

September 2021

Hanbury Properties Ltd

Agricultural Land Classification and Soil Resources

at

Land Adjacent to Woodgate Nurseries, Woodgate, West Sussex

**Beechwood Court,
Long Toll, Woodcote,
RG8 0RR**

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1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Hanbury Properties Ltd to investigate the Agricultural Land Classification (ALC) and soil resources of land adjacent to Woodgate Nurseries at Lidsey Road, Woodgate, West Sussex by means of a detailed survey of soil and site characteristics.
- 1.2 Guidance for assessing the quality of agricultural land in England and Wales is set out in the Ministry of Agriculture, Fisheries and Food (MAFF) revised guidelines and criteria for grading the quality of agricultural land (1988)¹, and summarised in Natural England's Technical Information Note 049².
- 1.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The principal physical factors influencing grading are climate, site and soil which, together with interactions between them, form the basis for classifying land into one of the five grades.
- 1.4 Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use. Grade 2 is very good quality agricultural land, with minor limitations which affect crop yield, cultivations or harvesting. Grade 3 land has moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield, and is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Grade 4 land is poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields. Grade 5 is very poor quality land, with very severe limitations which restrict use to permanent pasture or rough grazing.
- 1.5 Land which is classified as Grades 1, 2 and 3a is defined in the ALC system as the best and most versatile (BMV) agricultural land.
- 1.6 As explained in Natural England's TIN049, the whole of England and Wales was mapped from reconnaissance field surveys in the late 1960s and early 1970s, to provide general strategic

¹ **MAFF (1988).** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.* MAFF Publications.

² **Natural England (2012).** *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land,* Second Edition.

guidance on agricultural land quality for planners. This Provisional Series of maps was published on an Ordnance Survey base at a scale of One Inch to One Mile (1:63,360). The Provisional ALC map shows the site as Grade 2. However, TIN049 explains that:

"These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended ..."

- 1.7 TIN049 goes on to explain that a definitive ALC grading should be obtained by undertaking a detailed survey according to the published guidelines, at an observation density of one boring per hectare. This survey follows the established methodology and guidelines for carrying out ALC surveys.

2 Site and climatic conditions

General features, land form and drainage

- 2.1 The site extends to 3.5ha, of which 2.6ha comprises agricultural land in arable use. Non-agricultural land includes a gravel track leading off Lidsey Lane orientated east-west and established treelines along the western site edge and separating the two southern field parcels. The site is bordered to the east by Lidsey Road, to the north by residential properties and to the north-west by a former nursery where disused glasshouses still remain. Other agricultural land forms the remaining boundaries to the south and south-west.
- 2.2 Topography across the site is flat at 9m above Ordnance Datum (AOD). The land drains into peripheral field ditches.

Agro-climatic conditions

- 2.3 Agro-climatic data for the site have been interpolated from the Meteorological Office's standard 5km grid point data set at a representative altitude of 9m AOD and are given in Table 1. The climate is moist and warm with large moisture deficits. The number of Field Capacity Days (FCD) is larger than is average for lowland England (150) and is slightly unfavourable for providing opportunities for agricultural field work.

Table 1: Local agro-climatic conditions

Parameter	Measurement
Average Annual Rainfall	768mm
Accumulated Temperatures >0°C	1538 day°
Field Capacity Days	157 days
Average Moisture Deficit, wheat	118mm
Average Moisture Deficit, potatoes	114mm

Soil parent material and soil type

- 2.4 The underlying geology mapped by the British Geological Survey³ across the site is the London Clay Formation which comprises poorly laminated, blue-grey or grey-brown, slightly calcareous, clay with variable proportions of silt, and sometimes silt or sandy clay.
- 2.5 Superficial river terrace deposits are mapped across the site and include sand and gravel.
- 2.6 The Soil Survey of England and Wales soil association mapping⁴ (1:250,000 scale) shows the Park Gate association across the site, characterised by deep, stoneless, silty soils variably affected by groundwater. Profiles are typically seasonally waterlogged assessed as Wetness Class (WC) III or IV. Where appropriate drainage is in place, Park Gate soils are well drained or occasionally waterlogged, assessed as WC I or II⁵.

3 Agricultural land quality

Soil survey methods

- 3.1 Four soil profiles were examined across the site using an Edelman (Dutch) auger at an observation density of one per hectare in accordance with the established recommendations for ALC surveys. One observation pit was also excavated to examine subsoil structures. The locations of observations are shown on Figure RAC/9197/1. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:
- soil texture;

³ **British Geological Survey (2021).** *Geology of Britain viewer*, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁴ **Soil Survey of England and Wales (1984).** *Soils of South East England* (1:250,000), Sheet 6.

⁵ **Jarvis et al (1984).** *Soils and Their Use in South East England*. Soil Survey of England and Wales Bulletin 15, Harpenden.

