' is inserted in a cell the information is not appropriate on this occasion.
5. Boring or pit locations are directly (within 2 m accuracy) on the grid reference corresponding to the points on the map unless otherwise stated.
6. A point directly marked on a track, boundary or other feature will be moved 2-3 m off the point or omitted if surrounding points and soil types allow.
7. Borings that are potentially within 15 m of a gas pipeline are limited to 0.4 m depth and the strata description in the data table below this depth will be extrapolated from nearby borings and upper strata characteristics.
8. The *Observation Density* is 1 per ha on a 100 m grid or uses a semi *Free Survey* method if appropriate*. The letter 'B' in the second column of the data table refers to an observation point at which a boring was undertaken. A 'P' indicates a pit of which certain structural data is transferred to Boring locations for wetness and droughtiness calculations. In all cases the soil, geology, topography, flood risk and aerial crop patterns are assessed from published sources and the soils will be subject to a full 120 cm depth boring either side of a non-visited or non-bored point. If all data sources are agreeable, a soil pattern can be established.

* British Society of Soil Science. Working With Soil – The Professional Competency Scheme. Agricultural Land Classification: England and Wales. How2 sheet 4.2.4. 2018.
9. For moisture balance calculations, *strongly*, *moderately* and *well developed* structure will equate to *good*, *moderate* or *poor* structure terms respectively in Table 14 of the guidelines.
10. Pit information in addition to that listed in the table below will be detailed in Section 4.1 and 4.3 if needed.

Obs point	Grid ref. if off intersection	Boring or pit	(BSP) plu	Base Depth (cm)		Text.	Calc	Matrix colour	Motts. %/ depth	Mott colour	Ped face colour	Stns %	Stns type	Porosity	Struct (/ F =consis tence)	Degree of development	SPL depth (cm)	Glewing depth (cm)	SWC	Grade (wetness)	TAv	EAv	StTAv	StEAv	MBW	Grain (Dough WHEAT)	MBP	Grain (Dough POTATOES)
1		B	≤7	Point omitted																								
2		B	≤7	Point omitted																								
3		B	≤7	Point omitted																								
4		P	≤7	Point omitted																								
5		B	≤7	Point omitted																								
6		B	≤7	Point omitted																								
7		B	≤7	Point omitted																								
8		P	≤7	Point omitted																								
9		B	≤7	30		ZC	Y	10YR41				0					55	30	II	2	17		1		15.62	2	-6.57	2
				55		ZC		10YR41	15/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	15/55	10YR56		0		P	CPR	MD					0	0	0	0				
10		B	≤7	30		ZC	N	10YR41				0					55	30	II	3a	17		1		15.62	2	-6.57	2
				55		ZC		10YR42	20/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	25/55	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
11		B	≤7	Point omitted																								
12		P	≤7	30		ZC	N	10YR41				0					55	30	II	3a	17		1		15.62	2	-6.57	2
				55		ZC		10YR42	20/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	25/55	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
13		B	≤7	30		HZCL	N	10YR41				0					58	30	II	3a	19		1		21.62	2	-0.57	2
				58		ZC		10YR41	20/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	20/58	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
14		B	≤7	30		ZC	Y	10YR41				0					50	30	III	3a	17		1		15.62	2	-6.57	2
				50		ZC		10YR42	15/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	20/50	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
15		B	≤7	28		ZC	Y	10YR41				0					55	30	II	2	17		1		15.22	2	-6.97	2
				55		ZC		10YR41	15/28	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	25/55	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
16		B	≤7	30		ZC	N	10YR41				0					55	30	II	3a	17		1		15.62	2	-6.57	2
				55		ZC		10YR41	20/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	20/55	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
17		B	≤7	30		ZC	N	10YR41				0					58	30	II	3a	17		1		15.62	2	-6.57	2
				58		ZC		10YR41	10/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	20/58	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
18		B	≤7	25		ZC	N	10YR42				0					75	25	II	3a	17		1		14.62	2	-7.57	2
				75		ZC		10YR53	20/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	20/50	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
19		B	≤7	25		ZC	Y	10YR42				0					75	25	II	2	17		1		14.62	2	-7.57	2
				75		ZC		10YR53	20/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZC		10YR42	20/50	10YR56		0		P	CPR	MD					15	8	1	0.5				
																					0	0	0	0				
20		B	≤7	30		ZC	N	10YR43				0					55	30	II	3a	17		1		29.62	2	-6.57	2
				55		ZC		10YR42	15/30	10YR56		0		P	CAB	MD					15	8	1	0.5				
				120		ZCL		10YR53	20/55	10YR56		0		P	CPR	MD					15	10	1	0.5				
																					0	0	0	0				

