Dean Moor
Solar Farm

Environmental Statement: Appendix 2.8 – Agricultural Land Classification

on behalf of **FVS Dean Moor Limited**

March 2025
Prepared by: Stantec UK Ltd
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DEAN MOOR SOLAR FARM

ENVIRONMENTAL STATEMENT

APPENDIX 2.8 – AGRICULTURAL LAND CLASSIFICATION REPORT

PLANNING INSPECTORATE REFERENCE EN010155

PREPARED ON BEHALF OF FVS DEAN MOOR LIMITED

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, Regulation 5(2)(a)

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1 Introduction

1.1 Background

1.1.1 This report was commissioned by the Applicant to determine the quality of agricultural land proposed for the Dean Moor Solar Farm which is a solar photovoltaic (PV) energy generating station ('the Proposed Development').

1.1.2 The Site (ES Figure 1.1) [**REF: 6.2**] extends to approximately 276.5ha and is located approximately 1.1km east of the Lillyhall Industrial Estate, 600m east of the small village of Gilgarran, approximately 900m west of Branthwaite, and approximately 5km southeast of Workington town centre on the west Cumbrian coast. The hamlet of Branthwaite Edge is directly adjacent to the east of the Site.

1.1.3 The Site has been divided into four main areas (Areas A, B, C, and D), as shown in Appendix A.

1.1.4 The assessment was made following the Agricultural Land Classification ('ALC') system for England and Wales (see 'Methodology' below).

1.2 Competency

1.2.1 This report has been prepared by a Chartered Scientist ('CSci'), who is a Fellow (F.I. Soil Sci) of the British Society of Soil Science ('BSSS'). The author meets the requirements of the BSSS Professional Competency Standard ('PCS') scheme for ALC[1]. The BSSS PCS scheme is endorsed, amongst others, by the Department for Food and Rural Affairs (Defra), Natural England, the Science Council, and IEMA.

1.3 Methodology

1.3.1 This assessment is based upon the findings of a study of published information on climate, geology, and soil in combination with a soil investigation carried out following the Ministry of Agriculture, Fisheries and

[1] British Society of Soil Science. Professional Competency Standard Scheme Document 2 'Agricultural Land Classification' 4: Available at: h[redacted]f Accessed November 2024

Food (MAFF)[2] *'Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land'*, October 1988 (henceforth referred to as the 'the ALC Guidelines')[3].

1.3.2 The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades (Grade 1 *'Excellent'* to Grade 5 *'Very Poor'*), with Grade 3 subdivided into Subgrade 3a *'Good'* and Subgrade 3b *'Moderate'*. Further details of the ALC system and national planning policy implications are set out in Natural England's (NE) *'Guide to assessing development proposals on agricultural land'*[4]. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the 'best and most versatile' ('BMV') category, as described in NE's guidance on agricultural land.

1.3.3 A detailed soil survey and ALC of 206.6ha in the central and southern parts of the Site, i.e., Area C. was carried out by MAFF in 1990. This equates to a detailed coverage of approximately 74%, or nearly three-quarters of the Site. A copy of the MAFF ALC report and map (MAFF. Ref. 2FCS 50Y9, September 1990) is given in Appendix B. The MAFF ALC soil profile data is given in Appendix C.

1.3.4 This ALC report and the OSMP (ES Appendix 5.3) **[REF: 6.3]** have utilised the detailed (Post-1988) MAFF ALC soil profile data, which is complemented by a desk-based study of climate, geology, topography, flood risk, National Soil Map data, and MAFF provisional (Pre 1988) ALC information, and a detailed ALC survey of the remainder of the Site not covered by the MAFF Post-1988 ALC in the north (i.e., Areas A and B) which is approximately 72.9ha or 26% of the Site in July 2024. The

[2] The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001.

[3] Ministry of Agriculture, Fisheries and Food (October 1988). 'Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land (ALC011)': Available at [redacted]. Accessed October 2024

[4] Natural England (2022) 'Guide to assessing development proposals on agricultural land': Available at https://www.gov.uk/government/publications/agricultural-land-assess-proposals-for-development/guide-to-assessing-development-proposals-on-agricultural-land. Accessed October 2024

location of the 50 auger bores on agricultural land in the ALC study area is shown in Figure 2, and the soil profile information is given in Appendix D.

