

Cambridge Waste Water Treatment Plant Relocation Project



Agricultural Land Classification
and Soil Management Plan

February 2022

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1 Introduction

1.1 Background

- 1.1.1 Anglian Water Services Limited (AWS) is seeking a Development Consent Order (DCO), from the Secretary of State for the Environment, Food and Rural Affairs to construct, operate and maintain a new wastewater treatment plant to replace its existing wastewater treatment plant (WWTP) on Cowley Road, on the outskirts of Cambridge (grid reference TL 47538 61402). The Proposed Development is categorised as a nationally significant infrastructure under Section 35 of the Planning Act 2008 in view of the need to respond to the growth of Greater Cambridge and its surrounding region.
- 1.1.2 The Proposed Development is subject to mandatory Environmental Impact Assessment (EIA) as it is listed in paragraph 13 of Schedule 1 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (hereafter ‘the EIA Regulations’).

1.2 Document purpose and scope

- 1.2.1 This document reports on a soil survey that was undertaken to examine the soil resources and determine the distribution of Agricultural Land Classification (ALC) grades across the proposed WWTP, as part of an Environmental Impact Assessment. The soil properties identified have additionally been used to devise a Soil Management Plan (SMP) for the site of the proposed WWTP to ensure sustainable soil handling. The mitigation principles discussed within the SMP are also relevant to other areas of the proposed development, where no soil survey was carried out, but careful consideration must be given when doing so as discussed in Section 5.

1.3 Legislation, policy and guidance

- 1.3.1 Planning policy and guidance relating to agricultural land and pertinent to the Proposed Development comprises the following.

Planning policy

- 1.3.2 Planning policy can influence the sensitivity of receptors (and therefore the significance of effects) and the requirements for mitigation. The policy documents listed below: (i) identify the need to retain the best and most versatile agricultural land where practical (defined in Section 1.3.2 under Agricultural Land Classification of England and Wales ⁷) (ii) identify the need to minimise soil as a waste product by reusing on site.

The National Planning Policy Framework (NPPF)¹:

1.3.3 The National Planning Policy Framework sets out planning practice guidance² (PPG) that local planning authorities may need to consider to take account of the quality of agricultural land when making planning decisions. National planning policy of relevance to agricultural land and the Proposed Development is outlined in Section 15.174 of the NPPF, whereby decisions should contribute to and enhance the natural and local environment by:

- Protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
- Recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland; and
- Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

National Policy Statement for Wastewater³

1.3.4 A statement with the following relevance to agricultural land:

- Paragraph 4.8.8: Proposed developments should seek to minimise impacts on the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification), and preferably use land in areas of poorer quality (grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations; and
- Paragraph 4.8.16: The decision maker should ensure that justification is provided where applicants site their scheme on the best and most versatile agricultural land. It should give little weight to the loss of poor-quality agricultural land (in grades 3b, 4 and 5), except in areas (such as uplands) where particular agricultural practices may

¹ The National Planning Policy Framework (2021): Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2> Last Accessed: 8th November 2021.

² National Planning Practice Guidance: Natural Environment. Accessible at: <https://www.gov.uk/guidance/natural-environment>

³ The National Policy Statement for Wastewater(2012): Available at: <https://www.gov.uk/government/publications/national-policy-statement-for-waste-water>. Last Accessed: 8th November, 2021.

themselves contribute to the quality and character of the environment or the local economy.

South Cambridgeshire Local Plan⁴

1.3.5 The local planning policy highlights the following:

- Policy NH/3 (p114): Protecting Agricultural Land. Planning permission will not be granted for development which would lead to the irreversible loss of Grades 1, 2 or 3a agricultural land unless:
 - land is allocated for development in the Local Plan
 - sustainability considerations and the need for the development are sufficient to override the need to protect the agricultural value of the land

1.3.6 Policy CC/6 (p94): Soils must be carefully managed on construction sites so as to minimise the amount generated as waste. In addition, any construction spoil reused within the development site should take account of the landscape character and avoid the creation of features alien to the topography.

Cambridge City Council Local Plan⁵

1.3.7 Policy 8 (p37) highlights the importance of the retention of best and most versatile land within the agricultural industry.

Cambridgeshire and Peterborough Minerals and Waste Local Plan 2036⁶

1.3.8 Policy 24 (p62), entitled 'Sustainable use of soils', identifies where mineral and waste development will be permitted, specifically in the context of best and most versatile land and peat.

Guidance

Natural England Technical Information Note TIN049⁷

1.3.9 This document entitled *Agricultural Land Classification: protecting the best and most versatile agricultural land* states that 'where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of higher quality'. It outlines how an ALC provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system.

⁴ South Cambridgeshire District Council, 2018. South Cambridgeshire Local Plan – Adopted 2018 (SCDC/LP/27.09.2018).

⁵ Cambridge City Council, 2018. Cambridge Local Plan 2018.

⁶ Cambridgeshire and Peterborough Minerals and Waste Local Plan 2036, Adopted 2021. Available at: <https://drive.google.com/file/d/1OS9X5d3nz4kLgVPu93pXnXuevLChZDMP/view>. Last accessed on 8th November 2021

⁷ Natural England, 2009. Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)

Agricultural Land Classification of England and Wales⁸

- 1.3.10 ALC guidelines provide the industry standard framework for classifying land with respect to developments impacting agricultural land. The following grades describe the cropping potential of land depending on certain physical and chemical properties. Best and most versatile land is classified as grades 1, 2 and 3a.
- 1.3.11 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'.
- 1.3.12 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 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'.
- 1.3.13 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'.
- 1.3.14 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'.
- 1.3.15 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'.

⁸ Ministry of Agriculture, Fisheries and Food, 1988. Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.

A Green Future: Our 25 Year Plan to Improve the Environment⁹:

- 1.3.16 A call for a more sustainable approach to methods in agriculture and land use, including improving soil health and restoring and protecting peatlands in the context of widespread soil degradation. In parallel to this, a National Policy Statement for Water Resources Infrastructure¹⁰ was published in 2018, recognising the importance of protecting soils.

Safeguarding our Soils: A Strategy for England¹¹:

- 1.3.17 A policy paper that emphasises the sustainable use of soil as a non-renewable natural resource that provides ecosystem services and is threatened by intensive agriculture, pollution and urban development.

1.3.18 UK Peatland Strategy¹²

- 1.3.19 The UK Peatland Strategy recognises the pressures that are exerted on peatlands and outlines the importance of conserving and enhancing them, restoring heavily degraded peatland to functioning, peat-forming ecosystems, applying land uses that are compatible with healthy peatlands, shifting management of drained peatlands under productive use towards wetter ways of farming, and maintaining a formal governmental supported programme to promote best practice.

England Peat Action Plan¹³

- 1.3.20 The England Peat Action Plan sets out the government's long-term vision for the management, protection and restoration of our peatlands, so that they provide a wide range of benefits to wildlife, people and the planet. Of relevance, the Planning & Development section takes account of the importance of including peatland in planning policies.

Construction Code of Practice for the sustainable Use of Soils on Construction Sites¹⁴

- 1.3.21 This Code of Practice for the sustainable use of soil on construction sites is a practical guide to assist those involved in the construction industry to protect the soil resources with which they work.

⁹ HM Government., 2018. Green Future: Our 25 Year Plan to Improve the Environment.

¹⁰ Department for the Environment, Food and Rural Affairs, 2018. Draft National Policy Statement for Water Resources Infrastructure.

¹¹ Department for Environment, Food and Rural Affairs, 2009. Safeguarding our Soils: A Strategy for England.

¹² IUCN National Committee United Kingdom, 2018. UK Peatland Strategy.

¹³ UK Government, 2021. England Peat Action Plan.

¹⁴ Department for Environment, Food and Rural Affairs, 2009. Construction Code of Practice for the sustainable Use of Soils on Construction Sites

1.3.22 Below is a summary of the key messages of the code:

- Conduct a soil resource survey (for the land required for the construction of the proposed WWTP and Landscape Masterplan this has been incorporated into an ALC survey) prior to construction;
- Stay informed on waste regulations;
- Consider the use of sustainable drainage systems on site as these can provide more long-term protection of soils beyond the construction phase, by facilitating the infiltration and attenuation of surface water;
- Prepare a Soil Resource Plan showing the areas and type of topsoil and subsoil to be stripped, haul routes, the methods to be used, and the location, type and management of each soil stockpile;
- When stripping, stockpiling or placing soil, do so in the driest condition possible and use tracked equipment where possible to reduce compaction;
- Confine traffic movement to designated routes;
- Keep soil storage periods as short as possible;
- Clearly define stockpiles of different soil materials;
- Ensure that the entire soil profile is in a condition to promote sufficient aeration, drainage and root growth; and
- Safeguard and utilise on-site soil resources where possible. If importing soils, use a reputable supplier, establish the source of the soil and ensure it is suitable for the intended use.

British Standards

1.3.23 The following standards provide guidance on the handling of soils during construction:

- BS 3882 Specification for topsoil¹⁵
 - This British Standard specifies requirements for the classification, composition and use of topsoils that are moved or traded for creating soil profiles intended to support plant growth.
- BS 8601 Specification for subsoil and requirements for use¹⁶
 - This British Standard specifies requirements for the classification, composition and use of subsoils that are moved or traded for creating soil profiles intended to support plant growth.

¹⁵ British Standards Institution, 2013. BS 3882: Specification for topsoil

¹⁶ British Standards Institution, 2015. BS 8601: Specification for subsoil and requirements for use

CL:AIRE¹⁷

- 1.3.24 The CL:AIRE Definition of Waste: Development Industry Code of Practice (2008) outlines the process required to determine if site-won materials are to be considered as waste. Notably, where natural stripped soils are scheduled to be reinstated within the project area (use on site of origin), these are not considered a waste. If the site is a brownfield site, the quality of soils on site must be established and only if contamination has been discounted can those naturally occurring materials be considered for direct transfer and use.

¹⁷ Contaminated Land: Application in Real Environments (CL:AIRE) (2008). *Definition of Waste: Development Industry Code of Practice*.

2 Baseline information

2.1 Survey location

- 2.1.1 The Client provided direction to conduct the ALC survey in the proposed WWTP, but not the Transfers Zone and Waterbeach Zone. The ALC survey was undertaken on an area of approximately 100ha in the proposed WWTP, to the north of the A14 between Fen Ditton and Horningsea (Appendix A.1, drawing 409071-MMD-00-XX-GIS-Y-0813). Ten fields were surveyed, and labelled G036-1, G036-10, R037-1, R037-2, R037-3, R037-4, R037-5, Y039-1, Y039-2 and Y039-4 (Appendix A.1, drawing 409071-MMD-00-XX-GIS-Y-0813).

2.2 Land use and topography

- 2.2.1 Aerial imagery and preliminary site visit information indicate that land use in the proposed WWTP predominantly comprises arable land. While undertaking the ALC survey, winter wheat was identified in the fields in the west of the proposed WWTP and oilseed rape and beans in the east. We determined the slope of the land to be negligible, ranging between 0 – 1 degree.

2.3 Geology

- 2.3.1 Site geology influences soil formation and the various soil types found in specific regions. It should therefore be considered to aid assessment of design options, soil surveys, and soil management planning during construction activities. British Geological Survey (BGS) mapping¹⁸ was consulted to identify superficial and bedrock geology over the survey area prior to an intrusive survey.

Superficial geology

- 2.3.2 There is no recorded superficial geology for the site, as per the Geology of Britain viewer¹⁸. However, a strip of peat is recorded within 800m east of the proposed WWTP. River terrace deposits (sand and gravel sediment) are recorded within 1km south of the proposed WWTP.

Bedrock geology

- 2.3.3 The underlying bedrock on site is recorded as West Melbury Marly Chalk Formation. This is a buff, grey and off-white, soft, marly chalk and hard grey limestone arranged in couplets.

2.4 Soil resources

Soil Associations

- 2.4.1 National soil association mapping¹⁹ suggests that the soils in the proposed WWTP comprise the two soil associations, Wantage 2 (North-Western area) and Swaffham Prior (Central and Eastern areas). They are described as follows:
- Wantage 2: Shallow well-drained calcareous silty soils over argillaceous chalk. Sometimes affected by groundwater. Deeper well-drained coarse loamy soils in places. Complex soil patterns locally.

- Swaffham Prior: Well-drained calcareous coarse and fine loamy soils over chalk drift or rubble. Some similar shallow soils. Deep non-calcareous loamy soils in places. Striped and polygonal soil patterns locally.

2.5 Provisional and previous Agricultural Land Classification

- 2.5.1 Provisional ALC data²⁰ were initially consulted to establish a baseline understanding of the quality of agricultural land likely to be impacted by the proposed development. ALC grades are defined in section 1.3. Section 0 reports the results of the ALC survey subsequent to this baseline study and the results are mapped in Appendix A.3.
- 2.5.2 Provisional data from the Magic Map²¹ application suggests that the land required for the construction of the proposed WWTP and Landscape Masterplan comprises Grade 2 agricultural land. In concurrence, the Natural England map for the 'Likelihood of Best and Most Versatile (BMV) Agricultural Land' (Map Reference: NE170809-1016-779²²) indicates that there is a high likelihood of BMV land on the survey site (i.e. >60% of the area is BMV land).
- 2.5.3 No previous ALC survey data were available for consultation.

2.6 Climatological data and flooding

- 2.6.1 Climatological data and flood risk are important physical factors that influence Agricultural Land Classification.

¹⁸ British Geological Survey © UKRI: The Geology of Britain viewer (accessed 15th November 2021)

¹⁹ Cranfield University 2021. The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. Last accessed 25/11/2021

²⁰ Natural England (2020). Provisional Agricultural Land Classification (ALC) digitised GIS dataset.

²¹ Department for Environment, Food and Rural Affairs (Defra) (accessed 2nd December 2021). Magic Map Application.

²² Natural England, 2017. Available at: <http://publications.naturalengland.org.uk/file/4775489878622208>. (accessed 2nd December 2021)

Climatological data

2.6.2 Climate exerts influence on soil formation, soil properties and the agricultural potential of the land. Table 1 displays the climatological data for the site centred around grid reference TL 495 609 as recorded by the Met Office²³. Field capacity days are 96, which are low (less than 225) and indicate that the land may not be prone to waterlogging. Average rainfall is lower than the UK average recorded by the Met Office²⁴. The accumulated temperature above 0°C (January to June) (AT0) is higher than 1125 day-degrees and can therefore be considered warm enough for sustained cereal production²⁵.

Table 1. Climatological data for proposed WWTP

Variable	Measurement
National Grid Reference	TL 495 609
Altitude (m)	8
Average annual rainfall (mm)	570
Lapse rate for average annual rainfall (LAAR) (mm/m)	0.4
Average summer rainfall (April to September) (mm)	300
Accumulated temperature above 0° C (January to June)	1458
Accumulated temperature above 0° C (April to September)	2460
Moisture deficit for winter wheat (mm)	121
Moisture deficit for potatoes (mm)	117
Field capacity days	96

Flood risk

2.6.3 The Environment Agency's Flood Map for Planning²⁶ was used to identify flood zones. Flood risk is relevant because soils function as water stores for flood attenuation. The requirement for contractors to monitor and manage flood risk may affect soil resources during construction. Flood zones were reported with the following designations:

- Flood Zone 1 – less than 1 in 1,000 annual probability of river flooding.
- Flood Zone 2 – between a 1 in 100 and 1 in 1,000 annual probability of river flooding.
- Flood Zone 3 – 1 in 100 or greater annual probability of river flooding.

²³ Met Office. Available at: [UK climate averages - Met Office](#) (accessed 2nd December 2021)

²⁴ Met Office. Available at: [UK climate averages - Met Office](#) (accessed 2nd December 2021)

²⁵ Hallet and Jones, 1992. Compilation of an accumulated temperature database for use in an environmental information system. Agricultural and Forest Meteorology.