Obs point	Grid ref. if off intersection	Boring or pit	(Bep) (m)	Base Depth (cm)			Text.	Calc	Matrix colour	Motts. %/ depth	Mott colour	Ped face colour	Stns %	Stns type	Porosity	Struct	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grade (wetness)	TAw	EAv	StTAw	StEAv	MBW	Grade (Drought- WHEAT)	MBP	Grade (Drought- POT (KGS))
21		B	≤7	30			ZC	N	10YR42				0					60	30	II	3a	17		1		15.62	2	-6.57	2
				60		ZCL		10YR42	15/30	10YR56	0		P	CAB	MD	15	10					1	0.5						
				120		ZC		10YR53	20/60	10YR56	0		P	CPR	MD	0	0					0	0						
22		B	≤7	30			ZC	N	10YR41				0					55	30	II	3a	17		1		15.62	2	-6.57	2
				55		ZC		10YR42	25/30	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR42	25/55	10YR56	0		P	CPR	MD	15	8					1	0.5						
23		B	≤7	25			ZC	N	10YR41				0					55	25	II	3a	0	0	0	0	14.62	2	-7.57	2
				55		ZC		10YR42	15/25	10YR56	0		P	CAB	MD	17						1							
				120		ZC		10YR42	15/55	10YR56	0		P	CPR	MD	15	8					1	0.5						
24		B	≤7	25			ZC	N	10YR41				0					55	28	II	3a	0	0	0	0	14.62	2	-7.57	2
				55		ZC		10YR42	20/25	10YR56	0		P	CAB	MD	17						1							
				120		ZC		10YR42	20/55	10YR56	0		P	CPR	MD	15	8					1	0.5						
25		B	≤7	28			MZCL	N	10YR41				0					50	30	III	3a	0	0	0	0	20.82	2	-1.37	2
				50		ZC		10YR43	15/28	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR42	20/50	10YR56	0		P	CPR	MD	15	8					1	0.5						
26		P	≤7	30			MZCL	N	10YR42				0					50	30	III	3a	19		1		21.62	2	-0.57	2
				50		ZC		10YR42	20/30	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR42	20/50	10YR56	0		P	CPR	MD	15	8					1	0.5						
27		B	≤7	30			HZCL	N	10YR41				0					55	30	II	3a	17		1		15.62	2	-6.57	2
				55		ZC		10YR42	25/30	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR42	15/55	10YR56	0		P	CPR	MD	15	8					1	0.5						
28		B	≤7	30			ZC	Y	10YR41				0					50	30	III	3a	0	0	0	0	15.62	2	-6.57	2
				50		ZC		10YR42	25/30	10YR56	0		P	CAB	MD	17						1							
				120		ZC		10YR42	10/50	10YR56	0		P	CPR	MD	15	8					1	0.5						
29		B	≤7	Point omitted																									
30		B	≤7	28			HZCL	N	10YR41				0					55	28	II	3a	17		1		15.22	2	-6.97	2
				55		ZC		10YR53	20/28	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR52	20/55	10YR56	0		P	CPR	MD	0	0					0	0						
31		B	≤7	28			MZCL	N	10YR41				0					55	28	II	3a	17		1		15.22	2	-6.97	2
				55		ZC		10YR53	20/28	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR52	20/55	10YR56	0		P	CPR	MD	15	8					1	0.5						
32		B	≤7	28			ZC	N	10YR41				0					50	28	III	3b	17		1		15.22	2	-6.97	2
				50		ZC		10YR53	20/28	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR52	20/50	10YR56	0		P	CPR	MD	15	8					1	0.5						
33		B	≤7	25			ZC	N	10YR41				0					50	25	III	3b	17		1		17.12	2	-3.07	2
				50		ZC		10YR53	20/25	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		C		10YR52	20/50	10YR56	0		P	CPR	MD	16	8					1	0.5						
34		P	≤7	Point omitted																									
35		B	≤7	28			ZC	N	10YR41				0					50	28	III	3b	17		1		17.42	2	-2.77	2
				50		ZC		10YR53	20/28	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		C		10YR52	20/50	10YR56	0		P	CPR	MD	0	0					0	0						
36		B	≤7	28			ZC	N	10YR41				0					52	28	III	3b	17		1		15.22	2	-6.97	2
				52		ZC		10YR53	20/28	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR52	20/52	10YR56	0		P	CPR	MD	15	8					1	0.5						
37		B	≤7	Point omitted																									
38		B	≤7	Point omitted																									
39		B	≤7	25			ZC	N	10YR41				0					52	25	III	3b	17		1		14.62	2	-7.57	2
				52		ZC		10YR41	30/25	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR42	30/52	10YR56	0		P	CPR	MD	0	0					0	0						
40		B	≤7	30			HZCL	N	10YR41				0					50	30	III	3b	17		1		15.62	2	-6.57	2
				50		ZC		10YR42	30/30	10YR56	0		P	CAB	MD	15	8					1	0.5						
				120		ZC		10YR42	30/50	10YR56	0		P	CPR	MD	15	8					1	0.5						