- significant stoniness;
- colour (including localised mottling);
- consistency;
- structural condition;
- free carbonate; and
- depth.

- 3.2 One topsoil sample was submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are presented in Appendix 1.
- 3.3 Soil WC was determined from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling, and slowly permeable subsoil layers at least 15cm thick, in relation to the number of FCD at the location.
- 3.4 Soil droughtiness was investigated by the calculation of moisture balance equations (given in Appendix 2). Crop-adjusted Available Profile Water (AP) is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit (MD) for the standard crops, wheat and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs.

Agricultural land classification and site limitations

- 3.5 Assessment of land quality has been carried out according to the revised ALC guidelines (1988)¹. Soil profiles have been described according to Hodgson (1997)⁶ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.
- 3.6 There is one soil type present across the site.
- 3.7 The topsoil is dark greyish brown (2.5Y4/2 in the Munsell soil colour charts⁷) medium silty clay loam. Stone content is low, at around 2% to 5% by volume. The consistency is friable and the structure is medium subangular blocky.

⁶ Hodgson, J. M. (Ed.) (1997). *Soil survey field handbook*. Soil Survey Technical Monograph No. 5, Silsoe.

⁷ Munsell Color (2009). *Munsell Soil Color Book*. Grand Rapids, MI, USA

- 3.8 Upper subsoil comprises greyish brown or brown (10YR5/2 or 10YR5/3) medium silty clay loam. There are few to no stones. The consistency is friable and the structure is medium subangular blocky. The upper subsoil contains ochreous mottling indicating imperfect drainage although the stainings are often only faint.
- 3.9 The lower subsoil horizon comprises greyish brown or brown (10YR5/2 or 10YR5/3) heavy silty clay loam. The stone content continues to be low at up to 2% by volume. The lower subsoil has a friable consistency and coarse subangular blocky structure. Ochreous mottling is more prominent within the lower subsoil, with ferri-manganiferous nodules also observed within the pit.
- 3.10 Profiles are assessed as borderline to WC I and WC II due to the faintly mottled and marginally gleyed subsoils but no slowly permeable layer. Soils also have slight deficits in available water throughout the growing season. All of the agricultural land is limited to Grade 2 by both soil wetness and droughtiness.
- 3.11 The distribution of Grade 2 across the site is shown in Figure RAC/9197/2.
- 3.12 Agricultural land in the locality of Westergate and Woodgate is provisionally mapped primarily as Grade 2 quality, with Grade 1 to the north and south and some Grade 3 to the east.
- 3.13 Detailed ALC data correlates well with the provisional mapping with a prevalence of Grade 2 in the locality. There is Subgrade 3a quality land to the south-west of the site, however this land is on a restored landfill and is therefore not suitable for development.
- 3.14 Land of Subgrade 3b quality is identified north-east of the site, however this land is associated with a valley and is mapped as a flood zone, which similarly renders the land unsuitable for development.
- 3.15 It is therefore likely that any development opportunities around Woodgate and Westergate will involve the loss of BMV agricultural land, primarily of Grade 2.

4 Soil Management Strategy

4.1 Inevitably, soil structural quality will be disrupted by handling or trafficking. There are three principal objectives when stripping, handling and storing soils:

- avoiding unnecessary damage to all soil horizons, especially by compaction and smearing;
- maintaining a reasonable degree of fissuring, and hence aerobic conditions, in stored soils, especially topsoil; and
- replicating the original permeability of the soil profile when the materials are replaced.

4.2 All soil material to be re-used will be handled only under appropriate conditions, when in a dry and friable state, which is when they are least susceptible to damage by compaction and smearing, and according to the following rainfall criteria:

- if there is very light rain or drizzle, handling can proceed for up to four hours unless the soils are already in too moist a state (determined by field tests);
- if there is normal rain, handling will cease if the rain has not stopped in 15 minutes;
- if there is heavy rain (as from intense showers, slow-moving depressions) handling will stop immediately;
- after rainfall has ceased, field tests will be applied to determine when handling may re-start.

4.3 The field tests used to determine the suitability of handling should be applied to soils from at least five locations in each area to be assessed. Records of all tests will be kept.

4.4 The soils should be assessed as follows:

If the soil sample is wet, films of water are visible on the surfaces of grains and aggregates and/or when a soil sample is squeezed in the hand and it readily deforms into a cohesive "ball"	NO HANDLING
Peds (structures) break up/crumble readily when squeezed in the hand rather than forming into a ball	HANDLING OK
If the sample is moist, there is a slight dampness when squeezed between the fingers but it does not significantly change colour (darken) on further wetting	NO HANDLING BY DOZERS BUT MAY BE HANDLED BY TRACKED EXCAVATORS IF CONSISTENCY TEST (See 4.5) IS PASSED

If the sample is dry and brittle it will look dry and change colour (darken) if water is added	HANDLING OK IF CONSISTENCY TEST (See 4.5) IS PASSED
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- 4.5 The consistency of the soil should also be assessed, using the following methodology. Attempt to mould a soil sample into a ball by hand:

