



**CLEARSTONE
ENERGY**

DARTFORD ENERGY HUB

AGRICULTURAL LAND CLASSIFICATION

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Clearstone Energy Ltd



Dartford Energy Hub

Agricultural Land Classification

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ADAS GENERAL NOTES

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK ADAS Ltd.



EXECUTIVE SUMMARY

ADAS have been instructed by Clearstone Energy Ltd to undertake an Agricultural Land Classification survey of 5.4 ha for the Dartford Energy Hub project.

The survey has predominately identified well drained soils with fine sandy loam and fine sandy silt loam topsoils over heavy clay loam, heavy silty clay loam, sandy clay loam and fine sandy loam subsoils. These soils form agricultural land of Grade 2 (5.4 ha, 100 %) quality. On the Grade 2 land the principal limitation to the agricultural use of the land is a slight droughtiness limitation. Despite this, the surveyed land is currently used for livestock grazing and the occasional recreational use such as for circus and accompanying parking.

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1 INTRODUCTION

ADAS have been instructed by Clearstone Energy Ltd to undertake an Agricultural Land Classification (ALC) survey. This report provides information on the soils and agricultural land quality of approximately 5.4 ha of land in two field parcels at Northfleet, Gravesend, DA13 9PA. The report is based on a survey of the land undertaken in May 2024.

1.1 Site Environment

The Proposed Development is located in Northfleet near Gravesend. The Site comprises two agricultural field parcels and measures a total area of approximately 5.4 hectares. The two land parcels are located immediately north and south of Station Road (the B262).

Both the first and second sites to the north and south of Station Road slope from approximately 22 m to 10 m (AOD) in elevation.

Both land parcels are located in a Low Flood Risk Zone. This zone is deemed to be at lowest risk of flooding from rivers or sea, with less than 1 in 1000 annual probability of flooding in any year (<0.1%)¹.

1.2 Agricultural Use

The two sites to the north and south of Station Road appear to be currently utilised for livestock grazing with hedgerow borders with neighbouring fields. Both of these fields had recently been used as land to hold a circus and as temporary parking at the time of the survey.

1.3 Published Information

1.3.1 Geology

1:50,000 scale BGS information² records a main geological unit of Thanet Formation – Sand, which underlies the majority of the two sites.

A thin band of Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation – Chalk, also runs north to south through these two sites.

¹ Environment Agency - Flooding Service. Online resource at <https://flood-map-for-planning.service.gov.uk/flood-zone-results-explained?zone=FZ1>

² British Geological Survey, 2019. *Geology of Britain viewer*. Online resource: <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>

1.3.2 Soils

Two soil associations have been mapped on the Soil Survey of England and Wales, Soils of England and Wales national map. The mapping records the Site as belonging to the following soil associations:

- 1) **Frilsham Soil Association** – covering the northern two parcels to the north and south of Station Road.
 - Described as well drained fine loamy soils over chalk which are sometimes calcareous. Some similar soils are found with shallow calcareous fine loamy and fine silty soils.

1.3.3 Previous Agricultural Land Classification

The Natural England Regional Agricultural Land Classification Map³ shows the survey area as Grade 2.

2 METHODOLOGY

A detailed soil survey was carried out in May 2024. The survey was based on observations at intersects of a 100 m grid, giving a sampling density of at least one observation per hectare. During the survey, soils were examined via a combination of auger borings and two soil description pits to a maximum depth of 1.1 m. A map showing the location of each observation point is attached to this report as Appendix 1 and a log of the details of each observation point is attached to this report as Appendix 3.

Two soil description pits were dug at these sites. A topsoil sample from both pits (pit at auger boring 4 and auger boring 10) was submitted to NRM laboratories for particle size distribution analysis by the pipette methodology to confirm site findings. The results of this analysis are given in Section 3 and in Appendix 4.

3 SOILS

3.1 Soil Types

There is one principal soil type found across the two land parcels as described below. The two sites either side of Station Road have Soil Type 1 as described below.