²⁶ Environment Agency, Flood map for planning. Available at: <https://flood-map-for-planning.service.gov.uk/confirm-location?easting=546290&northing=257473&placeOrPostcode=cambridge>. (Accessed on 30th November 2021).

- 2.6.4 The area of land required for the construction of the proposed WWTP and Landscape Masterplan is located in flood zone 1, with less than 1 in 1,000 annual probability of river flooding.

3 Survey methodology

- 3.1.1 The intrusive Soil Survey were undertaken between 22nd and 26th November 2021 by suitably qualified Mott MacDonald Soil Scientists. Within this, the purpose of the ALC survey was to determine the grade of the agricultural land, whilst the aim of soil sampling to obtain samples for laboratory analysis for nutrient and organic matter levels.
- 3.1.2 The ALC survey was undertaken in accordance with the 'Agricultural Land Classification of England and Wales'²⁷ and the Soil Survey Handbook²⁸. Edelman (Dutch) hand augers were used to take cores to a depth of 120cm or bedrock, whichever was shallower. The cores were distributed across the survey site in a grid formation every 100m, satisfying and exceeding the requirement for 1 auger bore per hectare (Appendix A.1, drawing 409071-MMD-00-XX-GIS-Y-0813). The auger points were positioned using a handheld GPS with a pre-loaded survey boundary and auger bore locations. Two soil pits were also included to further examine the soil profile and structure. To avoid buried services, Cable Avoidance Tool and Generator (CAT and Genny) equipment was used to scan auger locations and a buried service plan was consulted. The ALC survey comprised an assessment for soil horizon depth, texture, mottling, stoniness, structure, ped strength, carbonate content, slope and presence of roots. Soil calcareousness was determined by the addition of hydrochloric acid (10%). Soil colour was classified according to a Munsell Soil Colour Chart²⁹.
- 3.1.3 Soil sampling of topsoil and subsoil was undertaken in accordance with the guidelines outlined in Natural England Technical Information Note TIN035³⁰. Soil samples were taken from each field in clean polythene bags. These comprised 25 cores bulked together to give a single sample (500 g). A soil sampler was used to take the 25 topsoil cores (to a depth of ~25cm) and the 25 subsoil cores (~25 – 50cm), distributed in a W pattern across the field. The soil samples were tested by NRM Laboratories (UK) for pH, available phosphorus (P), potassium (K) and magnesium (Mg), and organic matter. The results were interpreted as per Natural England TIN036³¹ and British Standard guidance^{15 16}.

²⁷ Ministry of Agriculture, Fisheries and Food, 1988. Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.

²⁸ Hodgson, J. M (1997). The Soil Survey Handbook: Describing and Sampling Soil Profiles

²⁹ Munsell Colour (2010). Munsell soil colour charts: with genuine Munsell colour chips.

³⁰ Natural England, 2008. Technical Information Note TIN035; Soil sampling for habitat recreation and restoration.

³¹ Natural England (2008). Soils and agri-environment schemes: interpretation of soil analysis TIN036

4 Survey results

4.1 Soil resources

Main soil types

- 4.1.1 The soils are generally well drained, calcareous soils with few to common flints at various depths. Three major soil types were identified in the survey (Appendix A.4). Soil type 1 is shallow, very calcareous loam over chalk, chalk rubble or chalk drift (Figure 1). Soil type 2 is very calcareous deep loam (Figure 2). Soil type 3 is very calcareous deep soil with loam over loamy sand or sand (Figure 3). The soils over the proposed WWTP vary within distance. Figure 4 indicates the frequent variation and complex pattern of the soils. Detailed auger borehole data are in Appendix A.2.



Figure 1. Soil Type 1 – Shallow calcareous loam



Figure 2. Soil Type 2 – Deep calcareous loam



Figure 3. Soil Type 3 – Calcareous loam over loamy sand or sand



Figure 4. Soil pattern

Soil Nutrients

4.1.2 The results of laboratory soil nutrient analyses are displayed in Table 2 (and attached in Appendix A.13) and interpreted following Natural England TIN036³¹ and British Standard guidance^{15 16}. Most soils are classified as low fertility calcareous soils as per British Standard guidance^{15 16} for soils with <5% soil organic matter, <20mg P/L, >20% clay, and a pH>7. The distribution of specific nutrients phosphorous (P), potassium (K) and Magnesium (Mg) is shown in Appendices A.5 – 0. Topsoil P levels are mostly low, with one field having very low levels and two fields having moderate levels. Most subsoil P levels are very low, with two fields having low levels. Topsoil K levels are mostly moderate, whilst subsoil levels are mostly low. Topsoil Mg levels range from low to moderate, whilst subsoil Mg is low. The low nutrient levels and fertility of the proposed WWTP soil is ideal for the establishment of biodiverse habitats, which are commonly associated with low available P levels. Field R037-2 is an exception with moderate P levels and is therefore categorised as multipurpose soil, which may not be suitable for biodiverse habitats.

Table 2. Soil nutrient levels.

Field	Soil Layer	pH	Organic matter (LOI %)	Phosphorous (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Description
G036-10	Topsoil	8.2	3.6	10.8 (L)*	126 (M)	35 (L)	Low fertility calcareous soil
	Subsoil	8.2	3.4	8.6 (VL)*	118 (L)	35 (L)	
G036-1	Topsoil	8.1	4.8	11.2 (L)*	81 (L)	38 (L)	
	Subsoil	8.4	3.0	7.0 (VL)*	48 (L)	26 (L)	
R037-1	Topsoil	8	3.3	13.6 (L)*	137 (M)	41 (L)	

Field	Soil Layer	pH	Organic matter (LOI %)	Phosphorus (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Description
	Subsoil	8.1	2.7	7.4 (VL)*	112 (L)	34 (L)	
R037-2	Topsoil	8.2	3.1	20.8 (M)*	156 (M)	43 (L)	Multipurpose soil
	Subsoil	8.3	2.6	6.4 (VL)*	77 (L)	37 (L)	
R037-3	Topsoil	8	3.6	12 (L)*	149 (M)	52 (M)	
	Subsoil	7.7	2.8	7.4 (VL)*	113 (L)	43 (L)	
R037-4	Topsoil	8	3.3	11 (L)*	149 (M)	54 (M)	
	Subsoil	8.2	3	9.8 (L)*	132 (M)	49 (L)	
R037-5	Topsoil	8.2	3.1	19.8 (M)*	205 (M)	44 (L)	
	Subsoil	8.4	2.6	9.6 (L)*	145 (M)	38 (L)	
Y039-2	Topsoil	8	3.8	8.4 (VL)*	134 (M)	42 (L)	
	Subsoil	7.7	3.5	6.6 (VL)*	92 (L)	40 (L)	
Y039-4	Topsoil	8	5.7	13.8 (L)*	120 (L)	46 (L)	
	Subsoil	8.1	4.9	9.4 (VL)*	96 (L)	43 (L)	
Y039-1	Topsoil	7.5	3.9	13 (L)*	140 (M)	51 (M)	
	Subsoil	7.3	3.4	8 (VL)*	106 (L)	50 (L)	

*VL, Very Low; L, Low; M, Moderate as classified by Natural England TIN036

Soil volumes

4.1.3 Table 3 summarises the average thickness of topsoil and subsoils for each field on-site and provides an estimate of approximate soil volumes likely to be generated by soil stripping (rounded to the nearest 500 m³). The thickness of each horizon was estimated thanks to the soil texture descriptions of each borehole as per Appendix A.2 and reported in Table 4 and Appendix A.4.

Table 3. Average soil thickness and approximate volumes

Field	Area (m ²)	Average horizon thickness (cm)			Approximate volume (m ³)		
		Topsoil	Upper subsoil	Lower subsoil	Topsoil	Upper subsoil	Lower subsoil
G036-1	14,000	32	36	52	4,500	5,000	7,500
G036-10	48,300	38	27	45	18,500	13,000	22,000
R037-1	119,500	28	24	53	33,500	29,000	63,000
R037-2	225,800	37	34	40	84,000	78,000	90,500
R037-3	158,800	32	34	42	50,500	54,000	67,000

Field	Area (m ²)	Average horizon thickness (cm)			Approximate volume (m ³)		
		Topsoil	Upper subsoil	Lower subsoil	Topsoil	Upper subsoil	Lower subsoil
R037-4	177,400	28	34	44	49,000	60,500	78,000
R037-5	21,400	27	27	67	5,500	5,500	14,500
Y039-1	116,500	34	36	41	39,500	41,500	48,000
Y039-2	94,200	34	37	38	32,000	34,500	35,500
Y039-4	16,000	30	30	60	5,000	5,000	9,500

Table 4. Average soil layer thickness per soil type

Soil type	Average horizon thickness (cm)		
	Topsoil	Upper subsoil	Lower subsoil
Type 1	28	21	24
Type 2	27	22	48
Type 3	27	25	47

4.2 Agricultural Land Classification

Climatic limitations

- 4.2.1 Climate does not pose a significant limiting factor on crop production, as demonstrated by the accumulated temperature of 2460°C above 0°C and 570mm of average annual rainfall (Table 1) on the site. Therefore, the land is considered Grade 1 for climatic limitation.

Gradient and microrelief

- 4.2.2 The site gradient is generally level between 0 – 1 degrees with only a few very gentle slopes in fields R037-5, R037-4 and Y039-1. As such, gradient and microrelief are not considered to represent limiting factors.

Flooding

- 4.2.3 The Environment Agency's 'Flood Map for Planning'²⁶ indicates that some areas of land within the proposed WWTP are within flood zone 1 with a 'less than 1 in 1,000 annual probability of river or sea flooding' (Section 0). The flooding risks over the summer and winter fall into the very rare category (not more than once in 15 years). This does not represent a site limitation.

Soil texture and structure

- 4.2.4 As stated in Section 0 and soil textures in soil profile characteristics Appendix A.2, the soils of the site generally comprise very calcareous loamy topsoils with few to common hard stones over either loamy subsoils, greyish chalk, chalk rubble, or occasionally loamy sand or sand. The soils are well drained with few mottles in lower subsoils or chalk and have a moderate structure overall. No slowly permeable layers were observed in soil profiles. This indicates that in general, there is no soil texture and structure limitation.

Soil depth and stoniness

- 4.2.5 Soil depth on the site generally reaches 1.2 m, or around 39 – 115cm when the soils occur over chalk or chalk rubble. The flints and pebbles from topsoils are lightly or very lightly stony. These give a depth Grade of 1 – 3a, and a stoniness Grade of 1 – 2, but these Grades are overridden by other Grades of other factors.

Chemical limitations

- 4.2.6 No evidence of long-term agricultural limitations caused by soil chemical properties was observed on-site. As such, there are no chemical limitations considered to impact the ALC Grade.

Erosion

- 4.2.7 No evidence of soil erosion was observed during the survey, and therefore erosion is not considered an agricultural limitation.

Interactive limitations

- 4.2.8 Soil wetness and droughtiness were assessed to examine limitations from climate, site and soils data collected during the ALC survey for each auger borehole. These are included within Appendix A.2. The calculation indicates that the wetness Grades of the soils is 1 and 2, and droughtiness is Grades 2, 3a and 3b (Appendix A.2).

ALC Grades

- 4.2.9 Considering all factors and Grades assessed in Section 0, soil droughtiness appears to be the major deciding factor on overall ALC Grade for the soils within the surveyed area. The ALC of the proposed WWTP falls under Grades 2, 3a and 3b.
- 4.2.10 The area and distribution of overall ALC Grades in the surveyed area (100 ha) are displayed in Appendix A.3 and are summarised as follows:
- Grade 2 (very good quality agricultural land): 30 ha, 30% of the surveyed area of the area of land required for the Proposed WWTP.
 - Grade 3a (good to moderate quality agricultural land): 50 ha, 50% of the surveyed area of the area of land required for the Proposed WWTP.
 - Grade 3b (moderate quality agricultural land): 20 ha, 20% of the surveyed area of the area of land required for the Proposed WWTP.

5 Soil Management Plan

- 5.1.1 Soil is a non-renewable natural resource and invaluable national asset. Mishandling of soils may have consequences for soil quality and eventual suitability for soil end-use by exacerbating erosion, run-off, compaction and contamination. A soil management plan (SMP) is required to minimise damage to the soils during and after construction of the proposed WWTP, associated earthwork banks and structures.
- 5.1.2 While the SMP guidance can be interpreted in conjunction with the baseline information provided by the ALC survey for the proposed WWTP and landscaping proposal, Soil Resource Surveys (SRS) were scoped out for areas of temporary land-take (Waterbeach pipeline, final effluent transfer and the areas required for launch and recovering shafts for transfer pipeline installation). In these temporarily impacted areas, the soil mitigation measures outlined in the SMP may be applied, provided that a soil specialist is present on-site to monitor key soil management stages, or that a soil specialist has delivered appropriate training to the Contractor prior to the commencement of works.
- 5.1.3 The guidance within this SMP concerns soils up to a depth of 1.2 m. It is given in line with industry best practice ('The Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' - Defra 2009, BS 3882 Specification for topsoil, BS 8601 Specification for subsoil), and is designed to ensure that soil structure and overall quality does not unduly deteriorate during construction, thereby remaining suitable for eventual reinstatement or reuse. The SMP includes:
- Approximations of potentially available soil volumes.
 - Descriptions of suitable guidance for the handling of soils including stripping, storage, reconditioning, reinstatement and record keeping.
 - An outline of the required aftercare and monitoring programmes for ensuring the continuation of soil resource suitability following the construction of the proposed development.

5.2 Pre-construction planning

- 5.2.1 Table 5 outlines the planning operations that have been undertaken ahead of construction.

Table 5. Pre-construction planning operations

Operation	Details
Agricultural Land Classification survey	An ALC survey was undertaken within the proposed WWTP (Appendix A.1, drawing 409071-MMD-00-XX-GIS-Y-0813) by suitably qualified and experienced Mott MacDonald Soil Scientists between 22nd and 26th November 2021. The purpose was to identify and quantify specific soil properties to calculate the quality of the land for agriculture and inform decisions on development and construction.
Baseline Survey	A desk-based study was undertaken for information ahead of the ALC survey and to support results from the survey. Informed by open-access

Operation	Details
	data, the study established anticipated geology, and soil associations, climate, flood risk and predicted ALC grades.
Soil Management Plan	This document reports upon the soil properties identified in the ALC survey and provides both general principles and site-specific soil management guidance to be consulted throughout all construction phases and during the reinstatement of displaced soils. As the report precedes the finalisation of scheme design, such soil management information should be treated flexibly and updated once plans are finalised.
Appropriate and regular liaison arrangements	Throughout the planning and execution stages of the ALC survey, regular contact has been made between the Soil Scientists and the Contractor. Upon construction, it will be crucial to ensure that regular contact continues. This is to guarantee the sharing of up-to-date site information, including earthwork, stockpiling and haul route design.
Operation Checklist	An operation checklist has been produced to guide all stages of soil handling. Please refer to Appendix A.1, A.11 for a copy of the Operation Checklist, which includes key audit agendas regarding: (1) pre-development (2) soil resource planning (3) topsoil stripping (4) subsoil stripping (5) soil stockpiling (6) soil placement (7) sourcing and importing soil (8) topsoil manufacture (9) soil aftercare (10) uses for surplus soil.