Impossible to mould a soil sample into a ball by hand because the soil is too hard (dry)	HANDLING OK
Impossible to mould a soil sample into a ball by hand because the soil is too loose (dry)	HANDLING OK
Impossible to mould a soil sample into a ball by hand because the soil is too loose (wet)	HANDLING NOT OK
Possible to mould a soil sample into a ball by hand	GO TO 4.6

- 4.6 If a ball can be formed by hand, attempt to roll it into a thread of 3mm diameter:

Impossible to roll the ball into a thread of 3mm diameter on a flat non-adhesive surface using light pressure from the flat of the hand; the soil crumbles or disintegrates	HANDLING OK
Possible to roll the ball into a thread of 3mm diameter on a flat non-adhesive surface using light pressure from the flat of the hand	NO HANDLING

Soil handling

- 4.7 There is one soil type to be stripped from the site.
- 4.8 Any bulky vegetation will normally be cut and removed before stripping. Plant of appropriate size for the operation will be used to strip the topsoils and place them into storage bunds within the site, the locations and volumes of which must be recorded. Haul routes to the storage areas will first be stripped of topsoil to avoid trafficking over undisturbed topsoil by wheeled vehicles.

Depth of Soil Stripping

- 4.9 The full thickness of the topsoil horizon should be stripped, identified by colour, avoiding incorporation of subsoil material into the removed topsoil.
- 4.10 The topsoil resource could be stripped uniformly to 300mm without incorporating notable volumes of upper subsoil material.

Topsoil stockpiling

- 4.11 Topsoil must be stockpiled when in an appropriate condition as determined by the field tests for moisture and consistency described above in paragraphs 4.4 to 4.6. This will ensure the soil is less prone to damage and compaction and will also facilitate re-spreading where applicable.
- 4.12 Topsoil stockpiles are proposed to have a maximum height of 3m and a side gradient of 1 in 3 to allow for maintenance by mowing rather than strimming. Stockpiles must be located away from areas that may be at risk of flooding or ponding during the construction phase. This precludes the use of the south-eastern corner of the site which lies adjacent to a food zone. The remainder of the boundary of the site which is outside the area of built development but away from tree canopies and roots would be appropriate for the siting of stockpiles.
- 4.13 Any stockpiles in place for more than 6 months will be grassed down, normally with a low-maintenance mix unless otherwise agreed, and kept in a tidy and weed-free condition.
- 4.14 Locations will be monitored for signs of ponding. If that occurs, temporary drainage measures will be put in place.

Subsoil preparation

- 4.15 Soil placement will occur once the areas to be reinstated to gardens and green infrastructure are dry and clear of debris. Any debris that may have been incorporated into the subsoil resource during the construction phase will be removed.
- 4.16 To ensure successful establishment of grass and trees, the subsoil must be uncompacted and well aerated in order to avoid waterlogging and the development of anaerobic conditions. If significant rainfall occurs, work must be suspended and not restarted until the weather forecast is expected to be dry for at least one full day.

Topsoil re-spreading

- 4.17 Topsoil should be taken out of stockpiles when in a dry and friable condition, and loose-tipped onto the prepared subsoil, to a depth of 300mm (plus up to 20% to allow for settlement).
- 4.18 Following topsoil resspreading, the soil profiles should be decompacted if required following inspection, and larger clods broken up prior to the soil being seeded or trees being planted.

- 4.19 Tree and grass establishment must be monitored subsequent to planting. At the first signs of failure, the soil profiles will be examined in order to identify any drainage or compaction issues, and a strategy to ameliorate these issues will be developed.

5 Summary and Conclusion

- 5.1 The land adjacent to Woodgate Nurseries extends to 3.5ha in total, of which 2.6ha is agricultural land in arable use.
- 5.2 An ALC survey undertaken in May 2021 classified all of the agricultural land at the site as Grade 2.
- 5.3 The agricultural land amounts to 2.6ha but is divided across three well-defined field parcels which may affect the efficiency of some farming operations.
- 5.4 Paragraph 175 of the NPPF states that plans should allocate for development land with the least environmental or amenity value. In terms of agricultural land quality, agricultural land of lower quality in the vicinity of the site is subject to other constraints that make that land unsuitable for development. It is highly likely that development on any suitable agricultural land in the vicinity of Westergate and Woodgate will involve the loss of Grade 2 quality land and therefore there is little opportunity to direct development to sites of a lesser environmental value.
- 5.5 There is one soil type to be stripped and re-used, which is a very good quality, slightly stony, freely draining, medium silty clay loam, with an average depth of 300mm.
- 5.6 A suitable soil profile for reinstatement should use as much of the displaced topsoil resource as is possible. The remaining topsoil should be used for beneficial and sustainable reuse off-site in a manner appropriate to its quality.
- 5.7 All soil material to be re-used will be handled only under appropriate conditions, when in a dry and friable state, which is when they are least susceptible to damage by compaction and smearing. Rainfall, soil moisture and consistency criteria will be followed to ensure soil is handled in appropriate conditions.