Obs point	Grid ref. Full transmission	Boring or pit	Flag	Base Depth (cm)		Text.	Calc.	Matrix colour	Motts. %/ depth	Mott colour	Ped face colour	Stns %	Stns type	Porosity	Struct	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grain (wetness)	TA _v	EA _v	RTA _v	REA _v	MBW	Grain/Diag. (WEX)	MBP	Grain/Diag. (POX/DB)
41		B	s7	30		ZC	N	10YR41				0					52	30	III	3b	17		1		15.62	2	6.57	2
				52		ZC		10YR41	30/30	10YR56	0		P	CAB	MD	15					8	1	0.5					
				120		ZC		10YR42	25/52	10YR56	0		P	CPR	MD	15					8	1	0.5					
42		B	s7	25		ZC	N	10YR41				0					52	25	III	3b	17		1		14.62	2	7.57	2
				52		ZC		10YR41	30/25	10YR56	0		P	CAB	MD	15					8	1	0.5					
				120		ZC		10YR42	20/52	10YR56	0		P	CPR	MD	15					8	1	0.5					
43		B	s7	30		ZC	N	10YR41				0					60	30	II	3a	17		1		15.62	2	6.57	2
				60		ZC		10YR53	25/30	10YR56	0		P	CAB	MD	15					8	1	0.5					
				120		ZC		10YR42	25/60	10YR56	0		P	CPR	MD	15					8	1	0.5					
44		B	s7	28		H2CL	N	10YR41				0					52	28	III	3b	17		1		15.22	2	6.97	2
				52		ZC		10YR41	30/28	10YR56	0		P	CAB	MD	15					8	1	0.5					
				120		ZC		10YR42	25/52	10YR56	0		P	CPR	MD	15					8	1	0.5					
45		B	s7	25		H2CL	Y	10YR42				5	HR				85	25	II	2	19		1		4.13	3a	18.32	3a
				85		H2CL		10YR52	15/25	10YR56	0		P	CAB	MD	17					10	1	0.5					
				120		H2CL		10YR51	20/85	10YR56	0		P	CPR	WK	12					6	1	0.5					
46		B	s7	120																	0	0	0	0				
47		B	s7	25		ZC	N	10YR43				0					55	25	II	3a	19		1		37.88	3a	31.07	3a
				35		C		2.5Y41	15/25	10YR56	0		P	CAB	MD	16					8	1	0.5					
				55		C		2.5Y41	15/45	7.5YR 56	0		P	CPR	MD	13					7	1	0.5					
48		B	s7	120		ZC		10YR52	20/55	7.5YR 56		0		P	CPR	WK	80	25	II	3a	12	7	1	0.5	2.62	3a	16.57	3a
				25		C	N	10YR41			0					17						1						
				80		ZC		10YR42	2/25	7.5YR 56	0		P	CAB	MD	16					8	1	0.5					
49		B	s7	120		C		10YR41	20/80	7.5YR 56		0		P	CPR	WK	80	28	II	3a	13	7	1	0.5	3.82	3a	15.37	3a
				28		C	N	10YR41			0					0					0	0	0					
				80		ZC		10YR42	10/28	7.5YR 56	0		P	CAB	MD	17						1						
50		B	s7	120		C		10YR41	15/80	10YR56		0		P	CPR	WK	75	25	II	3a	16	8	1	0.5	2.62	3a	16.57	3a
				25		C	N	10YR42			0					13					7	1	0.5					
				75		ZC		10YR42	5/25	7.5YR 56	0		P	CAB	MD	0					0	0	0					