5.3 Soil handling constraints

- 5.3.1 The term 'handling' refers to all stages of the construction process including stripping, storage and reinstatement. Handling of site soils to a depth of 1.2m, should be conducted in accordance with Defra (2009³²) guidance. It is understood that soil resources removed from below this depth will be handled in accordance with Series 600 Earthworks – Standards for Highways³². It is also understood that subsoils within the proposed WWTP site that are to be used to construct the bund, will be mixed with subsoils excavated from below 1.2m and as such will also be handled in accordance with the same earthworks standard.
- 5.3.2 To ensure that soil quality is retained, soils should be handled in appropriate weather conditions, with suitable soil moisture and consistency. More specifically, handling soils in a sufficiently dry and friable state ensures that compaction and smearing are reduced, both of which may result in the deterioration of overall soil quality. These considerations are particularly relevant to this site as it predominantly comprises of medium-textured loams, which are susceptible to structural damage when handled at high moisture content or when plastic.

Appropriate weather and ground conditions

- 5.3.3 Work must be suspended if sustained heavy rainfall (e.g., >10mm in 24 hours) occurs during soil stripping, stockpiling or placement operations. It cannot be restarted until the ground has had at least a full dry day or a recognised soil consistency test has been used to establish handling suitability.
- 5.3.4 It is recommended that handling is not undertaken when: (1) rain – however heavy – has persisted for more than 15 minutes; (2) there is heavy rain (i.e., slow-moving depressions or intense showers); (3) there are other forms of heavy precipitation (e.g., hail, snow) for a spell. In these instances, following the end of precipitation, soil must be demonstrated to pass a field test for consistency before it may be handled again.
- 5.3.5 Soils should not be handled when soils are waterlogged, frozen or covered by snow, nor if pools of water are present.

5.4 Soil stripping

- 5.4.1 It is recommended that suitable tracked/low ground pressure vehicles are used throughout stripping and haulage to reduce structural damage through compaction. More specifically, it is recommended that soil strip is undertaken using a bulldozer, loading using a 360° excavator, haulage using articulated dump-trucks and that a sequential system of bed stripping is adopted as depicted in Figure 5.

³² Manual of contract documents for highway works. Volume 1 Specification for highway works. Amended 2016.

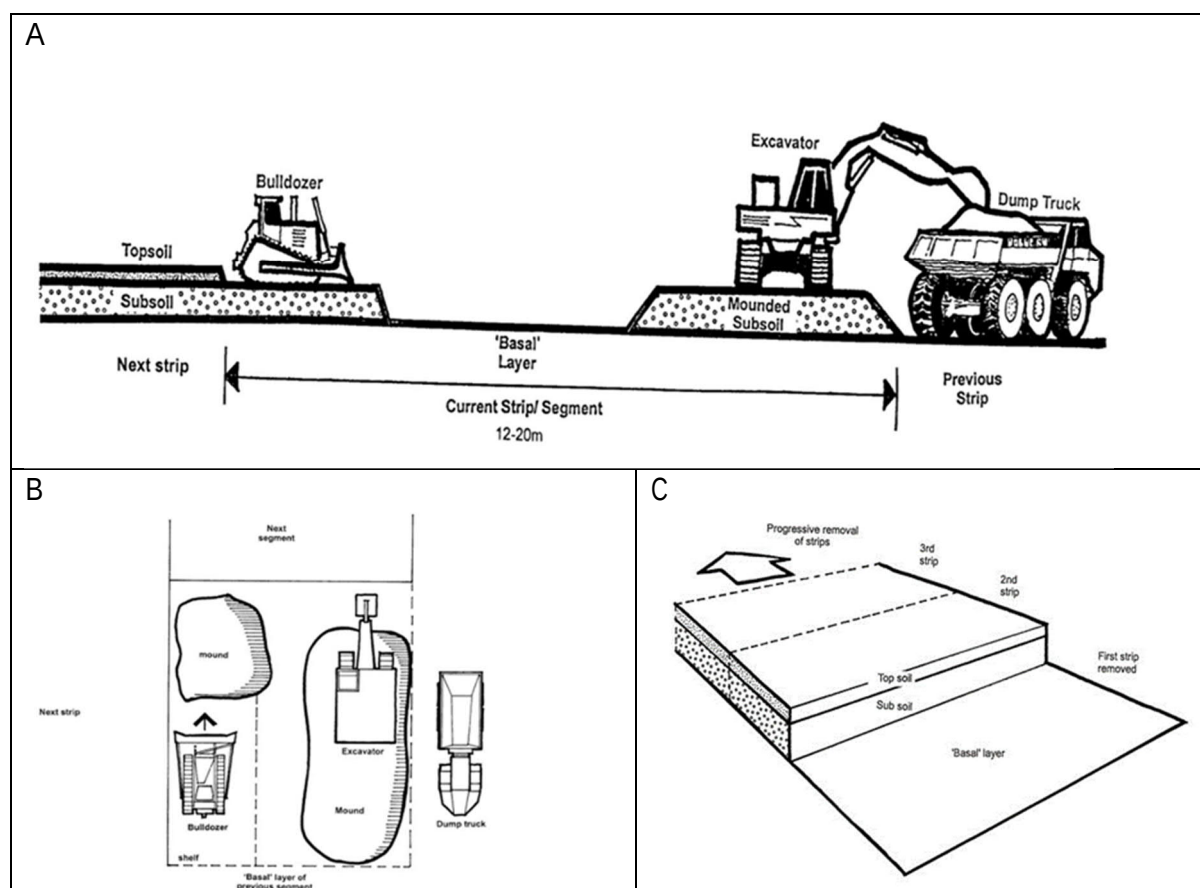


Figure 5. Topsoil and subsoil vehicle use (A) stripping bulldozer, (B) 360° excavator and articulated dump-truck, and (C) the sequential bed stripping

Topsoil stripping

- 5.4.2 Topsoil should be stripped from all areas that will be disturbed by earthworks, construction and storage. Areas designated as haul routes and access tracks must be stripped of topsoil to avoid compaction and should be designed to ensure that vehicles do not traverse surrounding soils (e.g., tracks may be designed to accommodate two passing vehicles, or a one-way system may be implemented).
- 5.4.3 Topsoil should be stripped to its maximum depth (as set out for each soil type in Section 0) and no deeper.
- 5.4.4 The following should be adhered to at all times during the construction process:
- Vegetation should be cleared prior to stripping to ensure that it is not incorporated within stockpiled soils. If herbicide is to be used, this should be undertaken at least two weeks prior to the commencement of stripping operations.
 - Stripping should be undertaken during the driest possible conditions.
 - Soils that are stripped with comparatively wetter profiles or horizons (in a plastic state) should be stockpiled separately to allow for subsequent reconditioning prior to reinstatement.

- Soil stripping should be stopped during or directly after heavy rain, or when water is pooled on the surface (please refer to Section 0 for soil handling constraints with regard to weather conditions).
- Where identified as being required, stripping should be conducted in the presence of an archaeological watching brief as part of the archaeological investigation mitigation strategy.
- Where possible, tracked equipment should be used to reduce compaction.
- Vehicles required for stripping and haulage should stay on the designated routes to avoid additional compaction.
- Wheeled vehicles should be kept off topsoil where possible.
- Dust generation should be kept to a minimum to avoid air pollution.
- Topsoil should not be stripped below the specified depths, as detailed in Section 0, as this would reduce topsoil fertility and overall quality.
- Topsoil with different textures (e.g., clay loam) should be handled separately.
- The stripping operation should be supervised and monitored at all times.
- Excavators, bulldozers, towed earth scrapers, self-propelled scrapers and dump trucks may be used for stripping, which should be undertaken in line with the process from the 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' ¹⁴ as outlined in Figure 5. Topsoil and subsoil vehicle use (A) stripping bulldozer, (B) 360° excavator and articulated dump-truck, and (C) the sequential bed stripping .

Subsoil stripping

- 5.4.5 If subsoils are to be stripped and reinstated post construction, this must be done after the stripping of topsoils to their maximum depth. During subsoil stripping, the following list should be adhered to at all times:
- Stripping should be undertaken during the driest possible weather conditions to avoid excessive subsoil wetting.
 - Upper and lower subsoil should be stripped separately.
 - Soils stripped with comparatively wetter horizons (plastic) should be stockpiled separately where applicable to allow for subsequent reconditioning prior to reinstatement.
 - Where possible, tracked equipment should be used to reduce compaction.
 - Dust generation should be kept to a minimum to avoid air pollution when subsoils are dry.
 - Soil stripping should be stopped during or directly after heavy rain, or when water is pooled on the surface (please refer to Section 0 for soil handling constraints with regard to weather conditions).
 - Subsoils should not be stripped below the specified depths, as detailed in Section 0.

- Subsoil with different textures (e.g. clay loam) should be handled separately.
- 5.4.6 Low fertility soils and multipurpose soils should be stockpiled separately (as per Table 2).
- 5.4.7 Vehicles required for stripping and haulage should stay on the designated haul routes to avoid additional compaction.

5.5 Soil stockpiling

- 5.5.1 To ensure suitability for reinstatement, it is imperative that soils are stockpiled in a sustainable manner to limit degradation from weather and construction activities and minimise occupation of surface area.

Stockpile Storage Location

- 5.5.2 Stockpile construction should where possible take place on dry, flat ground, avoiding hollows. It should be away from tree crowns, ditches, watercourses, boreholes or other areas where they might disturb local surface drainage. Vegetation and waste must be cleared from the intended locations prior to stripping operations, although it may be preferable to retain vegetation surrounding nearby ditches and watercourses or to establish grass buffer strips following stockpiling, to minimise drainage disturbances.
- 5.5.3 Stripped soils should be stored according to type (i.e., topsoil, subsoil), texture (i.e., clay loams, sandy loams) and locally where possible. This will help to avoid the mixing of different soil types or soils from different fields/farms and reduce the potential of avoidable structural damage resulting from unnecessary double-handling and excessive trafficking.
- 5.5.4 If it is necessary to store soil significant distances from where it will be reinstated, it is paramount that guidance relating to soil transport is followed to minimise soil degradation associated with such situations. This particularly relates to ensuring that soils are dry and non-plastic before loading and transporting them.

Stockpile formation

- 5.5.5 Topsoils, upper subsoils and lower subsoils should be segregated when forming stockpiles to ensure suitability for appropriate soil horizon reinstatement or reuse. Furthermore, soil textures should be segregated when forming stockpiles. Where it is necessary to store topsoil and subsoil stockpiles in close proximity whereby there is a risk of mixing, a distinctive geotextile, straw or similarly non-detrimental material should be used for segregation.

5.5.6 The size and height of stockpiles should be based on soil moisture status and consistency (plasticity) as per the 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' ¹⁴. Appropriate stockpile heights normally adhere to the following:

- 3 – 4m for topsoil in a dry state but can be higher where stockpile space is limited.
- Subsoil in a dry state may be higher than topsoil.
- If it is inevitable for wet soils to be stockpiled, the height should not exceed 2m as outlined in 'Method 2' below.

5.5.7 Although soils have a natural angle of repose of up to 40°, the maximum angle to ensure stockpile stability should be less than that. For stockpiles that are stored for long periods (e.g., more than 6 months), they should be stored at 25°, with the added recommendation that they are grass seeded.

- **Method 1: stockpile formation on dry non-plastic soils**

The excavated soils contained within dump trucks should be tipped in heaps as demonstrated in Figure 6a. This should be undertaken in order, starting with the furthest end of the stockpile site from the access entrance. After designated stockpile areas are filled with soil heaps, tracked excavators or dozers may start to level and firm soil heaps, as demonstrated in Figure 6b and 1c. Following this, the sequence may be repeated as depicted in Figure 6d and 1e. When stockpiles reach their planned height and size, a tracked vehicle should firm soils and shape and smooth sides to the planned slope angle.

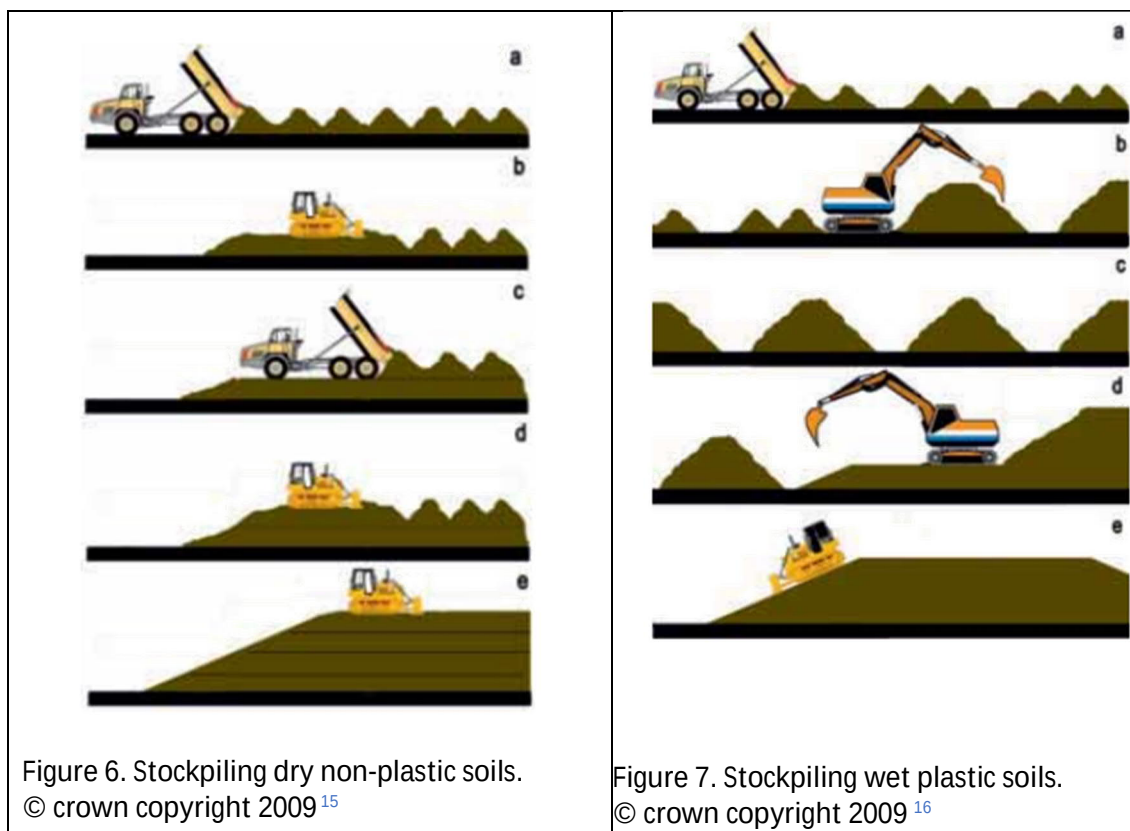
- **Method 2: stockpile formation on wet, plastic soils**

It is not advised to stockpile wet soils as the soil is easily compacted by the weight of the soil above it. However, in unavoidable circumstances, the soils should be placed into windrows (Figure 6) of no more than 2m in height to minimise compaction and maximise the surface area for drying. When dry, the soil may be re-turned to dry further before gathering into higher stockpiles.

Excavated soils from dump trucks should be tipped in heaps to form 'windrows', as depicted in Figure 7a. This should be undertaken in order, beginning with the furthest end of the stockpile to the access entrance. Space between 'windrows' should be sufficient for tracked vehicles to work between them to form larger 'windrows', which may be up to a maximum height of 2m (Figure 7b and 6c).

Once soils are dry (usually several weeks of dry and windy or warm weather), 'windrows' may be combined into larger stockpiles (Figure 7d and 6e), for which the surface of the stockpile should be shaped into the target gradient and firmed by a tracked machine to limit rainwater infiltration.

Gaps between stockpiles should be left for passing vehicles, which should not run over stockpiles.