3.1.1 Soil Type 1

These soils have a fine sandy loam, heavy clay loam or, in one case, clay topsoil with a heavy silty clay loam, heavy clay loam or in one case sandy clay loam subsoil. Topsoil depths range from 35-38 cm but are mostly 38 cm deep. All soil profiles were found to extend to the maximum exanimated depth of 110 cm. The soils are very slightly to moderately stony.

An example soil profile is described below from the pit at observation point 4.

³ Natural England, 2023. Regional Agricultural Land Classification Map. Online resource: <https://publications.naturalengland.org.uk/publication/141047?category=5954148537204736>

Pit @ 4

0-38 cm	Dark brown (7.5YR3/2) fine sandy loam; very slightly stony (0-5%), with a few small pebble-like stones; moderately-developed granular structure; friable; common fine fibrous roots; porosity >0.5% biopores greater than 0.5mm diameter; wavy boundary.
38-110 cm	Brown (7.5YR4/3) heavy silty clay loam; moderately stony (25%), with a few small pebble-like stones; moderately-developed fine to medium sub-angular blocky structure; friable; porosity >0.5% biopores greater than 0.5mm diameter; common fine fibrous roots to 70cm; no mottling.

The soil profiles are well drained and belong to Wetness Class I. There are no wetness limitations within this field. However, these soil profiles also have moisture balances of 18 to 33 for wheat and -1 to -7 for potatoes which places them within Grade 2 for droughtiness. At two profiles, moisture balances of 5 mm to 7 mm for wheat and -11 mm to -13 mm for potatoes places the profiles within Subgrade 3a for droughtiness.

At observation 7, the topsoil texture was classified as clay meaning that this location is placed within Subgrade 3a due to greater wetness limitation.



Photograph 1: Pit at observation 4.

3.2 Laboratory Analysis

A sample representative of the top 25 cm of the soil profile was taken from Pit 1 at auger observation point 4. These soils were submitted to NRM Laboratories for particle size distribution (PSD) analysis. The laboratory report is given in Appendix 4, the textures are confirmed in the table below.

Table 3.2: PSD analysis results

Observation	PSD Analysis
4	Sandy Loam

4 AGRICULTURAL LAND CLASSIFICATION

The Agricultural Land Classification (ALC) system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use for food production. The limitations can operate in one or more of four principal ways; they may affect the range of crops which can be grown, the level of crop yield, the consistency of crop yield, and the cost of obtaining a crop.

The classification system gives considerable weight to flexibility of cropping, whether actual or potential, however the ability of some land to produce consistently high yields of a narrower range of crops is also taken into account.

The Agricultural Land Classification (ALC) system classifies land into five grades numbered 1 to 5, with grade 3 divided into two subgrades (3a and 3b). The system was devised and introduced by the then Ministry of Agriculture, Fisheries and Food (MAFF) in the 1960s and revised in 1988. A description of the grades used in the ALC system is attached to this report as Appendix 5.

4.1 Climate

The agricultural climate is an important factor in assessing the agricultural quality of land, and the agricultural climate of this site has been calculated using the Climatological Data for Agricultural Land Classification⁴.

Table 4.1: Agro-climatic variables

	Land Parcel 1	Land Parcel 2
Grid Reference	TQ 616 721	TQ 617 721
Altitude(m)	15	16
Average Annual Rainfall (AAR)	580 mm	581 mm
January-June Accumulated Temperature (AT0)	1486 day °C	1485 day °C
Field Capacity Days (FCDs)	111	111
Field Capacity Period	early November – early March	
Moisture Deficit Wheat (MDW)	123 mm	123 mm
Moisture Deficit Potatoes (MWP)	121 mm	121 mm
Climate (upper grade limit)	1	1

The site has no climatic limitation.

⁴ Meteorological Office, (1989). *Climatological Data for Agricultural Land Classification*.

4.2 Results

The results of the soil survey described in Section 3 were used in conjunction with the agro-climatic data above to classify the land according to the revised guidelines for Agricultural Land Classification issued in 1988 by the Ministry of Agriculture, Fisheries and Food (now Defra)⁵.

This report has identified agricultural land of Grade 1 and 2 quality.

Grade 1

No land of this quality has been mapped.