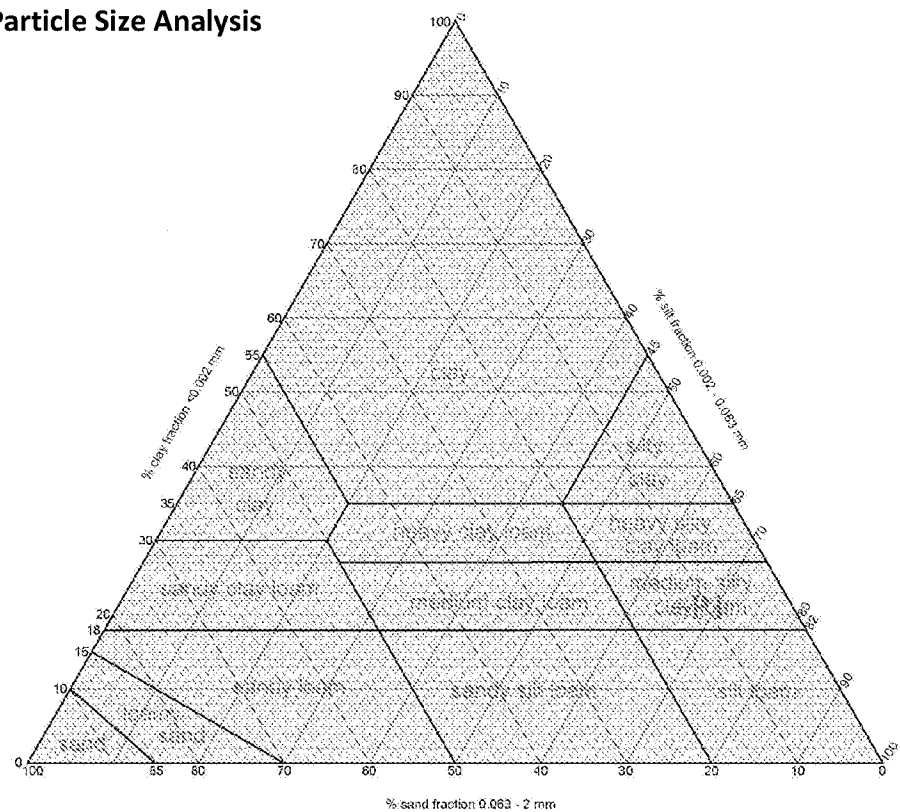
Appendix 1: Laboratory Data

Determinand	P1	Units
Sand 2.00-0.063 mm	3.3	% w/w
Silt 0.063-0.002 mm	66	% w/w
Clay <0.002 mm	21	% w/w
Organic Matter	1.9	% w/w
Texture	Medium silty clay loam	

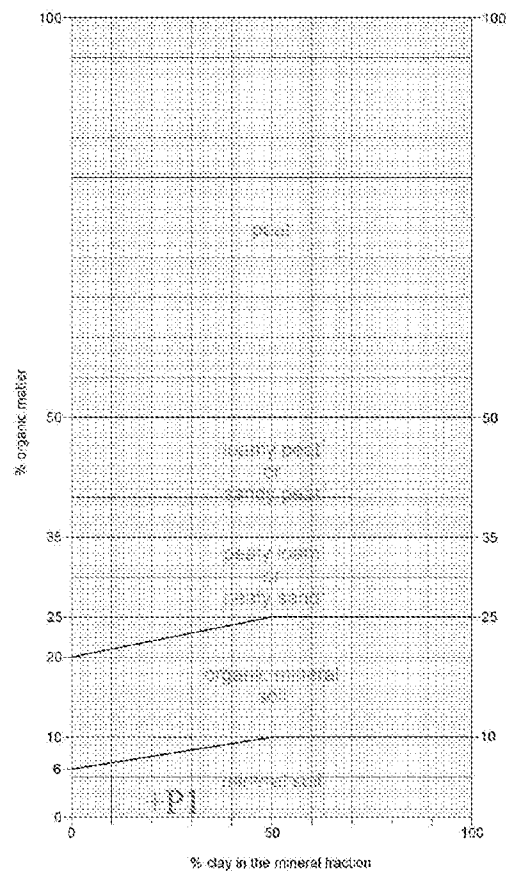
Determinand	P1	Units
Soil pH	5.5	
Phosphorus (P)	26.4	mg/l (av)
Potassium (K)	140	mg/l (av)
Magnesium (Mg)	73.4	mg/l (av)

Determinand	P1	Units
Phosphorus (P)	3	ADAS Index
Potassium (K)	2-	ADAS Index
Magnesium (Mg)	2	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



† Less than 50% sand in the mineral fraction
‡ 50% sand or more in the mineral fraction

Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Wetness calculations are made according to the methodology given in Appendix 3 of the ALC guidelines, MAFF 1988

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.