Stockpile maintenance

- 5.5.8 Once soil stockpiles have been formed, the area should be cordoned off with barrier tape to prevent any disturbances or contamination by other construction activities.
- 5.5.9 If stockpiles are to be stored for a period of over six months, it is recommended that they are seeded with a grass/clover mixture (subject to agreement with landowner/tenant), to minimise soil erosion, nutrient loss and reduce ingress by weeds which may spread seed onto adjacent land. This is of particular importance on low lying land close to watercourses where eroded soils from stockpiles can potentially enter the adjacent watercourse. If weeds appear during the summer months, they should be removed by mowing/strimming to prevent seed spreading.
- 5.5.10 If rainwater gathers on the stockpile surface or in areas adjacent to them, drainage pathways to soakaway areas should be provided.
- 5.5.11 A storage database should be produced to accurately record all appropriate details regarding stored soils. Where soils are not moved from the immediate vicinity (<30m) and where their reinstatement is completed in a short space of time (1-2 weeks) signage may suffice. Records may include:
- Farm name
 - Field name

- Soil type
- Projected end-use
- Field vegetation type
- Soil depth stripped
- Soil layer (e.g., Topsoil or subsoil)
- Dates stripped and stockpiled

5.5.12 An example of a soil storage record card is shown in Appendix A.12.

5.6 Soil reinstatement and reuse

5.6.1 The projected end-use of the soils will be for reinstatement of profiles and landscape features. The main objective for the reinstatement of agricultural land is to restore the land to its original (pre-development) soil quality, as determined by ALC grade obtained during the pre-construction survey. This is primarily achieved by ensuring that the full soil profile is reinstated in the correct sequence of horizons with minimal damage to soil structure, and in a state where good soil profile drainage and plant root development are achieved.

Soil reconditioning

5.6.2 Prior to reinstatement, soils may need to be reconditioned to restore quality and structure if soils are observed to be plastic due to soil wetness, or in instances of anaerobic conditions. The following procedure should be followed:

- Tip soils in heaps to form windrows. This should start at the furthest point along the stockpile area and run toward the access point. Windrows should be spaced to allow for vehicles between them.
- Windrows should be produced with a rough surface to maximise drying.
- No machinery should traverse the windrows to avoid compaction, which may damage the suitability of the soil for reuse.
- Windrows should be turned until all soil has been exposed to the air to facilitate drying.
- Throughout the process, windrows should be monitored.

- 5.6.3 In addition to the reconditioning of the stored soils, the substrate receiving the topsoil or subsoil should be loosened on the basis that it will be compacted during construction activities. Decompaction promotes deeper root growth and reduces flood risk by reducing the impedance of water drainage. Decompaction can be achieved with a method tailored to the available space and degree of compaction, as outlined in Table 6.

Table 6. Soil decompaction methods

Circumstance	Method
Restricted amount of space (e.g., planting beds and road verges)	A small (1 – 5t) to medium sized (13t) tracked excavator, fitted with a single rigid tine.
Open areas with moderately compacted soil	A tractor-drawn subsoiler or compressed air injection.
Highly compacted soil	A heavy-duty ripper equipment, such as a single rigid tine device.

Soil placement

- 5.6.4 Soil reinstatement will be subject to the same weather and soil texture constraints as soil stripping (see Section 5.3). Once it has been established that soils are suitable for reinstatement, they should be tipped and spread according to the ‘loose-tipping’ method as defined by Defra ¹⁴. The ‘loose-tipping’ method should only occur if the following conditions are met:

- Soils must only be handled as per Section 5.2.
- All alien objects (i.e., construction debris, wire, rope, wood, metal, plastic) should be removed from both receiving land and stockpiled soils before reinstatement.
- Stripping vehicles must have room to easily pass each other.
- Prior to soil placement, the receiving ground (whether a basal layer or compacted subsoil) must first be loosened as per above.

- 5.6.5 This method involves working to a strip system where the width of the strip is determined by the reach of the excavator and the soil is replaced sequentially across the soiling area. The process is diagrammatised in Figure 8. The loose-tipping method of soil reinstatement and as follows:

1. A hydraulic excavator loads soil from stockpiles into dump-trucks. Dump-trucks may then discharge soils onto receiving surfaces.
2. An excavator stands next to the newly dropped soil and spreads this to the required thickness.

3. The whole length of the strip is restored with subsoil before the process is repeated with topsoil. The topsoil is lifted onto the subsoil without the excavator travelling on the newly placed subsoil, and topsoil and subsoil are not mixed. Only when the strip has been completed is the next one started.
 4. If soil is cloddy in structure, the excavator bucket can be used to break up the clods. Large stones can be removed during the operation.
- 5.6.6 Modified versions of the loose-tipping method, for use when both subsoil and topsoil are to be placed, include spreading the subsoil as described above but then spreading the topsoil layer out using a low ground pressure dozer. Providing that soil conditions are suitably dry and dozer movements are minimised, this can gently consolidate the placed soil without causing over-compaction.

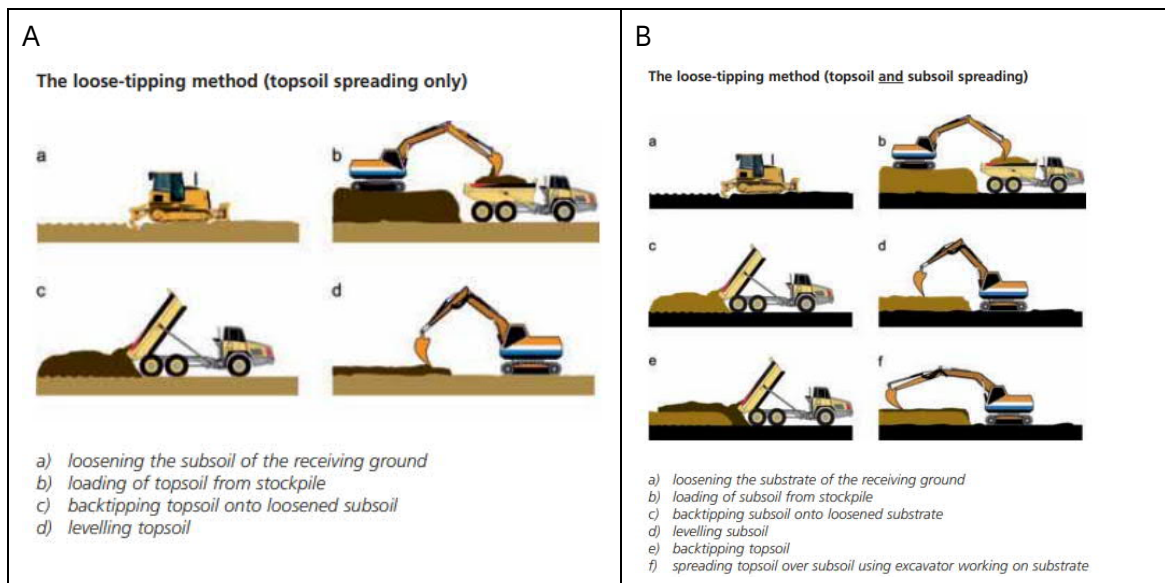


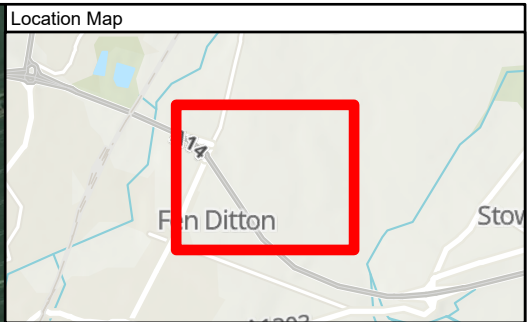
Figure 8. The loose-tipping method of soil reinstatement

5.7 Post reinstatement Issues

- 5.7.1 Although well executed soil management will minimise damage to reinstated soil profiles, issues may become apparent in both agricultural land and newly landscaped areas, that are distinctly uncharacteristic or persistent beyond 2-3 years post reinstatement. In such situations, advice should be sought from a suitably qualified and competent soil scientist, and the necessary steps taken to restore the soil profile to suitable health.

6 Appendices

A.1. Site and Auger Borehole Location Map



Key to Symbols

- Draft Scheme Order Limits
- Field Boundary
- Soil Auger Borehole

Notes

Data Sources:
Land Parcels: Savills 2021
Borehole locations: Mott MacDonald 2021
Indicative DCO boundary: AWS @One Alliance, 2021
Basemapping : Contains OS data © Crown Copyright and database right 2020
Contains data from OS Zoomstack, Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, GeoTechnologies, Inc., METI/NASA, USGS, Maxar, Microsoft, Contains OS data © Crown Copyright and database right 2019

03	09/02/22	NC	Overview Map	ZL	ZL
Rev	Date	Drawn	Description	Ch'k'd	App'd

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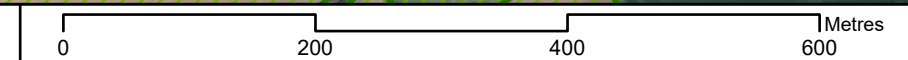
Client

Title

CWWTPR Project
Soil Survey
Agricultural Land Classification
Survey Auger Borehole Locations

Designed	-	Eng Check	-	
Drawn	NC	Coordination	ZL	
GIS Check	AB	Approved	ZL	
Scale at A3 1:6,000	Status PRE	Rev P3	Security STD	

Drawing Number
409071-MMD-00-XX-GIS-Y-0813



A.2. Auger borehole Soil Profile Characteristics

Auger Borehole	Horizon (cm)	Texture	Soil Matrix Colour	Mottling*	CaCo3 %	Organic Matter %	Wetness Grade	Drought Grade (Wheat)	Drought Grade (Potato)	Overall ALC Grade
AB 1	0 – 27	hCL	7.5YR3/4	None	>10%	4 – 5	2	3b	3a	3b
	27 – 58	hCL	7.5YR3/4	None	>10%					
AB 2	0 – 26	hCL	7.5YR3/4	None	>10%	3	2	3b	3b	3b
	26 – 48	hCL	7.5YR3/4	None	>10%					
AB 3	0 – 27	hCL	7.5YR3/4	None	>10%	5	2	3b	3a	3b
	27 – 58	hCL	7.5YR3/4	None	>10%					
AB 4	0 – 28	hCL	10YR4/2	None	>10%		2	3a	3a	3a
	28 – 55	hCL	10YR5/2	Few	>10%					
	55 – 80	hCL	10YR7/0	Few	>10%					
AB 5	0 – 26	hCL	10YR4/3	None	>10%		2	2	3a	3a
	26 – 53	hCL	10YR5/3	Few	>10%					
	53 – 76	hCL	10YR7/0	Few	>10%					
	76 – 120	mSL	10YR7/0	Common	>10%					
AB 6	0 – 25	SCL	7.5YR3/4	None	>10%	4 – 5	1	3a	3a	3a
	25 – 48	SCL	7.5YR3/4	None	>10%					
	48 – 75	SCL	7.5YR6/4	None	>10%					
AB 7	0 – 26	mCL	7.5YR3/4	None	>10%	5	1	3b	3b	3b
	26 – 48	mCL	7.5YR3/4	None	>10%					
AB 8	0 – 29	hCL	7.5YR3/4	None	>10%	5	2	3b	3b	3b
	29 – 45	hCL	7.5YR7/6	None	>10%					

AB 9	0 – 32	mCL	7.5YR3/4	None	>10%	5	1	3b	2	3b
	32 – 70	SCL	7.5YR7/6	None	>10%					
	70+			None	>10%					
AB 10	0 – 28	hCL	7.5YR4/3	None	>10%	5	2	3b	3b	3b
	28 – 45	hCL	7.5YR4/3	None	>10%					
	45+		2.5YR7/1	None	>10%					
AB 11	0 – 26	mCL	10YR4/3	None	>10%		1	3a	3a	3a
	26 – 67	hCL	10YR5/3	Few	>10%					
	67 – 88	hCL	10YR7/0	None	>10%					
AB 12	0 – 24	mCL	10YR4/3	None	>10%		1	3a	3a	3a
	24 – 50	hCL	10YR5/3	Few	>10%					
	50 – 88	hCL	10YR7/0	None	>10%					
AB 13	0 – 26	mCL	7.5YR3/4	None	>10%	5	1	2	2	2
	26 – 40	mCL	7.5YR3/4	None	>10%					
	40 – 70	SCL	7.5YR4/3	None	>10%					
	70 – 120	SCL	7.5YR6/4	None	>10%					
AB 14	0 – 28	mCL	7.5YR3/4	None	>10%	5	1	2	2	2
	28 – 40	mCL	7.5YR3/4	None	>10%					
	40 – 120	mCL	7.5YR7/6	None	>10%					
AB 15	0 – 25	mCL	7.5YR3/4	None	>10%	5	1	2	3a	3a
	25 – 42	mCL	7.5YR3/4	None	>10%					
	42 – 120	SCL	7.5YR7/8	None	>10%					

AB 16	0 – 26	mCL	7.5YR3/4	None	>10%	5	1	3a	2	3a
	26 – 40	mCL	7.5YR3/4	None	>10%					
	40 – 75	SCL	7.5YR4/3	None	>10%					
	75 – 100	SCL	7.5YR7/8	None	>10%					
AB 17	0 – 30	mCL	7.5YR2.5/2	None	>10%	8	1	2	2	2
	30 – 60	hCL	7.5YR6/4	None	>10%					
	60 – 120	hCL	7.5YR7/8	None	>10%					
AB 18	0 – 25	hCL	7.5YR3/4	None	>10%	5	2	3b	3a	3b
	25 – 35	hCL	7.5YR3/4	None	>10%					
	35 – 65	hCL	7.5YR4/3	None	>10%					
AB 19	0 – 25	hCL	7.5YR4/3	None	>10%	4	2	3b	3b	3b
	25 – 45	hCL	7.5YR4/3	None	>10%					
	45+		2.5YR7/1	Few	>10%					
AB 20	0 – 30	hCL	7.5YR3/4	None	>10%	5	2	3b	3a	3b
	30 – 65	hCL	7.5YR3/4	None	>10%					
	65+		2.5YR7/1	None	>10%					
AB 21	0 – 29	hCL	7.5YR4/3	None	>10%		2	3b	3a	3b
	29 – 55	hCL	7.5YR4/3	None	>10%					
	55+		2.5YR7/1	None	>10%					
AB 22	0 – 28	mCL	10YR4/2	None	>10%		1	3a	3a	3a
	28 – 52	hCL	10YR5/3	None	>10%					
	52 – 68	hCL	10YR7/0	None	>10%					

	68 – 90	SL	10YR7/0	None	>10%					
AB23	0 – 34	mCL	7.5YR3/3	None	>10%	5	1	2	3a	3a
	34 – 58	mCL	7.5YR3/4	None	>10%					
	58 – 107	SL	10YR7/0	None	>10%					
	107+			None	>10%					
AB 24	0 – 28	mCL	7.5YR3/4	None	>10%	5	1	3b	2	3b
	28 – 45	mCL	7.5YR3/4	None	>10%					
	45 – 68	mCL	7.5YR4/3	None	>10%					
AB 25	0 – 30	mCL	7.5YR3/4	None	>10%	5	1	3a	2	3a
	30 – 52	SCL	7.5YR4/3	None	>10%					
	52 – 75	mSL	7.5YR4/3	None	>10%					
AB 26	0 – 30	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	30 – 80	hCL	7.5YR4/3	None	>10%					
	80 – 110	mCL	7.5YR7/8	None	>10%					
AB 27	0 – 29	hCL	7.5YR3/4	None	>10%	5	2	3a	2	3a
	29 – 42	hCL	7.5YR4/3	None	>10%					
	42 – 75	hCL	7.5YR7/8	Few	>10%					
AB 28	0 – 30	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	30 – 65	hCL	7.5YR4/3	None	>10%					
	65 – 120	SCL	7.5YR7/8	None	>10%					
AB 29	0 – 30	hCL	7.5YR2.5/3	None	>10%	7 – 8	2	2	3a	3a
	30 – 40	hCL	7.5YR2.5/3	None	>10%					