1.4 Structure of the remainder of this report

1.4.1 The remainder of this report is structured as follows:

- Section 2 – National Planning Policy Framework and Relevant Guidance;
- Section 3 – Agricultural Land Classification; and
- Section 4 – Summary and Conclusions.

2 National Planning Policy Framework and Relevant Guidance

2.1 Background

2.1.1 This section of the report sets out the national planning framework in which to assess the opportunities and constraints to development at the Site in terms of the soil resource and agricultural land quality.

2.2 Overarching National Policy Statement (NPS) for Energy (EN-1) 2024

2.2.1 Paragraph 5.11.12-5.11.13 of EN-1[5] refer to the best and most versatile ('BMV') agricultural land by stating:

'Applicants 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).
Applicants should also identify any effects and seek to minimise impacts on soil…'

2.3 National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) 2024

2.3.1 Of relevance to this report, EN-3[6] states at paragraph 2.10.33 that:

'The Agricultural Land Classification (ALC) is the only approved system for grading agricultural quality in England and Wales and, if necessary, field surveys should be used to establish the ALC grades in accordance with the current, or any successor to it, grading criteria and identify the soil types to inform soil management at the construction, operation, and decommissioning phases in line with the Defra Construction Code[7]'.

2.3.2 EN-3 Paragraph 2.10.34 states that:

'Applicants are encouraged to develop and implement a Soil Resources and Management Plan which could help to use and manage soils sustainably and minimise adverse impacts on soil health and potential land contamination. This should be in line with the ambition set out in the Environmental Improvement Plan to bring at least 40% of England's agricultural soils into sustainable management by 2028 and increase this up to 60% by 2030'.

[5] HM Government (2024). Department for Energy Security and Net Zero (DESNZ). Overarching National Policy Statement (NPS) for Energy (EN-1)

[6] HM Government (2024). DESNZ. Overarching National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3):

[7] HM Government (2009). Department for Environment, Food and Rural Affairs (DEFRA) Code of Practice for the Sustainable Use of Soils on Construction Sites

2.4 Soil Functions and Soil Health

2.4.1 Aims and objectives for safeguarding and, where possible, improving soil health are set out in the Government's *'Safeguarding our soils: A strategy for England"*[8] (henceforth referred to as the 'Soil Strategy for England'). This new Soil Strategy for England, which builds on Defra's *'Soil Action Plan for England (2004-2006)'*, sets out an ambitious vision to protect and improve soil to meet an increased global demand for food and help combat climate change's adverse effects.

2.4.2 Paragraph 1.2 of the Soil Strategy for England states that *'…soil is a fundamental and essentially non-renewable natural resource, providing the essential link between the components that make up our environment. Soils vary hugely from region to region and even from field to field. They all perform a number of valuable functions*[9] *or ecosystem services*[10] *for society.'*

2.4.3 The main soil functions are:

- Food and other biomass production;
- Environmental interaction: storage (including carbon sequestration), filtering, and transformation;
- Biological habitat and gene pool;
- Source of raw materials;
- Physical and cultural heritage; and
- Platform for man-made structures: buildings, highways.

2.4.4 The vision of the Soil Strategy for England has been developed in the Government's 25 Year Plan for the Environment[11]. Soil is recognised as an important national resource, and the Plan states that *'We will ensure that resources from nature, such as food, fish and timber, are used more sustainably and efficiently. We will do this [in part] by: …improving our approach to soil management: by 2030 we want all of England's soils to*

[8] HM Government (2009) DEFRA. Safeguarding our soils: A strategy for England.

[9] ISRIC World Soil Information.

[10] HM Government (2013). DEFRA. Ecosystem Services

[11] HM Government (2018, last updated 2023). DEFRA. A Green Future: Our 25 Year Plan to Improve the Environment

be managed sustainably, and we will use natural capital thinking to develop appropriate soil metrics and management approaches…'.