51		B	s7	120		C		10YR41	10/75	7.5YR 56		0		P	CPR	WK	80	25	II	3a	17		1		2.62	3a	16.57	3a
				25		C	N	10YR41			0					16					8	1	0.5					
				80		C		10YR41	5/25	7.5YR 56	0		P	CAB	MD	13					7	1	0.5					
52	537021, 317152	B	s7	120		C		10YR41	15/80	7.5YR 56		0		P	CPR	WK	70	28	II	3a	0	0	0	0	9.42	2	9.77	2
				28		H2CL	N	10YR41			0					19						1						
				70		C		10YR42	5/28	10YR56	0		P	CAB	MD	16					8	1	0.5					
53	537005, 317102	B	s7	120		C	N	10YR41	20/70	10YR56		0		P	CPR	WK	70	28	II	3a	13	7	1	0.5	3.82	3a	15.37	3a
				28		C	N	10YR41			0					17						1						
				70		ZC		10YR42	5/28	7.5YR 56	0		P	CAB	MD	16					8	1	0.5					
54	537087, 317110	B	s7	120		C		10YR41	20/70	10YR56		0		P	CPR	WK	70	28	II	3a	13	7	1	0.5	3.82	3a	15.37	3a
				28		C	N	10YR41			0					0					0	0	0					
				70		ZC		10YR42	5/28	7.5YR 56	0		P	CAB	MD	17						1						
55	537151, 317120	B	s7	120		C	Y	10YR42				5	HR				45	25	III	3a	16	8	1	0.5	2.16	3a	12.15	3a
				28		C	Y	10YR42			10	HR	P	CAB	MD	17						1						
				45		C		10YR51	5/25	10YR56	10	HR	P	M/F		15					7	1	0.5					
56		B	s7	120		CSZL		10YR51	10/45	10YR56		5	HR	P	M/F		50	25	III	3a	0	0	0	0	1.65	3a	15.09	3a
				28		C	Y	10YR42			5	HR				17						1						
				50		C		10YR51	5/25	10YR56	10	HR	P	CAB	MD	16					8	1	0.5					
57	537175, 316930	B	s7	120		CSZL		10YR51	5/50	10YR56		10	HR	P	M/F		55	25	II	3a	15	7	1	0.5	5.16	3a	23.27	3a
				25		C	N	2.5YR41			5	HR	P	CAB	MD	17						1						
				55		C		10YR41	5/25	10YR56	5	HR	P	CPR	WK	16					8	1	0.5					
58	537121, 316864	B	s7	120		C		10YR41	10/55	10YR56		5	HR	P	CPR	WK	60	25	II	3a	13	7	1	0.5	1.96	3a	20.07	3a
				25		C	N	2.5YR41			2	HR				17						1						
				60		C		10YR41	10/25	10YR56	5	HR	P	CAB	MD	16					8	1	0.5					
59	537177, 316892	P	s7	120		C		10YR42	15/60	10YR56		5	HR	P	CPR	WK	60	25	II	3a	13	7	1	0.5	1.38	3a	20.57	3a
				25		C	N	2.5YR41			10	HR				17						1						
				60		C		10YR41	10/25	10YR56	5	HR	P	CAB	MD	16					8	1	0.5					
60	537258, 316901	B	s7	120		C		2.5YR41	15/60	10YR56		0		P	CPR	WK	60	25	II	3a	13	7	1	0.5	1.38	3a	20.57	3a
				25		C	N	2.5YR41			10	HR				17						1						
				55		C		10YR41	5/10	10YR56	5	HR	P	CAB	MD	16					8	1	0.5					