	40 – 75	hCL	7.5YR4/3	None	>10%					
	75 – 120	hCL	7.5YR4/3	None	>10%					
AB 30	0 – 27	hCL	7.5YR3/4	None	>10%	6	2	3a	2	3a
	27 – 42	hCL	7.5YR3/4	None	>10%					
	42 – 75	hCL	7.5YR4/3	None	>10%					
AB 31	0 – 27	hCL	7.5YR3/2	None	>10%	4 – 5	2	3a	2	3a
	27 – 80	hCL	7.5YR4/2	None	>10%					
	80+		2.5YR7/1	Few	>10%					
AB 32 (Pit 1)	0 – 27	SCL	7.5YR3/2	None	>10%	4 – 5	2	3a	3a	3a
	27 – 78	SCL	7.5YR4/2	None	>10%					
	78+		2.5YR7/1	Few	>10%					
AB 33	0 – 30	hCL	7.5YR4/3	None	>10%	4	2	3a	2	3a
	30 – 120	hCL	7.5YR7/1	Few	>10%					
AB 34	0 – 28	mCL	10YR4/2	None	>10%		1	3a	3a	3a
	28 – 56	hCL	10YR4/3	None	>10%					
	56 – 85	hCL	2.5Y8/3	Few	>10%					
AB 35	0 – 30	mCL	7.5YR3/2	None	>10%		1	3a	2	3a
	30 – 47	mSCL	7.5YR4/3	Few	>10%					
	47 – 87	mSL	7.5YR4/4	None	>10%					
	87 – 120		7.5YR6/1	Few	>10%					
AB 36	0 – 26	mCL	10YR4/2	None	>10%		1	2	3a	3a
	26 – 55	SCL	10YR4/4	Few	>10%					

	55 – 82	SCL	10YR7/0	Few	>10%					
	82 – 120	mSL	7.5YR5/6	None	>10%					
AB 37	0 – 29	mCL	7.5YR3/4	None	>10%	4 – 5	1	3b	3b	3b
	29 – 48	mCL	7.5YR3/4	None	>10%					
	48 – 68	hZCL	7.5YR7/1	Few	>10%					
	68+		2.5YR7/1	Few	>10%					
AB 38	0 – 28	mCL	10YR4/3	None	>10%		1	3a	3a	3a
	28 – 62	SCL	10YR5/3	Few	>10%					
	62 – 82	SCL	10YR5/4	Few	>10%					
AB 39	0 – 23	mCL	10YR4/2	None	>10%		1	3a	3a	3a
	23 – 46	SCL	7.5YR5/6	Few	>10%					
	46 – 92	SCL	10YR7/0	None	>10%					
AB 40	0 – 25	mCL	10YR4/2	None	>10%		1	3a	3a	3a
	25 – 50	SCL	10YR4/3	None	>10%					
	50 – 68	SCL	10YR7/0	Few	>10%					
	68 – 90	SCL	10YR7/0	None	>10%					
AB 41	0 – 25	mCL	10YR3/2	None	>10%		1	3a	3a	3a
	25 – 45	SCL	10YR5/3	None	>10%					
	45 – 72	SCL	10YR7/0	Common	>10%					
	72 – 120	mS	10YR7/8	None	>10%					
AB 42	0 – 30	hCL	7.5YR2.5/3	None	>10%	6 – 7	2	2	2	2
	30 – 60	hCL	7.5YR3/4	None	>10%					

	60 – 85	hCL	7.5YR4/3	None	>10%					
	85 – 115	mCL	7.5YR7/8	Few	>10%					
AB 43	0 – 29	mCL	7.5YR3/4	None	>10%	4	1	3b	3a	3b
	29 – 39	mCL	7.5YR5/3	None	>10%					
	39+		2.5YR7/1	None	>10%					
AB 44	0 – 27	SCL	10YR4/2	None	>10%		1	3b	3a	3b
	27 – 62	SCL	10YR4/3	None	>10%					
AB 45	0 – 26	SCL	10YR4/2	None	>10%		1	3a	3a	3a
	26 – 50	SCL	10YR4/3	None	>10%					
	50 – 65	SCL	10YR7/0	None	>10%					
	65 – 96	mSL	10YR7/0	None	>10%					
AB 46	0 – 26	mCL	10YR4/2	None	>10%		1	3a	3a	3a
	26 – 55	SCL	10YR5/4	Few	>10%					
	55 – 88	SCL	10YR4/5	Few	>10%					
AB 47	0 – 28	mCL	7.5YR3/4	None	>10%	4 – 5	1	2	2	2
	28 – 48	mCL	7.5YR3/4	None	>10%					
	48 – 88	mSL	10YR7/8	None	>10%					
	88 – 120	SCL	7.5YR7/1	Few	>10%					
AB 48	0 – 28	mCL	10YR4/2	None	>10%		1	2	3a	3a
	28 – 48	SCL	7.5YR5/6	None	>10%					
	48 – 80	SCL	10YR7/0	Few	>10%					
	80 – 120	SCL	10YR7/0	None	>10%					

AB 49	0 – 27	SCL	10YR4/2	None	>10%		1	3a	3a	3a
	27 – 48	SCL	10YR5/3	Few	>10%					
	48 – 95	mSL	10YR7/0	None	>10%					
AB 50	0 – 27	mCL	10YR4/3	None	>10%		1	2	2	2
	27 – 55	hCL	10YR4/4	Few	>10%					
	55 – 85	SCL	10YR5/4	Common	>10%					
	85 – 120	SCL	10YR7/0	None	>10%					
AB 51	0 – 27	mCL	10YR4/3	None	1%		1	2	3a	3a
	27 – 56	SCL	10YR4/4	Few	>10%					
	56 – 72	SCL	10YR5/4	Common	>10%					
	72 – 120	SCL	10YR7/0	None	>10%					
AB 52	0 – 28	hCL	7.5YR2.5/3	None	>10%	6	2	2	2	2
	28 – 50	hCL	7.5YR4/3	None	>10%					
	50 – 70	SCL	7.5YR7/8	None	>10%					
	70 – 115	LmS	7.5YR7/6	None	>10%					
AB 53	0 – 28	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	28 – 97	hCL	7.5YR4/3	None	>10%					
AB 54	0 – 27	mCL	10YR4/2	None	>10%		1	3b	3a	3b
	27 – 46	hCL	10YR4/3	None	>10%					
	46 – 70	SCL	10YR7/0	Few	>10%					
AB 55	0 – 28	mCL	10YR4/2	None	5%		1	3b	3a	3b
	28 – 46	hCL	10YR5/3	Few	5%					

	46 – 74	SCL	10YR7/0	Few	>10%					
AB 56	0 – 28	mCL	10YR4/2	None	>10%		1	2	3a	3a
	28 – 45	SCL	10YR4/4	Few	>10%					
	45 – 70	SCL	10YR7/0	Few	>10%					
	70 – 120	mSL	10YR6/4	None	>10%					
AB 57	0 – 26	mCL	7.5YR3/4	None	>10%		1	2	2	2
	26 – 39	mCL	7.5YR3/4	None	>10%					
	39 – 82	mSL	7.5YR7/8	None	>10%					
	82 – 108	LmS	7.5YR7/8	None	>10%					
AB 58	0 – 25	mCL	10YR4/2	None	5%		1	3a	3a	3a
	25 – 46	SCL	10YR5/3	Few	>10%					
	46 – 70	SCL	10YR7/0	Few	>10%					
	70 – 120	mSL	10YR7/0	None	>10%					
AB 59	0 – 27	SCL	10YR4/2	None	>10%		1	3a	2	3a
	27 – 50	SCL	10YR5/3	Few	>10%					
	50 – 96	mSL	10YR7/0	Few	>10%					
AB 60	0 – 28	SCL	10YR4/2	None	>10%		1	3a	3a	3a
	28 – 65	SCL	10YR5/3	Few	>10%					
	65 – 92	LmS	7.5YR5/6	Few	>10%					
	92 – 120	mS	7.5YR5/6	None	>10%					
AB 61	0 – 25	mCL	10YR4/2	None	5%		1	3a	3a	3a
	25 – 58	SCL	10YR5/3	Few	>10%					

	58 – 75	SCL	10YR5/3	Few	>10%					
	75 – 88	mSL	10YR7/0	None	>10%					
AB 62	0 – 26	mCL	10YR4/2	None	>10%		1	3a	3a	3a
	26 – 65	hCL	10YR5/3	Few	>10%					
	65 – 105	mS	7.5YR5/6	Few	>10%					
	105 – 120	mS	10YR7/0	None	>10%					
AB 63	0 – 30	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	30 – 95	hCL	7.5YR4/3	None	>10%					
AB 64	0 – 25	mCL	10YR4/2	None	>10%		1	3b	3a	3b
	25 – 45	mCL	10YR4/4	Few	>10%					
	45 – 85	mSL	10YR7/0	None	>10%					
AB 65	0 – 30	mCL	10YR4/2	None	1%		1	3a	3a	3a
	30 – 56	SCL	10YR5/3	Few	5%					
	56 – 70	SCL	7.5YR5/6	Few	5%					
	70 – 85	mSL	7.5YR5/6	None	5%					
AB 66	0 – 25	mCL	10YR4/2	None	5%		1	2	2	2
	25 – 42	hCL	10YR4/4	None	5%					
	42 – 75	SCL	10YR5/4	Few	5%					
	75 – 120	SCL	10YR5/6	Few	>10%					
AB 67	0 – 27	mCL	7.5YR3/4	Few	>10%	5	1	2	2	2
	27 – 40	mCL	7.5YR3/4	None	>10%					
	40 – 90	hCL	7.5YR6/4	None	>10%					

	90 – 120	SCL	7.5YR5/6	None	>10%					
AB 68	0 – 26	mCL	10YR4/2	None	1%		1	2	3a	3a
	26 – 45	SCL	10YR5/3	Few	>10%					
	45 – 75	SCL	10YR7/0	None	>10%					
	75 – 120	mSL	10YR7/0	Few	>10%					
AB 69	0 – 26	mCL	10YR4/2	None	1%		1	2	3a	3a
	26 – 55	SCL	10YR4/4	None	5%					
	55 – 82	SCL	7.5YR5/6	Few	>10%					
	82 – 120	SL	10YR5/6	Few	>10%					
AB 70	0 – 28	SCL	10YR4/2	None	5%		1	2	3a	3a
	28 – 55	SCL	7.5YR5/6	Few	>10%					
	55 – 100	mSL	10YR6/4	Few	>10%					
	100 – 120	mS	10YR6/4	None	>10%					
AB 71	0 – 25	SCL	10YR4/2	None	5%		1	3a	3a	3a
	25 – 62	SCL	7.5YR5/6	Few	>10%					
	62 – 85	mSL	10YR6/4	Common	>10%					
	85 – 110	mS	10YR6/4	Few	>10%					
AB 72	0 – 25	hCL	10YR4/2	None	>10%		2	3a	2	3a
	25 – 55	hCL	10YR4/4	Few	>10%					
	55 – 72	SCL	7.5YR5/6	Common	>10%					
	72 – 90	SCL	10YR7/0	Few	>10%					
	0 – 27	hCL	7.5YR3/4	None	>10%	5				

AB 73	27 – 65	hCL	7.5YR4/3	None	>10%		2	2	2	2
	65 – 95	hZCL	7.5YR7/8	None	>10%					
AB 74	0 – 27	hCL	10YR4/2	None	>10%		2	3b	3a	3b
	27 – 58	hCL	10YR45/7	Few	>10%					
AB 75	0 – 26	SCL	10YR4/2	None	5%		1	3a	3a	3a
	26 – 33	SCL	10YR6/6	Few	>10%					
	33 – 78	SL	10YR7/8	Few	>10%					
	78 – 120	mSL	10YR7/0	None	>10%					
AB 76	0 – 24	mCL	10YR4/2	None	5%		1	3a	3a	3a
	24 – 48	hCL	10YR4/4	Few	5%					
	48 – 62	SCL	10YR7/0	Few	>10%					
	62 – 120	SCL	10YR7/0	None	>10%					
AB 77	0 – 25	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	25 – 40	hCL	7.5YR3/4	None	>10%					
	40 – 85	hCL	7.5YR6/4	None	>10%					
	85 – 115	hCL	7.5YR7/8	Few	>10%					
AB 78	0 – 25	mCL	7.5YR3/4	None	1%	5	1	3a	2	3a
	25 – 39	mCL	7.5YR3/4	None	5%					
	39 – 85	SCL	7.5YR6/4	None	>10%					
AB 79	0 – 25	mCL	10YR4/2	None	5%		1	3a	3a	3a
	25 – 45	SCL	10YR4/4	Few	5%					
	45 – 85	SCL	10YR7/0	Few	>10%					

	85 – 120	SCL	10YR7/0	Few	>10%					
AB 80	0 – 25	mCL	10YR4/2	None	5%		1	2	3a	3a
	25 – 56	hCL	10YR4/4	Few	>10%					
	56 – 85	mSL	7.5YR5/6	Common	>10%					
	85 – 120	mSL	10YR7/0	Few	>10%					
AB 81	0 – 26	hCL	10YR4/2	None	>10%		2	2	2	2
	26 – 54	hCL	10YR4/4	Few	>10%					
	54 – 88	SCL	10YR5/4	Common	>10%					
	88 – 120	SCL	10YR7/0	Few	>10%					
AB 82	0 – 30	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	30 – 45	SCL	7.5YR6/4	None	>10%					
	45 – 90	mSL	7.5YR7/6	None	>10%					
	90 – 120	LmS	7.5YR7/6	None	>10%					
AB 83	0 – 24	hCL	10YR4/2	None	>10%		2	2	2	2
	24 – 55	hCL	10YR4/4	Few	>10%					
	55 – 90	SCL	10YR5/4	Common	>10%					
	90 – 120	SCL	10YR7/0	Few	>10%					
AB 84	0 – 25	mCL	10YR4/2	None	5%		1	2	3a	3a
	25 – 57	SCL	10YR5/4	Few	5%					
	57 – 78	mSL	7.5YR5/6	Few	>10%					
	78 – 120	mS	10YR6/8	Few	>10%					
	27 – 38	hCL	7.5YR3/4	None	>10%	4				

AB 85	38 – 55	hCL	7.5YR3/4	None	>10%		2	2	2	2
	55 – 78	SCL	7.5YR3/4	None	>10%					
	78+	SCL	2.5YR5/2	None	>10%					
AB 86	0 – 27	mCL	7.5YR3/4	None	5%	5	1	1	2	2
	27 – 50	mCL	7.5YR3/4	None	5%					
	50 – 90	SCL	7.5YR4/3	None	5%					
	90 – 120	mSL	7.5YR6/4	None	>10%					
AB 87	0 – 25	mCL	10YR4/2	None	5%		1	2	2	2
	25 – 56	hCL	10YR5/4	Few	5%					
	56 – 82	SCL	7.5YR5/6	Common	>10%					
	82 – 120	mSL	10YR7/0	Few	>10%					
AB 88	0 – 29	mCL	10YR4/2	None	5%		1	2	3a	3a
	29 – 65	SCL	10YR5/4	Few	>10%					
	65 – 90	mSL	7.5YR5/6	Common	>10%					
	90 – 120	mSL	10YR7/0	Few	>10%					
AB 89	0 – 25	hCL	10YR4/2	None	>10%		2	2	2	2
	25 – 58	hCL	10YR4/4	Common	>10%					
	58 – 100	SCL	10YR5/4	Common	>10%					
	100 – 120	SCL	10YR7/0	Few	>10%					
AB 90	0 – 30	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	30 – 60	hCL	7.5YR6/4	None	>10%					
	60 – 105	mCL	7.5YR7/8	None	>10%					