Soil Health

2.4.5 This part of the report should be read in conjunction with Appendix E '*Soil Health*'.

2.4.6 The maintenance and improvement of soil health is a material consideration when deciding if development is appropriate on agricultural land. Soil health can be defined as *'…a soil's ability to function and sustain plants, animals, and humans as part of the ecosystem.'*

2.4.7 Of relevance to the Proposed Development, the installation of a solar PV array is reversible, i.e., the agricultural land can be returned to its former agricultural productivity once the generation of renewable electricity has ceased, and the solar panels and associated infrastructure is removed.

2.4.8 Land management under solar PV panels as grassland can benefit soil health, as described in Appendix E.

'A healthy soil has a well-developed soil structure, where soil particles are aggregated into soil peds (structural units) separated by pores or voids. This allows the free movement of water (precipitation) through the soil and facilitates gaseous exchange between the plant roots and the air. These soils are well aerated (oxygenated), encouraging healthy plant (crop) growth and an abundance of soil fauna and aerobic microbes. These soils often have high amounts of soil organic matter ('SOM'), associated with accumulated plant and animal matter. They thus are a good store of soil organic carbon ('SOC').'

'The greatest benefits in terms of increased SOM, and hence SOC, can be realised through land use change from intensive arable to grasslands. Likewise, SOM and SOC are increased when cultivation of the land for crops (tillage) ceases and the land is uncultivated (zero tillage). Global evidence suggests that zero tillage results in more total soil carbon storage when applied for 12 years or more. Therefore, there is evidence that conversion of land from arable to grassland which is uncultivated over the long-term (>12 years), such as that under solar PV arrays, increases SOC and SOM.' (see Appendix F).

'Soils are habitats for millions of species, ranging from bacteria, fungi, protozoa, and microscopic invertebrates to mites, springtails, ants, worms, and plants. The soil biota is strongly influenced by land management. Modern farming has led to the loss of soil biodiversity. Changes in land management practice and land use can have significant effects on soil biodiversity over relatively short time scales. Reducing the intensity of management, introducing no-tillage management, and converting arable land to pasture, such as grassland under solar PV arrays, has substantial beneficial effects.' (see Appendix F).

'In well-structured soil, water and air can move freely through cracks and pores.' However, 'a poor soil structure prevents water and air movement and increases the risk of runoff. Soil structure is improved when the land is uncultivated over time (no tillage), and SOM content is increased by accumulating plant material, such as roots, in the soil. SOM's aerobic (oxygenated) decomposition helps bind soil particles together into aggregates (peds). Therefore, the conversion of land that is tilled for arable to long-term grassland (no tillage), such as that under solar PV arrays, improves soil structure over time.' (see Appendix F).

2.5 Best Practice Guidance

2.5.1 This assessment of agricultural land and soil has drawn on best practice guidance set out in the key documents below:

a. BRE National Solar Centre's (2014*) 'Agricultural Good Practice Guidance for Solar Farms'*[12]. This provides best practice guidance on the construction of solar farms;

b. The Institute of Civil Engineering (ICE) provides guidance on assessing agricultural land quality and soil in the '*Environmental Impact Assessment Handbook: A practical guide for planners, developers and communities'*[13];

c. The IEMA has produced a *'New Perspective on Land and Soil in Environmental Assessment'*[14], which encourages *'a new approach to assessing soil functions, ecosystem services and natural capital provided by land and soils'*;

d. Defra has published '*Safeguarding our Soils – A Strategy for England*'[15]. The Soil Strategy was published in tandem with a '*Code of Practice for the Sustainable Use of Soils on Construction Sites*'. The Soil Strategy for England, which builds on Defra's '*Soil Action Plan for England (2004-2006)*', sets out an ambitious vision to protect and improve soil to meet an increased global demand for food and to help combat the adverse effects of climate change;

e. This assessment also considers recent guidance produced by the Soils in Planning Construction Task Force (Lancaster University et al) regarding '*Building on soil sustainability: Principles for soils in planning and construction'*[16]. This report contains guidance for local authorities, contractors, clients, developers, and design teams on managing soil in construction and planning. This guidance for conserving soil resources follows the principles of sustainable development and the circular economy (defined as '*The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as*

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[12] BRE (2014) 'Agricultural Good Practice Guidance for Solar Farms' (Ed J Scurlock)