Grade 2

There are 5.4 ha of Grade 2 land within the survey area. This land is predominately formed on well drained heavy silty clay loam or heavy clay loam topsoils over fine sandy loam, heavy clay loam, sandy clay loam and heavy silty clay loam subsoils in the majority of the survey area. These soils belong to Wetness Class I. There is little or no evidence of gleying or evidence of waterlogging.

The principal limitations to the agricultural use of this land are soil wetness (workability) and a slight droughtiness limitation.

Subgrade 3a

Two profiles were recorded as Grade 3a land within the survey area. This land is formed on differing soils with one found on well drained fine sandy loam topsoil over a heavy silty clay loam subsoil, and the other found as a clay topsoil over a clay and heavy clay loam subsoil. These soils both belong to Wetness Class I. There is little or no evidence of gleying or evidence of waterlogging.

However due to these being isolated within Grade 2 land within differing land parcels, they have not been mapped.

Subgrade 3b

No land of this quality has been mapped.

Grade 4

No land of this quality has been mapped.

Grade 5

No land of this quality has been mapped.

Non-agricultural

No land of this description has been mapped.

⁵ MAFF, (1988). *Agricultural Land Classification for England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land*.

Urban

No land of this description has been mapped.

Not Surveyed

All land was surveyed.

4.3 Summary of grade areas

The boundaries between the different grades of land are shown in Appendix 2. The area occupied by each grade is shown below.