Grades are shown for drought, wetness and any other soil or site factors which are relevant. The overall Grade is set by the most limiting factor and shown on the right.

Stone types		
%	TA _v	E _{av}
hard	1	0.5

hard flint & pebble

Climate Data	
MDwheat	118
MDpotato	114
FCD	157

Wetness Class Guidelines	II	III	IV	V
SPL within 60cm, gleying within 40cm	>70cm	42-70cm	<42cm	
SPL within 80cm, gleying at 40-70cm	>55cm	<55cm		
No SPL but gleying within 40cm	coarse subsoil	I	other cases	II

Maximum depth of auger penetration is underlined

Site No.	Depth cm	Texture	CaCO ₂	Colour	Mottle colour	abundance	stone% hard	stone% .	Structure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	0	28	mZCL	n	2.5Y4/2		2			52	52	n	n	II	2	2	WE DR
	28	62	mZCL	n	10YR5/2	Fe com	0			49	58	y	n				
	62	120	hZCL	n	10YR5/2	Fe com	2			57	13	y	n				
									Total	158	123						
									MB	40	9						
									Droughtiness grade (DR)	1	2						
2 Pit 1	0	30	mZCL	n	2.5Y4/2		5			54	54	n	n	II	2	2	WE DR
	30	58	mZCL	n	10YR5/3	Fe com	2			41	47	y	n				
	58	70	hZCL	n	10YR5/3	Ferrn com	0			12	20	y	n				
	70	120	hZCL	n	10YR5/3	Ferrn com	0			50	0	y	n				
									Total	157	121						
									MB	39	7						
									Droughtiness grade (DR)	1	2						
3	0	30	mZCL	n	2.5Y4/2		5			54	54	n	n	II	2	2	WE DR
	30	48	mZCL	n	10YR5/3	Fe com	0			31	31	y	n				
	48	120	hZCL	n	10YR5/2	Ferrn com	0			73	37	y	n				

USS-mottling common but faint borderline WC I/II
Pit stops at 70- full depth observed by auger

										Total	158	122	USS-mottling common but faint borderline WC I/II						
										MB	40	8							
Droughtiness grade (DR)											1	2							
4	T	0	32	mZCL	n	2.5Y4/2			5			58	58	n	n	//	2	2	WE DR
			32	63	mZCL	n	10YR5/3	Fe	com	0		44	53	y	n				
			63	120	hZCL	n	10YR5/2	Ferrn	com	0		57	12	y	n				
										Total	158	122	USS-mottling common but faint borderline WC I/II						
										MB	40	8							
Droughtiness grade (DR)											1	2							