[13] Askew, R.W. Section 7.4 'Soil' and Section 7.11 'Agricultural Land; in Institute of Civil Engineers (ICE) (2021) 'Environmental Impact Assessment Handbook: A practical guide for planners, developers and communities, Third edition'

[14] Institute of Environmental Assessment and Management (IEMA) (2022) 'A New Perspective on Land and Soil in Environmental Impact Assessment'

[15] HM Government (2009). DEFRA. Safeguarding our soils: A strategy for England'

[16] Soils in Planning Construction Task Force (September 2022) 'Building on soil sustainability: Principles for soils in planning and construction': available [redacted] Accessed October 2024

possible. In this way, the life cycle of products is extended. In practice, it implies reducing waste to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible. These can be productively used again and again, thereby creating further value'[17]); and

f. Best practice for the handling of soil is set out in the Institute of Quarrying (2021) '*Good Practice Guide for Handling Soils in Mineral Workings*' (Sheets A to E are of main relevance to this assessment)[18].

g. The Proposed Development will follow guidance in the '*England Peat Action Plan*[19]', which provides an integrated plan for the management, protection and restoration of our upland and lowland peatlands, so that they deliver benefits for nature and the climate.

[17] European Parliament (2015) Definition of a Circular Economy: available at: [redacted] Accessed October 2024

[18] Institute of Quarrying (2021) 'Good Practice Guide for Handlings Soils in Mineral Workings'

[19] HM Government (2021). DEFRA. England Peat Action Plan'

3 Agricultural Land Classification

3.1 Background

3.1.1 This section of the report sets out the national and local planning framework to assess the opportunities and constraints to development at the Site in agricultural land quality terms.

3.1.2 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:

- Climate;
- Site;
- Soil; and
- Interactive Limitations.

3.1.3 These factors are considered below.

3.2 Climate

3.2.1 Climate data for this study area were derived from the published agricultural climate dataset Climatological Data for Agricultural Land Classification (Meteorological Office 1989)[20] using standard interpolation procedures for 5km grid points around the study area is given in Table 3.1 below.

3.2.2 Parameters used for assessing overall climate are accumulated temperature, a measure of relative warmth, and average annual rainfall, a measure of overall wetness. Regarding the ALC Guidelines, Figure 1 *'Grade according to climate'* on page 6, agricultural land at the Site cannot be graded higher than Subgrade 3b for altitudes between 110m and 130m, and no higher than Grade 4 for altitudes greater than 130m, in the absence of any other limiting factor, i.e., site, soil and/or interactive limitations (see Appendix B also).

[20] Meteorological Office (1989) 'Climatological Data for Agricultural Land Classification: Gridpoint datasets of climatic variables, at 5km intervals, for England and Wales (ALC010)': Available at: [redacted]. Accessed October 2024

Table 3.1: ALC Climate Data for the Site

Climate Parameter	Northeast BGR* NY044242	Central BGR NY046229	Southwest BGR NY412223
Average Altitude (m)	117	144	197
Average Annual Rainfall (mm)	1390	1459	1519
Accumulated Temperature above 0˚C (January – June)	1273	1243	1175
Field Capacity Days (FCD)	294	303	287
Moisture Deficit (mm) Wheat	51	42	40
Moisture Deficit (mm) Potatoes	27	16	33
Grade According to Climate	3b	4	4

*British Grid Reference (BGR)

3.2.3 The average annual rainfall is between 1390mm-1519mm. Agricultural land at the Site is predicted to be at field capacity (i.e., the amount of soil moisture or water content held in the soil after excess water has drained away) for between 287 and 303 Field Capacity Days (‘FCD’) per year, mainly over the late autumn, winter, and early spring. The combination of topsoil texture, drainage status (Wetness Class) of the profile, and number of FCD affects the degree to which agricultural land is limited by soil wetness.

3.2.4 The climate at the Site falls in the >225 FCD category for assessing the ALC grade according to soil wetness (Table 6 of the ALC Guidelines), as described in more detail under *‘interactive limitations’* below.

3.3 The Site

3.3.1 As described in section 1.1, the Site extends to 276.5ha. The Site's location and boundary are shown in Figure 1 and Appendix A.