Obs point	Glacier front intersection	Boring or test	Depth (m)	Base Depth (cm)	Text	Calc	Matrix colour	Mott. %/ depth	Mott colour	Ped face colour	Stns %	Stns type	Porosity	Struct	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grade (vertical)	TA _v	EA _v	STAV _v	SEAV _v	REW	Char/Dmag# (WHA)	REP	Char/Dmag# (PO/NCES)
61		B	57	25		C	N	10YR41	10/25		5	HR				65	25	II	3a	17		1		3.16	3a	21.27	3a
				65		C		10YR42	10YR56		5	HR	P	CAB	MD					16	8	1	0.5				
				120		C		10YR51	20/65	10YR56	5	HR	P	CPR	WK					13	7	1	0.5				
				120																0	0	0	0				
62		B	57	25		C	N	10YR41	10/25	10YR56	5	HR				60	25	III	3b	19		1		1.59	3a	16.52	3a
				58		C		10YR41	10YR56		10	HR	P	CAB	MD					16	8	1	0.5				
				120		C		10YR51	20/758	10YR56	5	HR	P	CPR	WK					13	7	1	0.5				
				120																0	0	0	0				
63	537253-316681	B	57	25		C	N	10YR41	10/25	10YR56	5	HR				70	25	II	3a	17		1		0.62	3a	18.57	3a
				70		C		10YR41	10YR56		0		P	CAB	MD					16	8	1	0.5				
				120		C		10YR51	15/70	10YR56	0		P	CPR	WK					13	7	1	0.5				
				120																0	0	0	0				