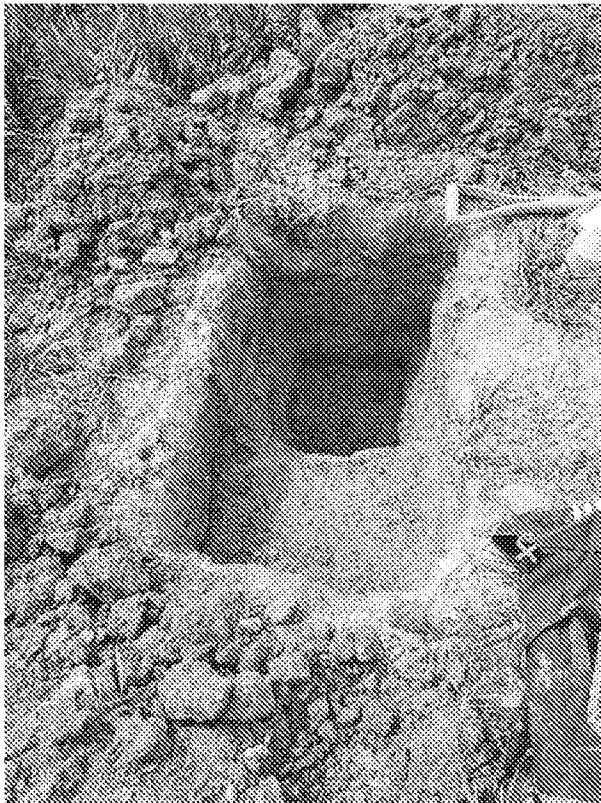
Appendix 3: Site Photographs



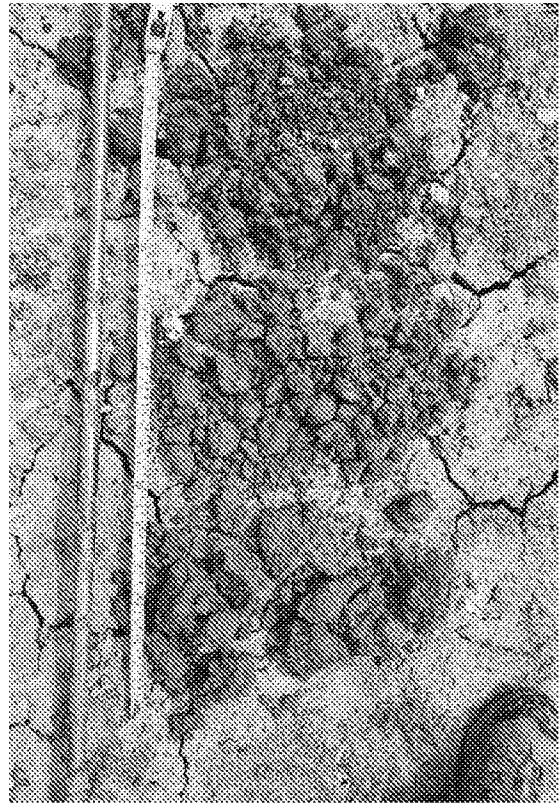
Arable land use



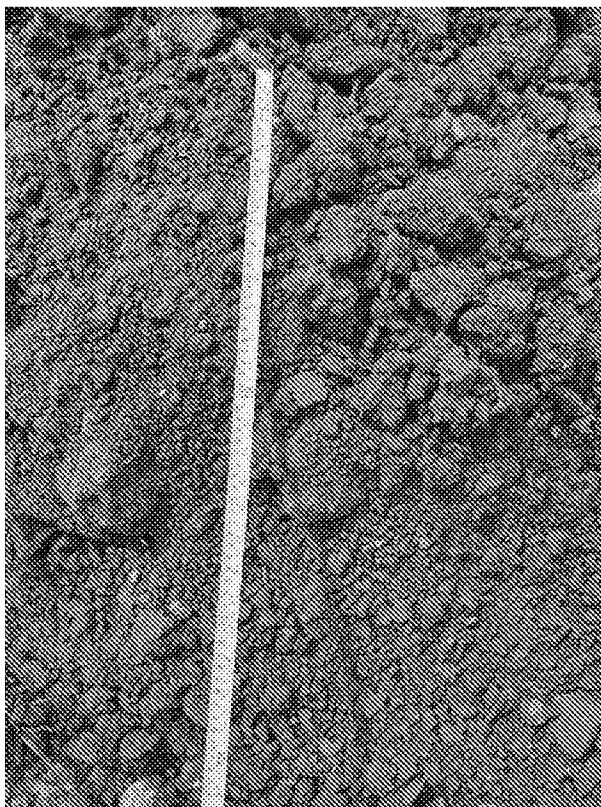
Pit 1 wall



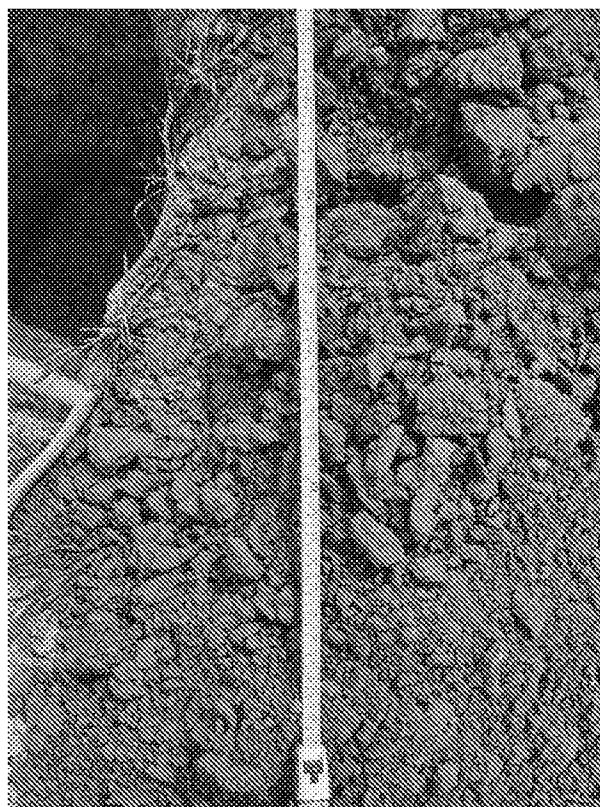
Pit 1 overview



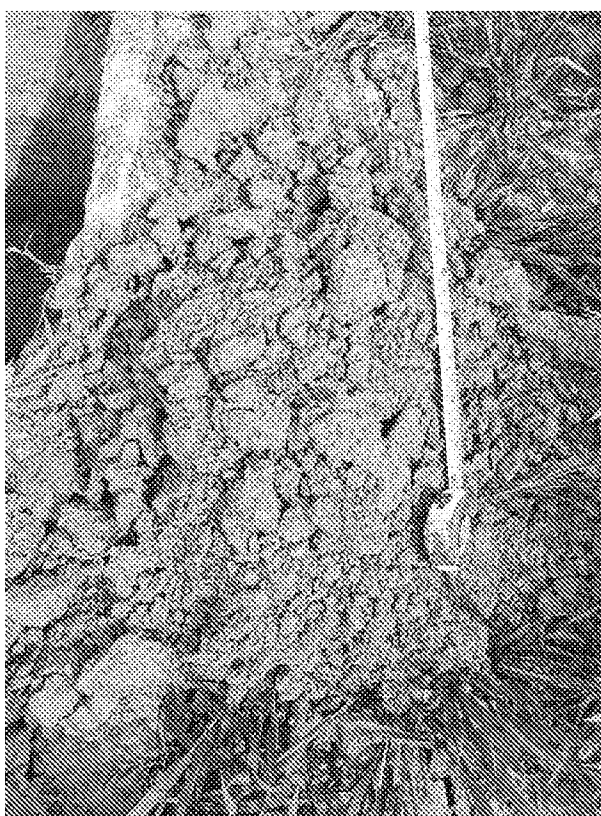
Pit 1 topsoil, upper subsoil, lower subsoil