3.3.2 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:

- Gradient;
- Micro-relief (i.e., complex change in slope angle over short distances); and
- Risk of flooding.

Gradient and micro-relief

3.3.3 The land at the Site is located on a north-facing slope with the highest elevation in the southwest corner (BGR NY041223) at an approximate elevation of 197mAOD.

3.3.4 The altitude of the land descends towards the centre at approximately 144mAOD (BNG NY046229). The lowest elevation occurs in the northeast (BNG NY044242) at approximately 117mAOD.

3.3.5 The quality of agricultural land at the Site is limited by gradient southern end of Area C (i.e., 16°-30°, Appendix B). The gradient can limit agricultural land quality to Subgrade 3b (i.e., >7°-11°), Grade 4 (i.e., >11°-18°), or Grade 5 (i.e., >18°), as per Table 1 of the ALC Guidelines. It is also very likely that the quality of agricultural land at the Site is limited by micro-relief in parts of the Site, i.e., complex changes in slope angle and direction over short distances, and/or due to the presence of boulders or rock outcrops, even on level ground or gentle slopes, that severely limit the use of agricultural machinery.

Flood limitation

3.3.6 From the Government's Flood Map for Planning website[21], the Site is mainly in Flood Zone 1, with a low risk of flooding. The ALC Guidelines take account of the frequency, duration, and timing of flooding in the summer and winter (Table 2 *'Grade according to flood risk in summer'* and/or Table 3 *'Grade according to flood risk in winter'*). There is no evidence the grade of agricultural land at the Site is limited by flood risk during the summer or winter following the ALC Guidelines.

[21] Government Flood Map for Planning: Available at: https://flood-map-for-planning.service.gov.uk/. Accessed October 2024

3.4 Soil

Geology/soil parent material/soil association

3.4.1 British Geological Survey ('BGS') information available online[22] has been used to identify the Bedrock underlying the Site and any Superficial (Drift) Deposits over the Bedrock. This information helps to determine the parent material from and within which a soil has formed.

3.4.2 The BGS information indicates that the Site is underlain predominantly by mudstone, siltstone, and sandstone in the Pennine (Lower and Middle) Coal Measures Formation. There are narrow bands of sandstone within the Pennine Middle Coal Measures Formation. A pocket of land in the southeast of Area C (BGR NY053229) is underlain by mudstone, siltstone, and sandstone in the Stainmore Formation. The highest land in the Site's southern end (within Area C) is underlain by sandstone in the Whitehaven Sandstone Formation.

3.4.3 In turn, the bedrock is predominantly covered by glacial till (Devensian, Diamicton), but there are large pockets over the Site in Areas A-D where no superficial deposits are recorded/no information. There are two narrow and isolated pockets of peat in the southwest of Area C, i.e., BGR NY040232 and BGR NY046223. There are two small pockets of Alluvium (clay, silt, sand, and gravel) in Area C of the Site near Rigg House (off-Site to the east) at BNG NY049236, and in the southeast NY051227 near a watercourse near to, or a tributary of, Thief Gill, at the base of a steep slope in Area C of the Site.

[22] British Geological Survey. Geology Viewer: Available at [redacted] Accessed October 2024

Published information on soil

3.4.4 The National Soil Map[23] shows that soils in the Brickfield 3 Association predominantly cover agricultural land at the Site. A pocket of soil in the Rivington 2 Association has developed from the sandstone in the southwest corner of the Site, within Area C. There is a narrow band of soil in the Wilcock 1 Association along the southern boundary of Area C, to the south of Thief Gill, on land underlain by peat.

3.4.5 As described by the Soil Survey of England and Wales ('SSEW')[24], the Brickfield 3 Association consists of:

'…predominantly of loamy and clayey surface-water gley soils belonging to the Brickfield, Dunkeswick and Hallsworth series. It is widespread throughout Northern England…usually below 250 m O.D on gentle to moderate slopes. The parent material is a greyish till or Head derived from Carboniferous and other Palaeozoic sandstones and shales. The loamy textures are due to the preponderance of sandstone in the drift. Greater proportions of shale give rise to more clayey drift. Brickfield soils, cambic stagnogley soils, are clay loam throughout and commonly contain many sandstones or, locally shales; at lower altitudes hard igneous and other erratic stones are also present. Stone content frequently increases with depth…The main soils are seasonally waterlogged (Wetness Class IV) but, with satisfactory drainage, may be in Wetness Class III where the annual rainfall is less than about 900 mm. They have slowly permeable loamy and clayey subsurface horizons which cause surface waterlogging'.