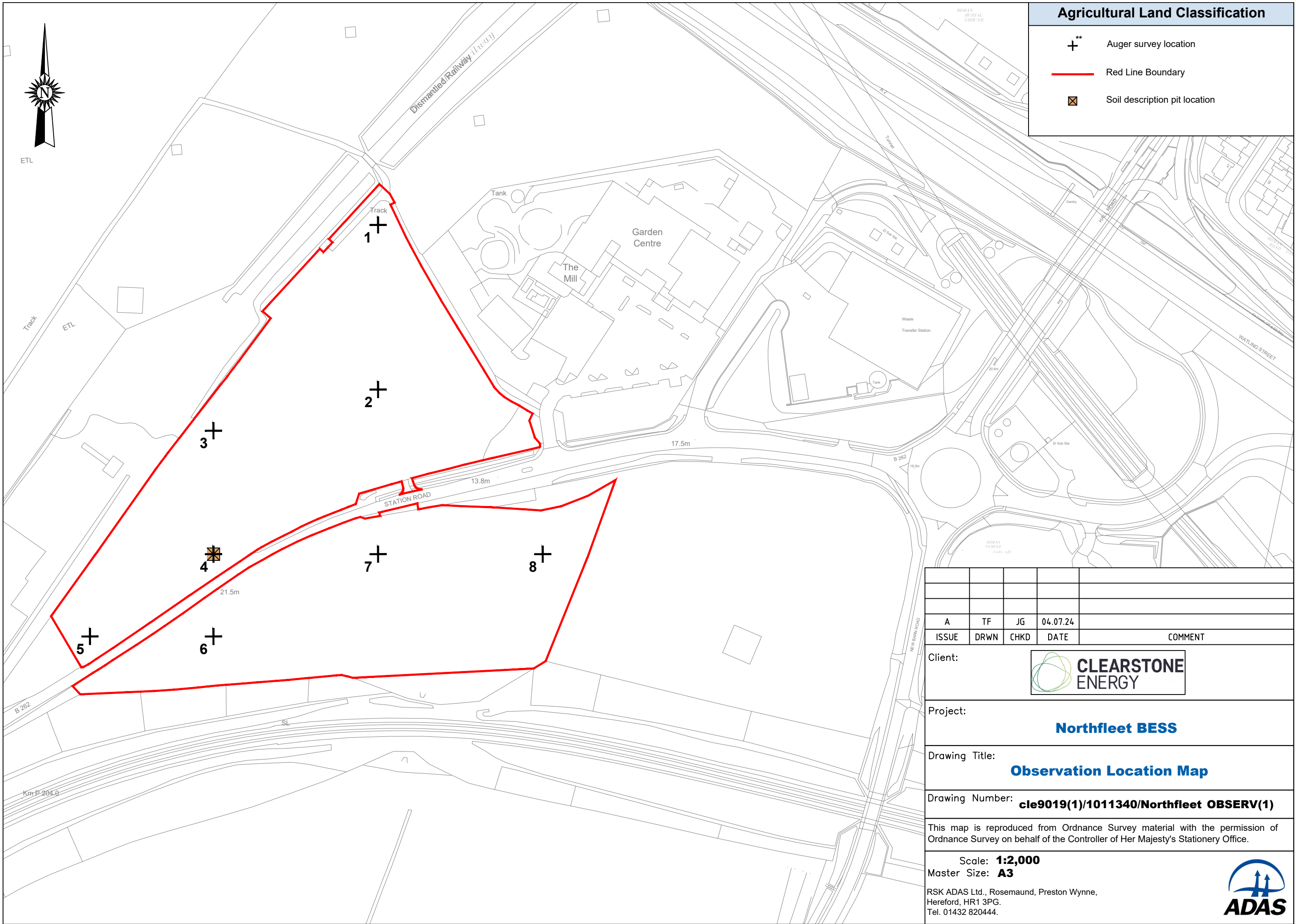
Table 4.3: Grade areas

Grade / subgrade	Area (ha)	Area (%)
Grade 1	-	-
Grade 2	5.4	100 %
Subgrade 3a	-	-
Subgrade 3b	-	-
Grade 4	-	-
Grade 5	-	-
Non-agricultural	-	-
Urban	-	-
Not Surveyed	-	-
Total	5.4	100

5 CONCLUSION

The survey has identified well drained soils with fine sandy silt loam, fine sandy loam, heavy clay loam and clay topsoils over heavy clay loam, heavy silty clay loam, sandy clay loam and fine sandy loam subsoils. These soils form agricultural land of Grade 2 (5.4 ha, 100 %) quality. On the Grade 2 land the principal limitation to the agricultural use of the land is a slight droughtiness limitation. Despite this, the surveyed land is currently used for livestock grazing and the occasional recreational use such as for circus and accompanying parking.