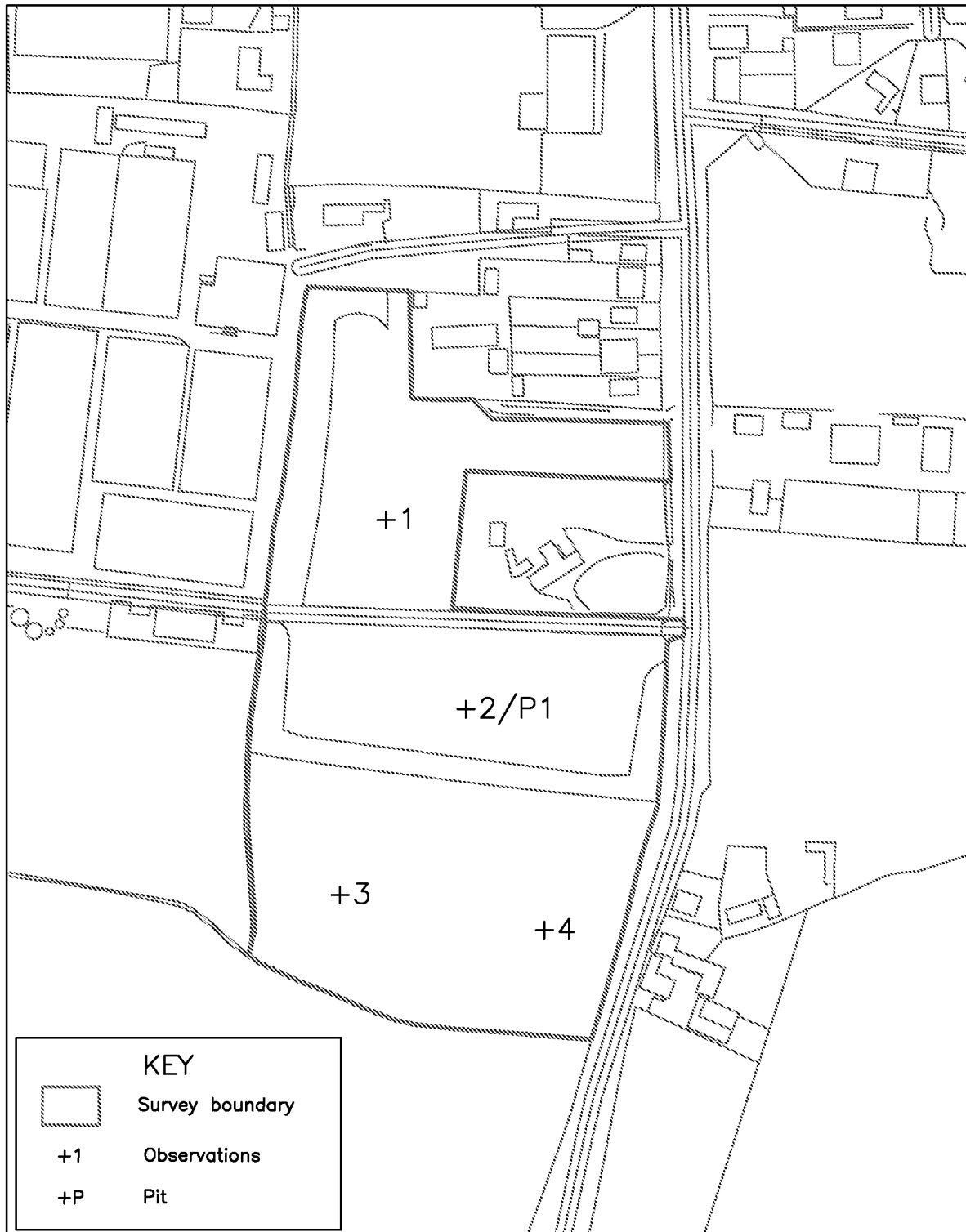
Pit 1 topsoil



Pit 1 upper subsoil

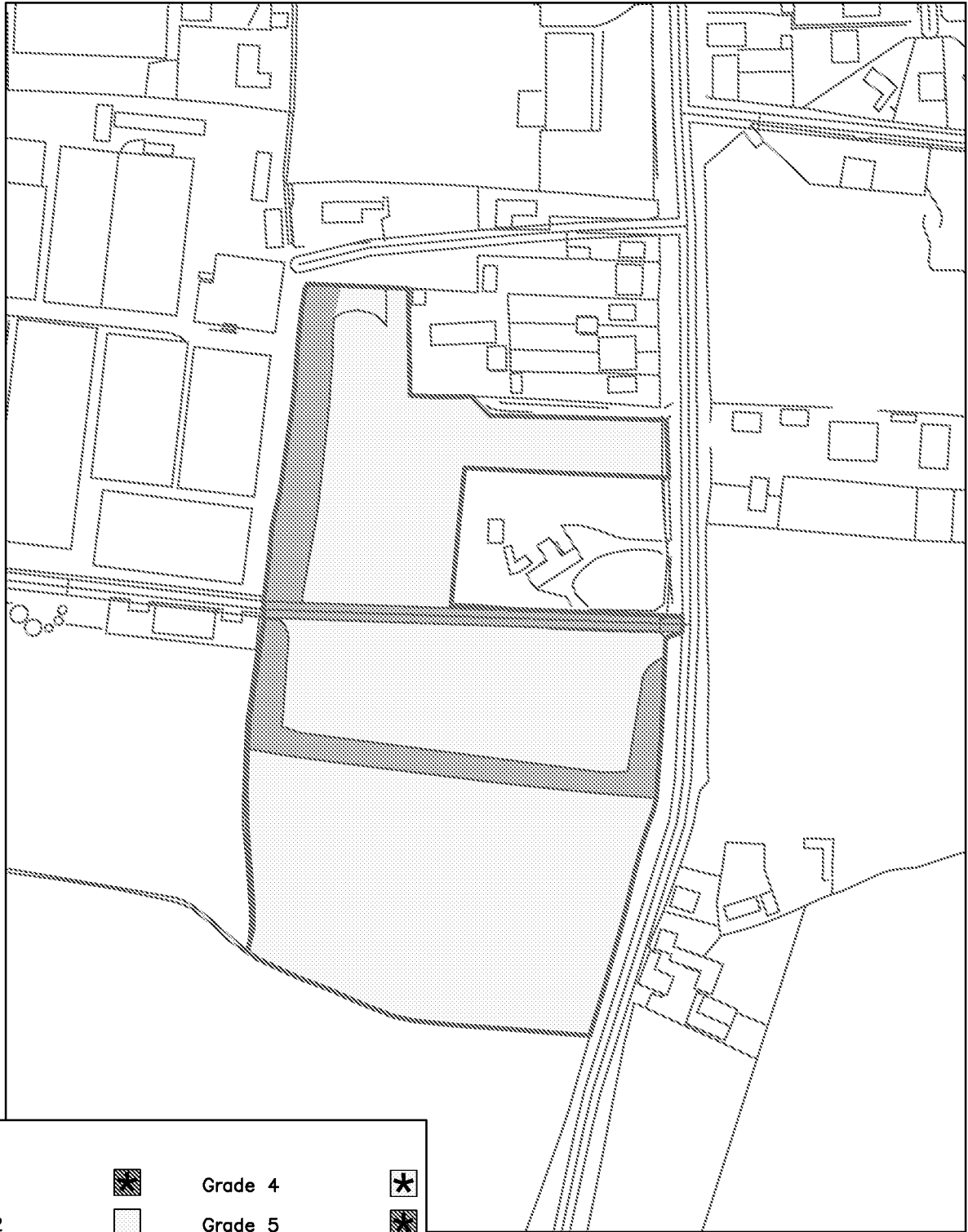


Pit 1 lower subsoil



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Contract LAND AT LIDSEY ROAD, WOODGATE, WEST SUSSEX	Drawn by AGM	Checked by AIF				
	Scales 1:2,500@A4	Date 09/2021	09/2021	Revised survey boundary	17/09/21	
			Rev.	Comment	Date	



KEY			
Grade 1		Grade 4	
Grade 2		Grade 5	
Subgrade 3a		Non-agricultural	
Subgrade 3b		Not present	



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Contract LAND AT LIDSEY ROAD, WOODGATE, WEST SUSSEX	Drawn by AGM	Checked by AIF				
	Scales 1:2,500@A4	Date 09/2021	09/2021	Revised survey boundary	17/09/21	
			Rev.	Comment	Date	