3.4.6 The SSEW describes how the Rivington 2 Association consists of:

'…loamy brown earths and brown podzolic soils over Palaeozoic, predominantly Carboniferous, sandstones and shales' '…moderate to steep valley sides, hills, and ridges'. [Elevations are primarily below 450 mAOD]. The climate is 'cold and wet in the uplands but milder and drier in the foothills and lowlands. The two soils which dominate the association, the Rivington series, typical brown earth, and the Withnell series, typical brown podzolic soils, are both coarse loamy, well-drained, and overlie hard sandstone within 80 cm. The subsidiary fine loamy Heapey series, stagnogleyic brown earths, overlies shale and is occasionally waterlogged…The major soils are well drained (Wetness Class I), but the Heapey series is seasonally waterlogged (Wetness Class III). Excess winter rainwater generally passes rapidly downwards through the permeable subsoil, although there is some run-off on steep slopes'.

3.4.7 The SSEW describes how the Wilcocks 1 Association:

'…contains strongly gleyed soils with peaty or humose topsoils. These are the loamy Wilcocks series and the fine loamy over clayey Kielder series (both cambic stagnohumic gley soils) and the coarse loamy Fordham series of the

[23] Cranfield University (2023) Soil site report, Soil Report for location 304713E, 523575N, 3km x 3km, Cranfield University

[24] Soil Survey of England and Wales, National Soil Resource Institute, Cranfield University (2023). The Soils Guide: available at: [redacted] Accessed October 2023

typical humic gley soils. They are seasonally waterlogged, stony soils in greyish drift derived from Carboniferous and Lower Palaeozoic rocks, occurring on gentle to moderate slopes…The Wilcocks series has an acid organic surface layer 10 to 40 cm thick, with underlying clay loam or sandy clay loam horizons which are grey and strongly mottled, although the mineral layer immediately below the peat is normally stained with organic matter. The Kielder series is similar but becomes clayey at depth. Unlike these soils, the Fordham series is sandy loam and gleying is not caused by a slowly permeable subsoil but by high groundwater levels. Stone content frequently increases with depth; stones are often sandstones and gritstones but may be shale fragments, or occasionally igneous and other erratics.…The main soils are severely waterlogged near the surface (Wetness Class V or VI), the wetness being due to a combination of high rainfall, slowly permeable subsoil, gentle relief, and a flow of water from the nearby Winter Hill and Belmont associations. Winter rainwater is not absorbed and runs off rapidly. The soils are not droughty because of their large available water capacity and the low moisture deficits in the districts where they occur.'

ALC and soil surveys

3.4.8 A log of the soil profiles recorded by MAFF on Site is given in Appendix C. MAFF report (Appendix B) that in the central part of the *Site '… the underlying Coal Measures are largely hidden by a superficial layer of glacial and post glacial drift. This consists mainly of medium to heavy textured, moderately stony boulder clay. Topsoils tend to be of medium, sometimes peaty clay loam, over a clay loam or sandy clay loam, slowly permeable subsoil (Soil Wetness Class IV or V). Moderate stoniness is common throughout many soil profiles and often makes augering below 80 cm depth difficult.'*

3.4.9 MAFF describes (Appendix B) how soils on higher ground in Area C of the Site have *'steeply sloping escarpments'* which are *'… underlain by Coal Measure shales at the foot of the hillside and by the reddish Whitehaven Sandstone on the higher ground. Soils on the Coal Measure consists of medium or heavy, sometimes humose clay loam topsoils over gleyed, slowly permeable clay or shale subsoils (Wetness Class V). Soils on the sandstone vary from deep peat (Wetness Class VI) to thin peaty soils over sandstone rubble.'*