Statement of competence - Agricultural land Classification

SES Ltd undertake several dozen Agricultural Land Classification (ALC) or Land Capability Classifications for Agriculture (LCCA-Scotland) surveys a year and have worked on sites up to 1000 ha including housing, roads, solar farm and mineral extraction developments.. We have been undertaking ALC surveys for 25 years and have won many contracts to supply Land Classification reports to local authorities as part of their strategic development plans. A number of our staff have attended the training course Agricultural Land Classification: England and Wales. Working with Soil – The IPSS Professional Competency Scheme. BSSS & DEFRA.

DR ROBIN DAVIES BSc PhD F.I.SoilSci. (Managing Director)

- Fellow of The British Society of Soil Science
- Council Member of The Institute of Professional Soil Scientists for 4 years.
- PhD Soil Physics - Agricultural land drainage - University of Newcastle upon Tyne
- Founder and Managing Director of Soil Environment Services Limited for 25 years.

Selected peer reviewed scientific papers:

- * **Soil nitrogen depletion - the threat from soil stockpiling.** Environmental Scientist: Journal of The Institution of Environmental Sciences, 1997.
- * **Nitrogen loss from a soil, restored after surface-mining.** Journal of Environmental Quality, 1995
- * **The influence of soil factors on the growth of a grass/clover sward on a restored site in Northumberland.** Grass & Forage Science, 1994.
- * **The effect of post-restoration cropping regime on some physical properties of a restored soil.** Soil Use & Management, 1994
- * **Water availability in a restored soil.** Soil Use & Management, 1992.
- * **A laboratory Method for Investigating the Stabilisation of Mole Channels.** J.Agric.Eng.Res.1991.

Louise Tavasso BSc (Hons) (Soil surveyor/ Environmental Consultant)

Member of British Society of Soil Science
Postgraduate short course Contaminated Land Risk assessment – LQM Nottingham University

Worked for Soil Environment Services Limited for 16 years.
Environmental consultant with initial work in contaminated land risk assessment and since 2011 as assistant soil surveyor with last three years as lead consultant on agricultural land classification surveys. All work areas have required field survey and identification and description of soils combined with an understanding of soil processes for reporting.

Completed the BSSS Agricultural Land Classification Course – 2021.



Main areas of specialisation

1 Agricultural Land Classification

Soil survey and Agricultural Land Classification for planning applications –, roads, housing, solar parks. Fully conversant with the procedures of the *Agricultural Land Classification of England and Wales, Guidelines and criteria for grading the quality of agricultural land, 1988, MAFF, London.*

2 Soil survey for habitat restoration

Soil survey and nutrient analysis assessment for conversion of farmland to species rich grassland.

3 Contaminated land risk assessment

Phase 1 site survey risk assessment of contaminated land; site investigation, on-site monitoring; risk analysis, modelling and communication; recommendations for Phase 2 and remediation options.

Examples of Agricultural Land Classification (ALC or LCCA Scotland) consultancy work

Kier Mining. Greenburn Opencast Coal Site. Soils and deep peat survey for LCCA report soil resources planning. 2011
Newcastle International Airport Ltd. ALC survey for solar park development. 2021.

Examples of soil survey habitat creation consultancy work

BSG Ecology. Backwork Estate – farmland conversion to wildflower meadow. 2020.
Private garden owner. Soil survey and recommendation for drainage system design. 2021

Examples of contaminated land consultancy work

Numerous risk assessments on petrol stations for hydrocarbon leakages (2006-2019)
Farm building risk assessments for conversion to residential housing (2006-2019)

GENERAL INFORMATION SOURCES

1. ***Agricultural Land Classification of England and Wales***. Revised guidelines and criteria for grading the quality of agricultural land. MAFF. 1988.
2. ***Soil Survey Field Handbook***. Technical Monograph No.5. Soil Survey of England and Wales.1976.
3. ***Climatological Data for Agricultural Land Classification***, The Met. Office 1989
4. ***Soil Map of England and Wales: 1:250 000***. Soil Survey of England and Wales, Harpenden.
5. ***Soils and Their Use in Eastern England***. Soil Survey of England and Wales,
6. ***Agricultural Land Classification Map*** 1:250 000. MAFF 1983.
7. ***Risk of Flooding***: <https://flood-warning-information.service.gov.uk/long-term-flood-risk>
8. ***Geology of Britain Viewer***. Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved
9. ***Butler, B E. Soil Classification for Soil Survey Monographs on Soil Survey (1980)***
Clarendon Press, Oxford
10. ***Munsell Soil Colour Charts***, Munsell Colour, Grand Rapids 1994.

GLOSSARY

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.

GLEYS, SPL: 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
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:

V: Visual	S: Sieved	D: Displacement
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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' might also be noted as RRC.

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.