APPENDIX 1 – OBSERVATION LOCATION MAP

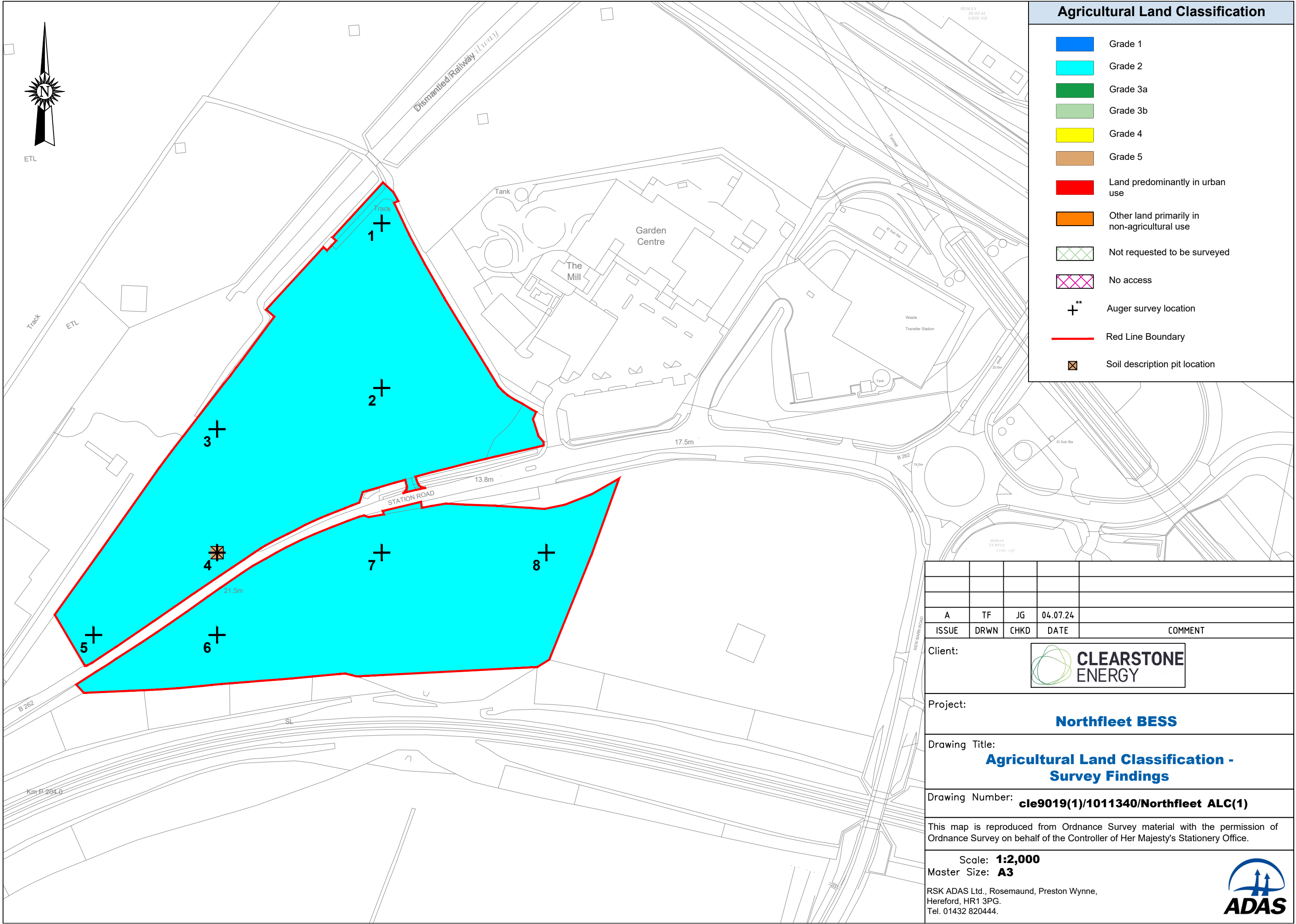


Agricultural Land Classification

- ++ Auger survey location
- Red Line Boundary
- Soil description pit location

A	TF	JG	04.07.24	
ISSUE	DRWN	CHKD	DATE	COMMENT
Client: 				
Project: Northfleet BESS				
Drawing Title: Observation Location Map				
Drawing Number: cle9019(1)/1011340/Northfleet OBSERV(1)				
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Scale: 1:2,000 Master Size: A3 RSK ADAS Ltd., Rosemaund, Preston Wynne, Hereford, HR1 3PG. Tel. 01432 820444.				
				

APPENDIX 2 – AGRICULTURAL LAND CLASSIFICATION MAP



Agricultural Land Classification

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Land predominantly in urban use
- Other land primarily in non-agricultural use
- Not requested to be surveyed
- No access
- Auger survey location
- Red Line Boundary
- Soil description pit location

A	TF	JG	04.07.24	
ISSUE	DRWN	CHKD	DATE	COMMENT
Client: 				
Project: Northfleet BESS				
Drawing Title: Agricultural Land Classification - Survey Findings				
Drawing Number: cle9019(1)/1011340/Northfleet ALC(1)				
This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office.				
Scale: 1:2,000 Master Size: A3				
RSK ADAS Ltd., Rosemaund, Preston Wynne, Hereford, HR1 3PG. Tel. 01432 820444.				
				