3.4.10 A log of the 50 auger bores examined by Askew Land & Soil Limited in July 2024 is given in Appendix D.

3.5 ALC Grading at the Site

3.5.1 MAFF (Appendix B) has determined that *'Subgrade 3b land is widespread on the lower lying land in the north. Topsoils consist of medium clay loam or silty clay loam over a similar or heavier textured slowly permeable subsoil (Wetness Class IV). Soil wetness along with the overriding climatic limitation are the principal limiting factors on this land.'*

3.5.2 MAFF (Appendix B) has also determined that *'Grade 4 land occurs across the central part of the site below the escarpment and as smaller areas on the high ground adjoining the southern boundary. Soils on the lower lying land are similar to those in the subgrade 3b area, but are limited to Grade 4 by the overall climatic limitation applying to all land above 135 m a.o.d. On the higher ground soils consist generally of thin peaty topsoils over relatively free draining sandy loam or sandstone rubble. These are also restricted to Grade 4 by the overall climatic limitation. The smaller area of Grade 4 land in the northwest corner is restricted to this grade by wetness.'*

3.5.3 Finally, MAFF (Appendix B) has determined that land in Grade 5 *'…occurs mainly on the sandstone area in the south. Soils on the gently and moderately sloping areas consists of deep peat or peaty topsoils over waterlogged gleyed slowly permeable heavy clay loam subsoils. Soils of this type fall within wetness Class VI and are restricted to the Grade by severe wetness problems which are very difficult to remedy. On the very steeply sloping ground, especially in Thief Gill, soils are relatively well-drained, but are restricted to Grade 5 by slopes in excess of 18.'*

3.5.4 The area of land in each ALC grade has been determined from the MAFF Post 1988 ALC Survey (Appendix B) and complemented by a desk-based prediction of ALC grades from the climate, geology, topography, flood, soil, and MAFF provisional (Pre 1988) ALC information in Section 3.0 of this report.

3.5.5 For the approximately 72.9ha of land within the northern part of the Site, i.e., Areas A and B of the Site, north of the Gilgarran Road and south of the Branthwaite Road, all the agricultural land is developed on Brickfield 3 soil (loamy and clayey surface-water gley soils in Wetness Class IV) and has an altitude below 130m (i.e., overriding climate limitation to Subgrade 3b). From the information earlier in this Section, and from the assessment of 50 auger bores on agricultural land (see Figure 2 and Appendix D), it has been determined that the land is limited by soil wetness to mainly Grade 4 (i.e., 294 FCD, heavy clay loam topsoil, and slowly permeable clay subsoil that is seasonally waterlogged for long periods over the winter in Wetness Class IV), with some Subgrade 3b(i.e., 294 FCD, medium clay loam topsoil, and slowly permeable clay subsoil that is seasonally waterlogged for long periods over the winter in Wetness Class IV). The remainder of the land (Area D) is classified as non-agricultural/other land, which includes roads, woodland, scrub/trees, and wind turbine infrastructure (i.e., turbines, roads, and hard standing).

3.5.6 The land area in each ALC grade has been measured from a composite ALC map given in Figure 1, and the area (ha) and proportion (% of the Site) are given in Table 3.2.

Table 3.2: Composite ALC Grading for the Site

ALC Grade	MAFF Post 1988 ALC of Area C (Ha) (see Appendices B and C)	Detailed ALC in July 2024 Area of Areas A and B (Ha) (see Appendix D)	Total Area (Ha)	Total Area (%)
Grade 1 (Excellent)	0	0	0	0
Grade 2 (Very Good)	0	0	0	0
Subgrade 3a (Good)	0	0	0	0
BMV Agricultural Land, i.e., total ALC Grade 1, Grade 2, and Subgrade 3a	*0*	*0*	*0*	*0*
Subgrade 3b (Moderate)	41.7	7.3	49	17.5
Grade 4 (Poor)	128.7	50.1	178.8	64.0
Grade 5 (Very Poor)	35.1	0	35.1	12.6

ALC Grade	MAFF Post 1988 ALC of Area C (Ha) (see Appendices B and C)	Detailed ALC in July 2024 Area of Areas A and B (Ha) (see Appendix D)	Total Area (Ha)	Total Area (%)
Other Land / Non-agricultural (e.g., roads, woodland)	1.1	15.5	16.6	5.9
Total	**206.6**	**72.9**	**279.5**	**100**

4 Summary and Conclusions

4.1.1 This ALC report was commissioned by the Applicant to determine the quality of agricultural land at the Site for the Proposed Development. The assessment was made following the Agricultural Land Classification system for England and Wales (see 'Methodology' in section 1.3).