AB 91	0 – 25	hCL	10YR4/2	None	>10%		2	3a	3a	3a
	25 – 54	hCL	10YR4/4	Common	>10%					
	54 – 82	SCL	10YR5/4	Common	>10%					
AB 92	0 – 25	hCL	7.5YR3/4	None	>10%	5	2	2	2	2
	25 – 95	hCL	7.5YR7/6	None	>10%					
	95 – 120	hCL	7.5YR7/1	None	>10%					
AB 93	0 – 28	mCL	7.5YR3/4	None	5%	5	1	2	2	2
	28 – 45	mCL	7.5YR3/4	None	5%					
	45 – 105	SCL	7.5YR5/6	None	>10%					
	105 – 120	SCL	2.5YR5/2	None	>10%					
AB 94	0 – 26	mCL	7.5YR3/4	None	5%	4 – 5	1	2	2	2
	26 – 45	mCL	7.5YR3/4	None	5%					
	45 – 95	hCL	7.5YR4/3	None	5%					
	95 – 120	hCL	7.5YR6/4	Few	5%					
AB 95	0 – 28	SCL	10YR4/2	None	5%		2	3a	3a	3a
	28 – 56	SCL	10YR4/4	Few	>10%					
	56 – 98	SCL	10YR7/0	None	>10%					
AB 96	0 – 26	mCL	10YR4/2	None	>10%		1	2	3a	3a
	26 – 52	SCL	10YR5/4	Few	>10%					
	52 – 84	SCL	10YR7/0	Few	>10%					
	84 – 120	mS	10YR6/8	Few	>10%					
	0 – 29	mCL	7.5YR3/4	None	>10%	5				

AB 97	29 – 60	mCL	7.5YR7/6	Few	>10%		1	3b	3a	3b
	60 – 115	LmS	7.5YR7/8	None	>10%					
AB 98	0 – 27	mCL	7.5YR3/4	None	>10%	5	1	2	2	2
	27 – 43	mCL	7.5YR3/4	None	>10%					
	43 – 95	mCL	7.5YR4/3	None	>10%					
	95 – 120	mCL	7.5YR3/4	None	>10%					
AB 99	0 – 26	mCL	10YR4/2	None	5%		1	2	2	3a
	26 – 62	SCL	10YR4/4	Few	>10%					
	62 – 120	mSL	10YR7/0	Common	>10%					
AB 100	0 – 27	mCL	7.5YR3/4	None	>10%	5	1	3a	2	3a
	27 – 79	mCL	7.5YR3/4	Few	>10%					
AB 101	0 – 27	mCL	7.5YR3/4	None	>10%	5	1	3a	2	3a
	27 – 79	mCL	7.5YR3/4	Few	>10%					
AB 102	0 – 30	mSL	7.5YR3/4	None	>10%	5	1	2	3a	3a
	30 – 50	mSL	7.5YR6/4	None	>10%					
	50 – 120	mSL	7.5YR6/4	None	>10%					
AB Pit 2	0 – 30	mCL	7.5YR3/4	None	>10%	4 – 5	1	2	3a	3a
	30 – 60	mCL	7.5YR3/4	None	>10%					
	60 – 100	mSL	7.5YR4/4	None	>10%					
	100 – 120	mZCL	7.5YR6/1	None	>10%					

Key for Auger Bore Log

Soil Texture

mS, medium sand; LmS, loamy medium sand; mSL, medium sandy loam; mCL, medium clay loam; mZCL, medium silty clay loam; hCL, heavy clay loam; hZCL, heavy silty clay loam; SCL, sandy clay loam

Mottling

None: 0%

Few: <2%

Common: 2 – 20%

*Munsell colour code system

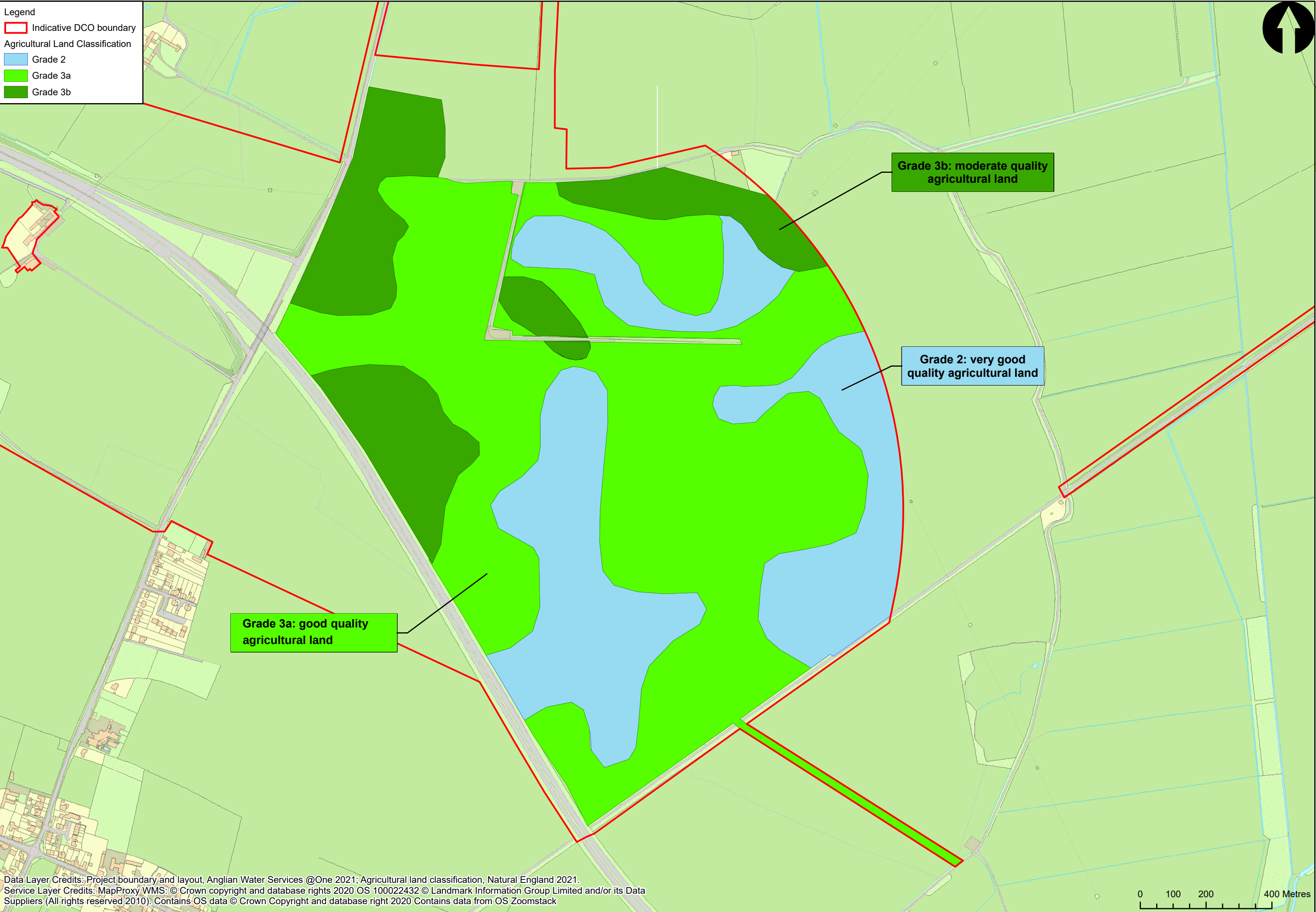
A.3. Agricultural Land Classification Map