APPENDIX 3 – ALC SURVEY DETAILS

Auger	Depth (cm)	Colours	Munsell Colours		Texture	Mottling	SPL	Stones		Slope	WC	WE Grade	DR Grade	Overall Grade	Limit(s)
			1	2				Total	Litho						
1	35	Dark Brown	7.5YR3/2		fsl	-	-	5		<7	I	1	2	2	DR
	85	Brown	7.5YR4/3		hzcl	-	-	5							
	110	Yellowish Brown	10YR5/6		hcl	x	-	5							
2	38	Dark Brown	7.5YR3/2		fsl	-	-	5		<7	I	1	2	2	DR
	110	Brown	7.5YR4/3		hcl	-	-	5							
3	38	Dark Brown	7.5YR3/2		fsl	-	-	5		<7	I	1	2	2	DR
	110	Brown	7.5YR4/3		hzcl	-	-	5							
4	38	Dark Brown	7.5YR3/2		fsl	-	-	5		<7	I	1	3a	3a	DR
	110	Brown	7.5YR4/3		hzcl	-	-	25							
5	38	Dark Brown	7.5YR3/2		fsl	-	-	5		<7	I	1	2	2	DR
	110	Brown	7.5YR4/3		fszl	-	-	25							
6	38	Dark Brown	7.5YR3/2		hcl	-	-	5		<7	I	1	2	2	DR
	60	Brown	7.5YR4/3		hcl	x	-	5							
	110	Brown	7.5YR4/3		scl	-	-	5							
7	35	Dark Brown	7.5YR3/2		c	-	-	5		<7	I	3a	3a	3a	WE & DR
	85	Very Dark Greyish Brown	10YR3/2		c	-	-	5							
	110	Brown	7.5YR4/3		hcl	-	-	5							
8	38	Dark Brown	7.5YR3/2		hcl	-	-	5		<7	I	1	2	2	DR
	70	Brown	7.5YR4/3		hcl	-	-	5							
	110	Brown	7.5YR4/3		scl	-	-	5							

Notes
MB (Wheat) = 19 mm, MB (Potatoes) = -4 mm
MB (Wheat) = 19 mm, MB (Potatoes) = -4 mm
MB (Wheat) = 19 mm, MB (Potatoes) = -4 mm
MB (Wheat) = 5 mm, MB (Potatoes) = -13 mm
MB (Wheat) = 33 mm, MB (Potatoes) = -1 mm
MB (Wheat) = 18 mm, MB (Potatoes) = -7 mm
MB (Wheat) = 7 mm, MB (Potatoes) = -11 mm
MB (Wheat) = 18 mm, MB (Potatoes) = -7 mm

Key to auger records:

Colour	Texture	Mottling	CaCO ₃
Bk - black Br - brown(ish) Bu - blue(ish) Dk - dark Du - dusky Gn - green(ish) Gr - grey(ish) Li - light Ol - olive Pi - pink(ish) Pl - pale Rd - red(dish) St - strong V - very Wk - weak Yl - yellow(ish)	C - clay ZC - silty clay SC - sandy clay CL - clay loam (H-heavy, M-medium) ZCL - silty clay loam (H-heavy, M-medium) SCL - sandy clay loam SZL - sandy silt loam (F-fine, M-medium, C-coarse) ZL - silt loam SL - sandy loam (F-fine, M-medium, C-coarse) LS - loamy sand (F-fine, M-medium, C-coarse) S - sand (F-fine, M-medium, C-coarse) Org - organic (S-sand, L-loam, C-clay) Pty - peaty (S-sand, L-loam) Pt - peat (S-sandy, L-loamy, H-humified, SF-semi-fibrous, F-fibrous) R - bedrock	o – unmottled soil; x – a few (<2%) <i>ochreous</i> mottles; xx – common (2-20%) to many (20-40%) <i>ochreous</i> mottles <u>OR</u> <i>greyish</i> or <i>pale</i> soil, typically with a few <i>ochreous</i> mottles; xxx – <i>greyish</i> or <i>pale</i> colours dominant in matrix and/or ped faces and common to very many (>40%) <i>ochreous</i> mottles <u>OR</u> if <i>reddish</i> colours are dominant in the matrix, > 2% <i>greyish</i> , <i>brownish</i> or <i>ochreous</i> mottles or ferri-manganiferous concentrations, and dominantly <i>pale</i> coloured ped faces (<i>gleyed horizon</i>); xxxx – dominantly grey soil, often with some <i>ochreous</i> mottles (<i>gleyed horizon</i>). 'greyish', 'pale' 'brownish', 'ochreous' and 'reddish' colours are assessed in the field using a Munsell Soil Colour Book and defined according to Appendix 3 of the ALC Guidelines.	non - non-calcareous v sl ca - very slightly calcareous sl ca - slightly calcareous ca - calcareous v ca - very calcareous
SPL			Stone lithology
yes - a slowly permeable layer. borderline - a borderline slowly permeable layer. no - not a slowly permeable layer.			1 - all hard rocks or stones 2 - soft, medium or coarse grained sandstones 3 - soft 'weathered' igneous or metamorphic rocks or stones 4 - soft oolitic or dolomitic limestones 5 - soft fine grained sandstones 6 - soft, argillaceous or silty rocks or stones 7 - chalk or chalk stones 8 - gravel with non-porous stones 9 - gravel with porous stones
Principal Limitation(s) to Agriculture			Notes
yes - a slowly permeable layer. borderline - a borderline slowly permeable layer. no - not a slowly permeable layer.			FMCs – ferri-manganiferous concentrations
CL - climate GR - gradient	DE - depth MR - microrelief	DR - droughtiness ST - stoniness	ER - erosion TX - texture FL - flooding WE - wetness
Droughtiness Calculation			
MDW - moisture deficit wheat (mm); MDP - moisture deficit potatoes (mm); MBW - moisture balance wheat (mm); MBP - moisture balance potatoes (mm); Grade W - droughtiness grade for wheat; Grade P - droughtiness grade for potatoes.			
Descriptions and classifications are made in accordance with <i>Soil Survey Field Handbook</i> (Hodgson, J.M., 1997), <i>Technical Information Note TIN037: Soil Texture</i> (Natural England, 2008) and <i>Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land</i> (MAFF, 1988).			