Legend

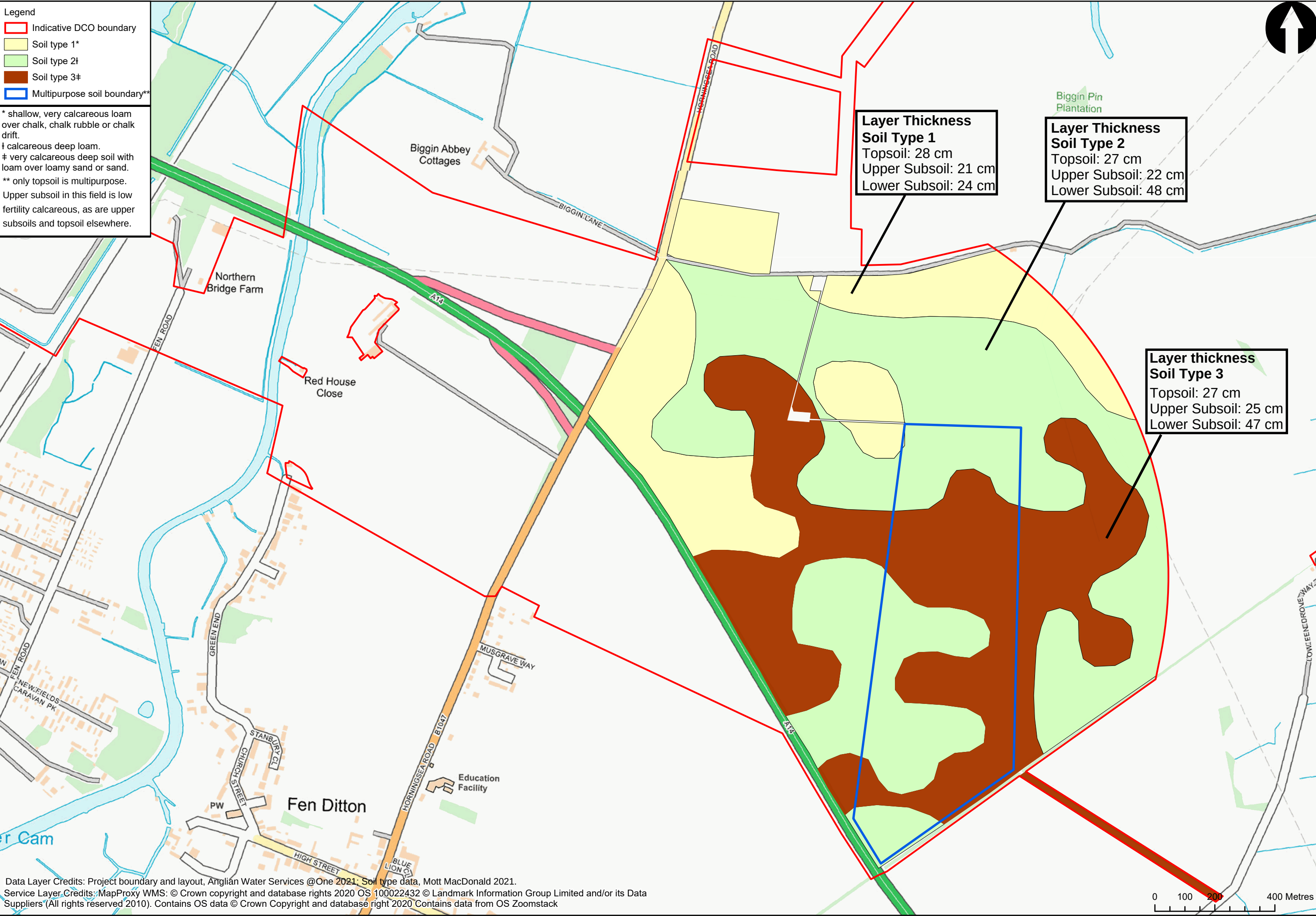
Indicative DCO boundary

Agricultural Land Classification

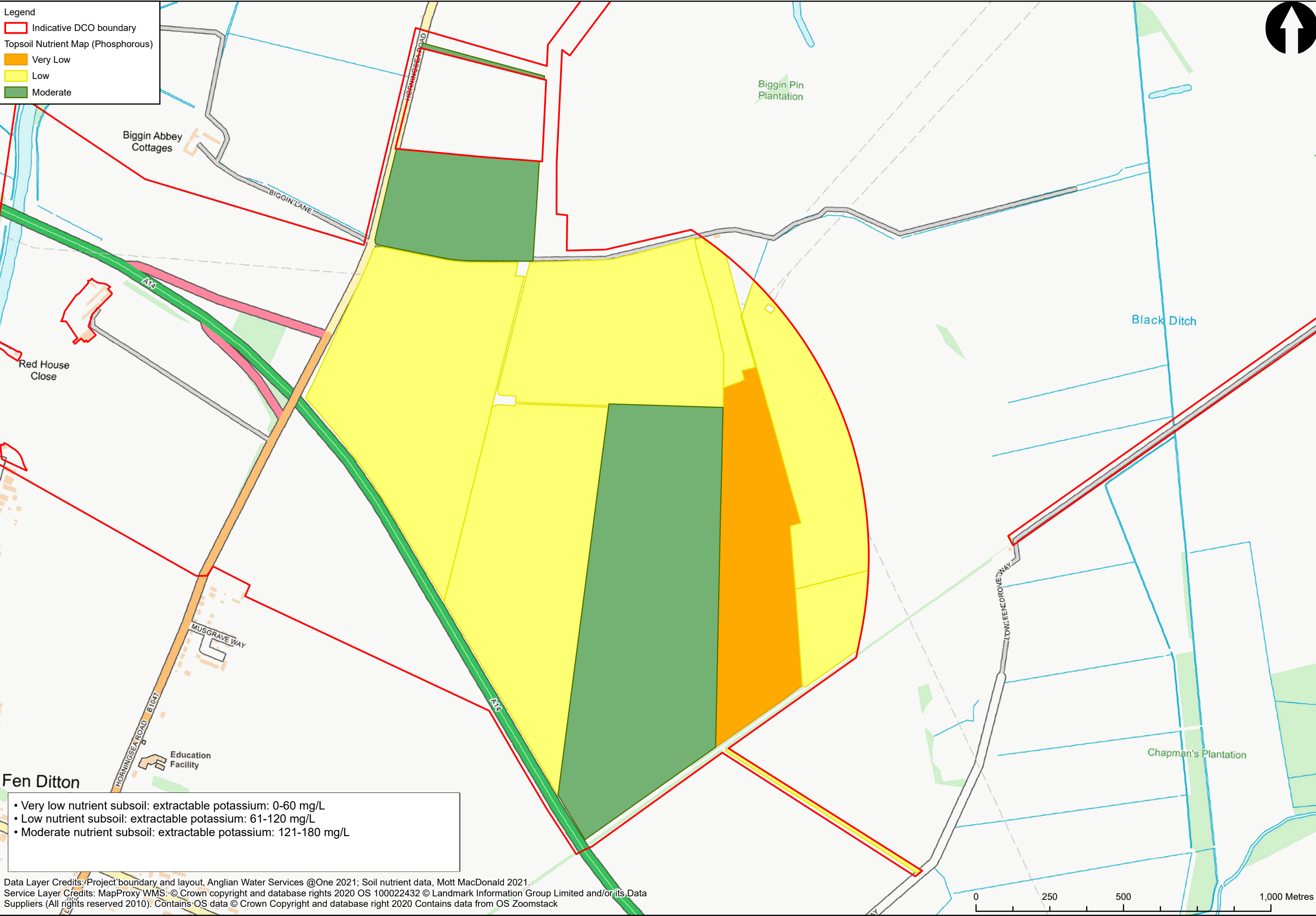
- Grade 2
- Grade 3a
- Grade 3b



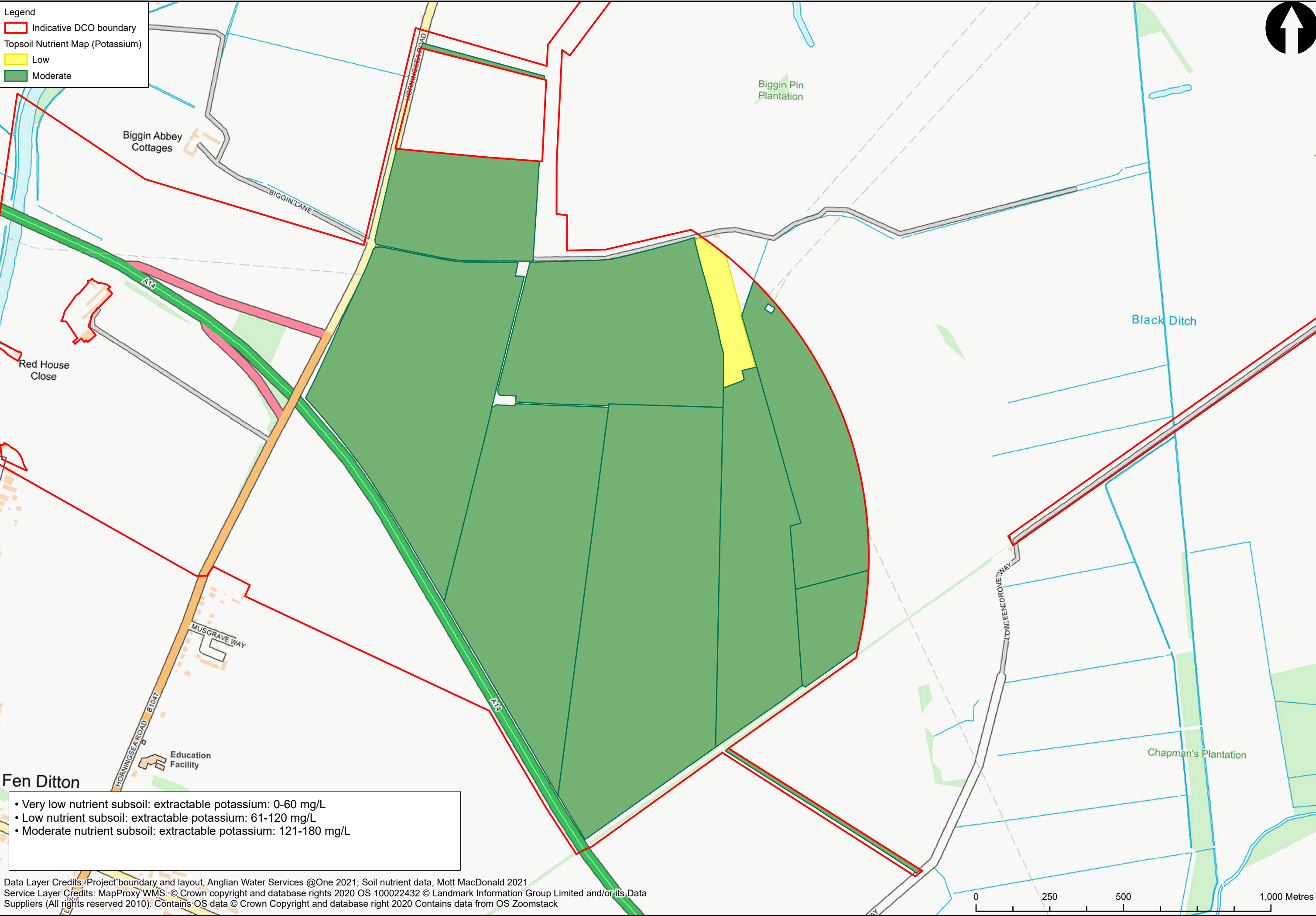
A.4. Soil Type Map



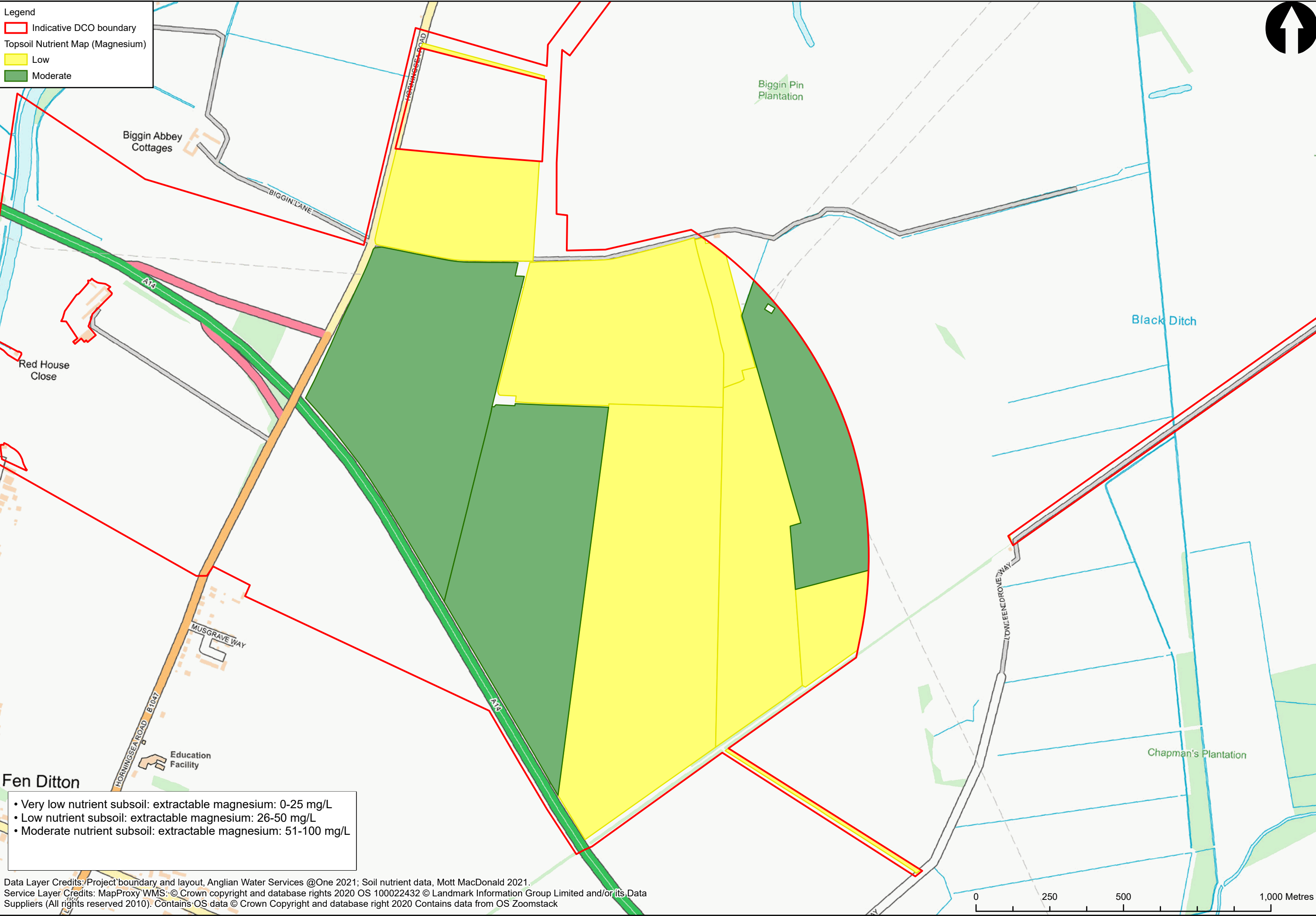
A.5. Topsoil Nutrient Map (Phosphorous)



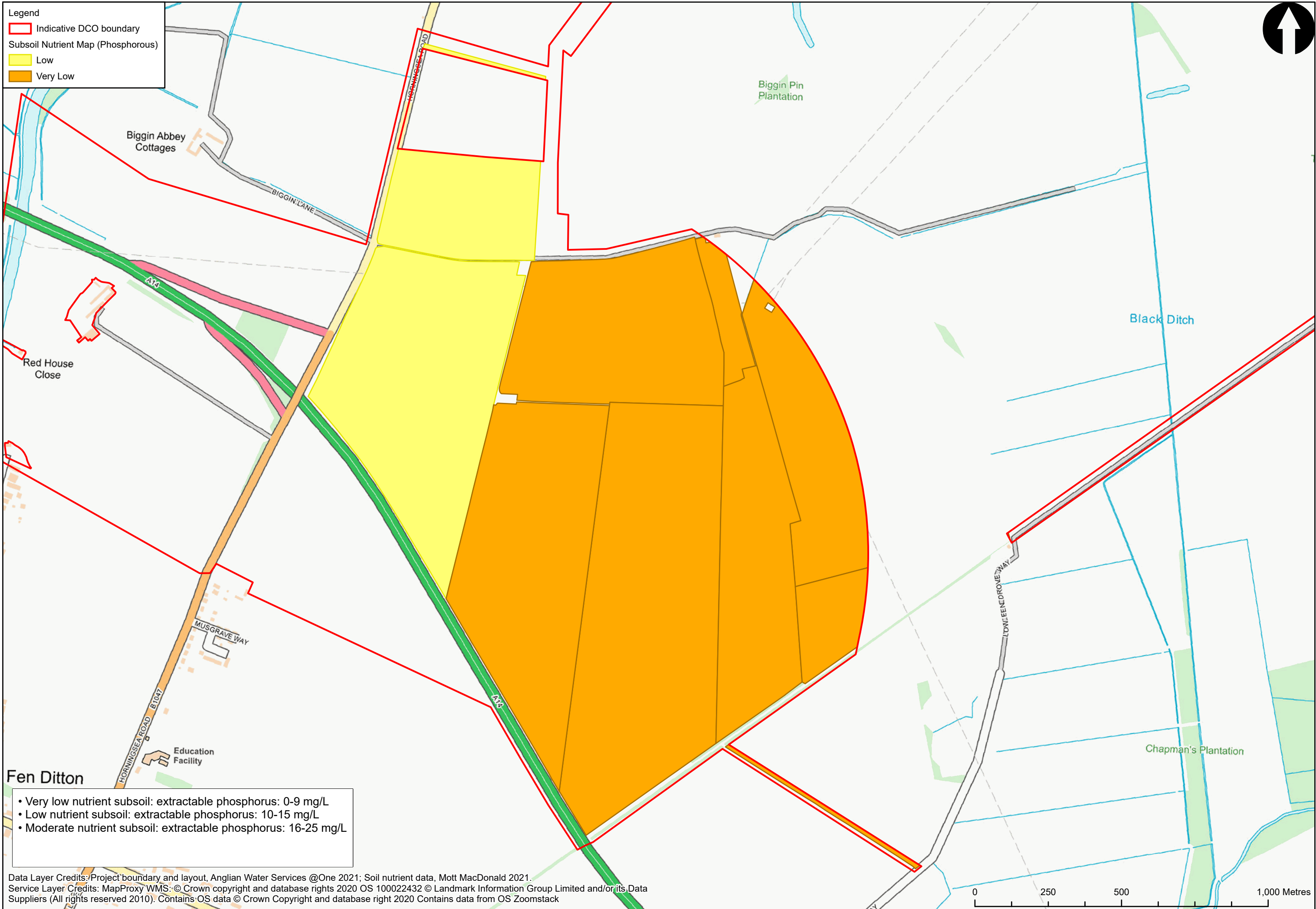
A.6. Topsoil Nutrient Map (Potassium)



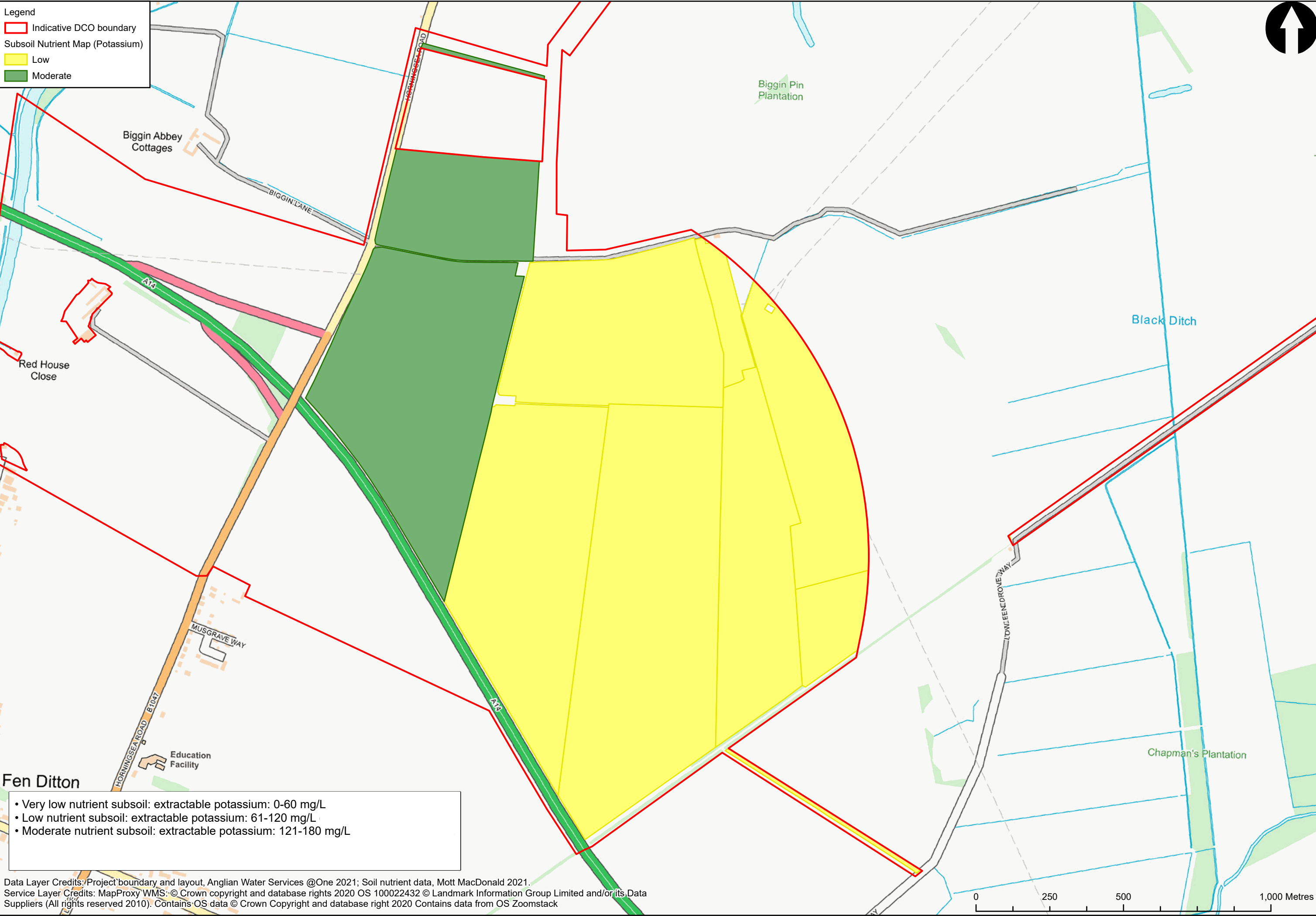
A.7. Topsoil Nutrient Map (Magnesium)



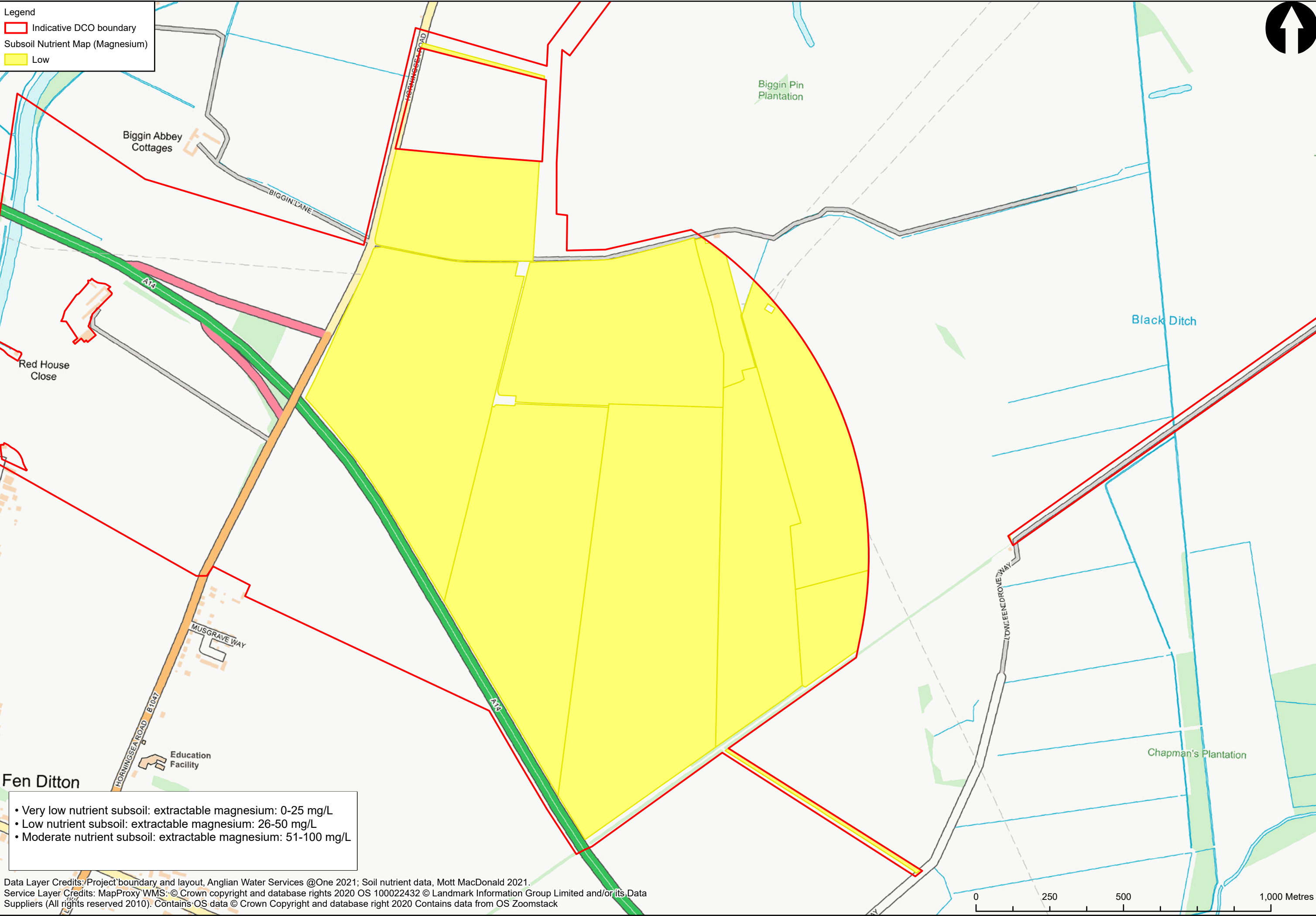
A.8. Subsoil Nutrient Map (Phosphorous)



A.9. Subsoil Nutrient Map (Potassium)



A.10. Subsoil Nutrient Map (Magnesium)



A.11. Operations Checklist

1. Predevelopment soil audit	✓ X
Have uncontaminated soil resources been identified on site?	
Has a detailed Soil Resource Survey of them been carried out by a suitably qualified soil scientist?	
Has a detailed report of the results been placed on file?	
Has the report been used to identify soil surpluses and soil deficits?	
Has space been identified for storage of any soils to be retained on-site for reuse?	

2. Soil Resource Planning	✓ X
Has a detailed Soil Resource Plan been produced?	
Has sufficient space been identified to store soils to be retained on site?	
Have volumes of each soil type been calculated?	
Has the type(s) of reuse been identified for each soil type to be retained?	
Have measures been put in place to protect soils to be stored or left in place from vehicle traffic?	
Has a qualified person been identified to supervise soil management?	

3. Topsoil stripping	✓ X
Is uncontaminated topsoil to be stripped from the site for reuse?	
Has surface vegetation been removed or killed?	
Has the overall soil stripping plan been developed and communicated to machine operators?	
Has topsoil stripping depth been defined and communicated to machine operators?	
Has the appropriate equipment been selected for stripping the topsoil?	
Does the working plan avoid machines travelling over topsoils to be reused?	
Have stripping activities been scheduled to avoid wet conditions?	
Is there provision to stand-down equipment if heavy rain occurs during topsoil stripping?	

4. Subsoil stripping	✓ X
Is uncontaminated subsoil to be stripped from the site for reuse?	
Has the overall soil stripping plan been developed and communicated to machine operators?	
Has subsoil stripping depth been defined and communicated to machine operators?	
Has the appropriate equipment been selected for stripping the soil?	
Does the working plan avoid machines travelling over subsoils to be reused?	
Have stripping activities been scheduled to avoid wet conditions?	
Is there provision to stand-down equipment if heavy rain occurs during topsoil stripping?	

5. Soil stockpiling	✓ X
Has sufficient space been identified to store soils to be retained on site?	
Has topsoil been removed from areas earmarked for storing subsoil or other materials?	
Are stockpiles located away from retained trees, current or future excavations, voids or watercourses?	
Are stockpiles likely to be relocated before the contents are reused?	
Have stockpile construction methods been (or will they be) adjusted to deal with wet soils?	
Have stockpile side slopes and top been tracked down for stability and weather proofing?	
Are stockpiles to be seeded with grass?	
Is there a maintenance plan in place for management of stockpile vegetation?	
Have the contents of each stockpile been accurately recorded on a plan and on signs?	

6. Soil placement	✓ X
Are topsoils or subsoils to be spread?	
Has the overall soil placement plan been developed and communicated to machine operators?	
Has the spreading thickness for each layer been defined and marked out using level boards	
Has the appropriate equipment been selected for decompacting subsoil and spreading topsoil?	
Have appropriate work methods been defined to avoid machinery traffic over newly placed soil?	
Have spreading activities been scheduled to avoid wet conditions?	

Is there provision to stand-down equipment if heavy rain occurs during soil spreading?	
--	--

7. Sourcing and importing soil	✓ X
Is soil to be imported to site?	
Have the soil composition requirements been properly defined for the different planned uses?	
Has the source of the imported soils been verified?	
Is the soil natural (e.g. stripped from a field or stockpiled from a field)?	
Is the soil manufactured or blended from one or more components?	
Do imported topsoils come with a verified analysis to BS3882:2007?	
Have all waste legislation requirements been met for all imported soil?	
Is there an appropriate quality control and inspection strategy for individual loads?	

8. Topsoil manufacture	✓ X
Is topsoil to be manufactured on site?	
Has the feasibility been assessed and source components been analysed?	
Have all waste legislation requirements been met for all imported components?	
Has a mixing method statement been prepared for producing soils of each composition required?	

9. Soil aftercare	✓ X
Is there a plan in place to check soil and vegetation health after spreading?	
Are there provisions in the landscape maintenance contract for remediation of ongoing soil deficiencies such as soil compaction?	
Have all waste legislation requirements been met?	
Are there surplus resources of clean soil on site?	
Have the soil needs of nearby developments or reclamations been investigated?	
Has the surplus soil been advertised on soil or waste exchange networks?	
Are all waste legislation requirements being met for soils to be exported?	

A.12. Soil Stockpile Record Card

Stockpile identification		Record	Additional notes
Stockpile ID:			
Stockpile establishment date (dd/mm/yyyy):			
Stockpile location (e.g. coordinates):			
Source (e.g. farm name, field):			
Intended soil end use:			
Soil horizon	Soil type	Depths (cm)	Volume (m ³)
Topsoil			
Subsoil 1			
Subsoil 2			
Subsoil 3			
Stockpile maintenance		Record	Additional notes (e.g. type of seed, type of maintenance, steps undertaken if not seeded)
Grass/clover seeded?		☐ No ☐ Yes – establishment date (dd/mm/yyyy):	
Grass/clover cover maintenance date(s) (dd/mm/yyyy):		Year 1: Year 2: Year 3: Year 4: Year 5:	
Graphical record?		☐ Stockpile sketch map (inc. horizons) ☐ Photograph	

A.13. Soil Laboratory Analysis

ANALYSIS REPORT

Contact :

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL
Tel. :

W680

Please quote the above code for all enquiries

Client :

Distributor :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 81205/21

Date Received 03-Dec-21

Date Reported 10-Dec-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
547763/21	1	R037-3 TOPSOIL <i>No cropping details given</i>	8.0	1	2-	2	12.0	149	52
547764/21	2	R037-3 SUBSOIL <i>No cropping details given</i>	7.7	0	1	1	7.4	113	43
547765/21	3	Y039-2 TOPSOIL <i>No cropping details given</i>	8.0	0	2-	1	8.4	134	42
547766/21	4	Y039-2 SUBSOIL <i>No cropping details given</i>	7.7	0	1	1	6.6	92	40
547767/21	5	G036-2 TOPSOIL <i>No cropping details given</i>	8.0	1	2-	1	14.8	135	41
547768/21	6	G036-2 SUBSOIL <i>No cropping details given</i>	8.2	0	1	1	7.4	105	45

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Sandy Cameron

On behalf of NRM

Date 10/12/21

MICRO NUTRIENT REPORT

DATE 10th December 2021

SAMPLES FROM

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL

Reference: 81205/547763/21	Field Name: R037-3 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.6	1	OM level	data not available for this crop			

Reference: 81205/547764/21	Field Name: R037-3 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		2.8	1	OM level	data not available for this crop			

Reference: 81205/547765/21	Field Name: Y039-2 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.8	1	OM level	data not available for this crop			

Reference: 81205/547766/21	Field Name: Y039-2 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.5	1	OM level	data not available for this crop			

Reference: 81205/547767/21	Field Name: G036-2 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		4.4	1	OM level	data not available for this crop			

Reference: 81205/547768/21	Field Name: G036-2 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.4	1	OM level	data not available for this crop			

Notes (*)

- (1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.

ANALYSIS REPORT

Contact :

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL
Tel. : 0117 9069500

W680

Please quote the above code for all enquiries

Client :

Distributor :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 81206/21

Date Received 03-Dec-21

Date Reported 13-Dec-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
547769/21	1	R037-1 TOPSOIL <i>No cropping details given</i>	8.0	1	2-	1	13.6	137	41
547770/21	2	R037-1 SUBSOIL <i>No cropping details given</i>	8.1	0	1	1	7.4	112	34
547771/21	3	R037-4 TOPSOIL <i>No cropping details given</i>	8.0	1	2-	2	11.0	149	54
547772/21	4	R037-4 SUBSOIL <i>No cropping details given</i>	8.2	1	2-	1	9.8	132	49
547773/21	5	R037-5 TOPSOIL <i>No cropping details given</i>	8.2	2	2+	1	19.8	205	44
547774/21	6	R037-5 SUBSOIL <i>No cropping details given</i>	8.4	1	2-	1	9.6	145	38

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Nina Mansfield

On behalf of NRM

Date 13/12/21

MICRO NUTRIENT REPORT

DATE 13th December 2021

SAMPLES FROM

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL

Reference: 81206/547769/21	Field Name: R037-1 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.3	1	OM level	data not available for this crop			

Reference: 81206/547770/21	Field Name: R037-1 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		2.7	1	OM level	data not available for this crop			

Reference: 81206/547771/21	Field Name: R037-4 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.3	1	OM level	data not available for this crop			

Reference: 81206/547772/21	Field Name: R037-4 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.0	1	OM level	data not available for this crop			

Reference: 81206/547773/21	Field Name: R037-5 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.1	1	OM level	data not available for this crop			

Reference: 81206/547774/21	Field Name: R037-5 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		2.6	1	OM level	data not available for this crop			

Notes (*)

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ANALYSIS REPORT

Contact :

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL
Tel. : 0117 9069500

W680

Please quote the above code for all enquiries

Client :

Distributor :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 81207/21

Date Received 03-Dec-21

Date Reported 13-Dec-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
547775/21	1	R037-2 TOPSOIL <i>No cropping details given</i>	8.2	2	2-	1	20.8	156	43
547776/21	2	R037-2 SUBSOIL <i>No cropping details given</i>	8.3	0	1	1	6.4	77	37
547777/21	3	Y039-4 TOPSOIL <i>No cropping details given</i>	8.0	1	1	1	13.8	120	46
547778/21	4	Y039-4 SUBSOIL <i>No cropping details given</i>	8.1	0	1	1	9.4	96	43
547779/21	5	G036-10 TOPSOIL <i>No cropping details given</i>	8.2	1	2-	1	10.8	126	35
547780/21	6	G036-10 SUBSOIL <i>No cropping details given</i>	8.2	0	1	1	8.6	118	35

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Nina Mansfield

On behalf of NRM

Date 13/12/21

MICRO NUTRIENT REPORT

DATE 13th December 2021

SAMPLES FROM

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL

Reference: 81207/547775/21	Field Name: R037-2 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.1	1	OM level	data not available for this crop			

Reference: 81207/547776/21	Field Name: R037-2 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		2.6	1	OM level	data not available for this crop			

Reference: 81207/547777/21	Field Name: Y039-4 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		5.7	1	OM level	data not available for this crop			

Reference: 81207/547778/21	Field Name: Y039-4 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		4.9	1	OM level	data not available for this crop			

Reference: 81207/547779/21	Field Name: G036-10 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.6	1	OM level	data not available for this crop			

Reference: 81207/547780/21	Field Name: G036-10 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.4	1	OM level	data not available for this crop			

Notes (*)

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ANALYSIS REPORT

Contact :

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL
Tel. : 0117 9069500

W680

Please quote the above code for all enquiries

Client :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 81234/21

Date Received 06-Dec-21

Date Reported 13-Dec-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
547870/21	1	YO39-A TOPSOIL <i>No cropping details given</i>	7.5	1	2-	2	13.0	140	51
547871/21	2	YO39-1 SUBSOIL <i>No cropping details given</i>	7.3	0	1	1	8.8	106	50

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Nina Mansfield

On behalf of NRM

Date 13/12/21

MICRO NUTRIENT REPORT

DATE 13th December 2021

SAMPLES FROM

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL

Reference: 81234/547870/21	Field Name: YO39-A TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.9	1	OM level	data not available for this crop			

Reference: 81234/547871/21	Field Name: YO39-1 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.4	1	OM level	data not available for this crop			

Notes (*)

- (1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.

ANALYSIS REPORT

Contact :

Client :

W680

Please quote the above code for all enquiries

Local Rep :

Telephone :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 81343/21

Date Received 09-Dec-21

Date Reported 20-Dec-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
548386/21	1	G036-1 TOPSOIL <i>No cropping details given</i>	8.1	1	1	1	11.2	81	38
548387/21	2	G036-1 SUBSOIL <i>No cropping details given</i>	8.4	0	0	1	7.0	48	26

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Nina Mansfield

On behalf of NRM

Date 20/12/21

MICRO NUTRIENT REPORT

DATE 20th December 2021

SAMPLES FROM

MOTT MACDONALD
10 TEMPLE BACK
BRISTOL
BS1 6FL

Reference: 81343/548386/21	Field Name: G036-1 TOPSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		4.8	1	OM level	data not available for this crop			

Reference: 81343/548387/21	Field Name: G036-1 SUBSOIL	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		3.0	1	OM level	data not available for this crop			

Notes (*)

- (1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.