APPENDIX 4 – LABORATORY ANALYSIS



ANALYTICAL REPORT										
Report Number	38146-24	K740	DARREN INGRAM	Client	NORTHFLEET					
Date Received	31-MAY-2024		RSK ADAS LTD		KENT					
Date Reported	01-JUL-2024		PRESTON WYNNE		SOIL 22-05-2024					
Project	1011340 - NORTHFLEET		HEREFORD							
Reference	NORTHFLEET		HR1 3PG							
Order Number	P69102DI2205									
Laboratory Reference		SOIL700212	SOIL700213							
Sample Reference		PIT 1 - TS								
Determinand	Unit	SOIL								
Sand 2.00-0.063mm	% w/w	56								
Silt 0.063-0.002mm	% w/w	28								
Clay <0.002mm	% w/w	16								
Textural Class **		SL								
Notes										
Analysis Notes	The sample submitted was of adequate size to complete all analysis requested. The results as reported relate only to the item(s) submitted for testing. The results are presented on a dry matter basis unless otherwise stipulated.									
Document Control	This test report shall not be reproduced, except in full, without the written approval of the laboratory.									
Reported by	** Please see the attached document for the definition of textural classes. <i>Teresa Clyne</i> Natural Resource Management, a trading division of Cawood Scientific Ltd. Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS Tel: 01344 886338 Fax: 01344 890972 email: enquiries@nrm.uk.com									

ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

Class	Code
Sand	S
Loamy sand	LS
Sandy loam	SL
Sandy Silt loam	SZL
Silt loam	ZL
Sandy clay loam	SCL
Clay loam	CL
Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

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

vf	Very Fine (more than 2/3's of sand less than 0.106 mm)
f	Fine (more than 2/3's of sand less than 0.212 mm)
c	Coarse (more than 1/3 of sand greater than 0.6 mm)
m	Medium (less than 2/3's fine sand and less than 1/3 coarse sand).

The subdivisions of *clay loam* and *silty clay loam* classes according to clay content are indicated as follows:

M	medium (less than 27% clay)
H	heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

APPENDIX 5 – DESCRIPTION OF ALC GRADES

The ALC grades and subgrades are described below in terms of the types of limitation which can occur, typical cropping range and the expected level and consistency of yield. The ‘*best and most versatile agricultural land*’ falls into grades 1, 2 and subgrade 3a – which collectively comprises about one-third of the agricultural land in England and Wales. About half the land in England and Wales is either of moderate quality (subgrade 3b) or poor quality (grade 4). Although less significant on a national scale, such land can be locally valuable to agriculture and the rural economy where poorer farmland predominates. The remainder is very poor quality land in grade 5, which mostly occurs in the uplands.

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 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 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 (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 – very poor quality agriculture land

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