4.1.2 BGS information indicates the Site is underlain by predominantly by mudstone, siltstone, and sandstone in the Pennine (Lower and Middle) Coal Measures Formation. There are narrow bands of sandstone within the Pennine Middle Coal Measures Formation. A pocket of land in the southeast (BGR NY053229) is underlain by mudstone, siltstone, and sandstone in the Stainmore Formation. The highest land in the Site's southern end is underlain by sandstone in the Whitehaven Sandstone Formation.

4.1.3 In turn, the bedrock is predominantly covered by glacial till (Devensian, Diamicton), but there are large pockets over the Site where no superficial deposits are recorded/no information. There are two narrow and isolated pockets of peat in the southwest of Area C, i.e., BGR NY040232 and BGR NY046223. There are two small pockets of Alluvium (clay, silt, sand, and gravel) in Area C of the Site, near Rigg House (off Site to the east) at BNG NY049236, and in the southeast (Area C) NY051227 near a watercourse near to, or a tributary of, Thief Gill, at the base of a steep slope.

4.1.4 The National Soil Map shows that agricultural land at the Site is predominantly covered by soils in the Brickfield 3 Association. There is a pocket of soil in the Rivington 2 Association, which has developed from the sandstone in the southwest corner of the Site (Area C). There is a narrow band of soil in the Wilcock 1 Association along the southern boundary on land underlain by peat.

4.1.5 MAFF has carried out a detailed (Post-1988) ALC and soil survey of Area C which is approximately 206.6ha (or approximately 74%, or nearly three-quarters of the Site) in 1990. A copy of the MAFF ALC report is given in Appendix B, and the MAFF ALC soil profile data is given in Appendix C.

4.1.6 The area of land in each ALC grade has been determined from the MAFF Post 1988 ALC Survey (Appendix B) and complemented by a desk-based prediction of ALC grades from the climate, geology, topography, flood, soil, and MAFF provisional (Pre 1988) ALC information in section 3 of this report.

4.1.7 For the approximately 72.9ha of land within the northern part of the Site, i.e., Areas A and B, south of the Branthwaite Road and north of the Gilgarran Road, all of the agricultural land is developed on Brickfield 3 soil (loamy and clayey surface-water gley soils in Wetness Class IV). It has an altitude below 130m (i.e., overriding climate limitation to Subgrade 3b). From the information earlier in this section, and from the assessment of 50 auger bores on agricultural land (see Figure 2 and Appendix D), it has been determined that the land is limited by soil wetness to mainly Grade 4 (i.e., 294 FCD, heavy clay loam topsoil, and slowly permeable clay subsoil that is seasonally waterlogged for long periods over the winter in Wetness Class IV), with some Subgrade 3b (i.e., 294 FCD, medium clay loam topsoil, and slowly permeable clay subsoil that is seasonally waterlogged for long periods over the winter in Wetness Class IV). The remainder of the land is classified as non-agricultural/other land (Area D), which includes roads, woodland, scrub/trees, and wind turbine infrastructure (i.e., turbines, roads, and hard standing).

4.1.8 The land area (ha) in each ALC grade has been measured from a composite ALC map in Figure 1. It has been determined the Site is predominantly classified as Grade 4, i.e., approximately 178.8ha (or 64% of the Site). A further approximately 49.0ha (or 17.5% of the Site) is Subgrade 3b, and approximately 35.1ha (or approximately 12.6% of the Site) is Grade 5. The remainder of the Site was classified as non-agricultural/other land consisting of roads, woodland, scrub/trees, and wind turbine infrastructure (i.e., 16.6ha, or 5.9% of the Site). This Site does not have any Best and Most Versatile (BMV) agricultural land in ALC Grades 1, 2, or Subgrade 3a.

4.1.9 The Proposed Development would follow best practices for soil management to help improve soil health, such as:

- Increasing SOM, and hence SOC;
- Increasing soil biodiversity; and
- Improving soil structure.

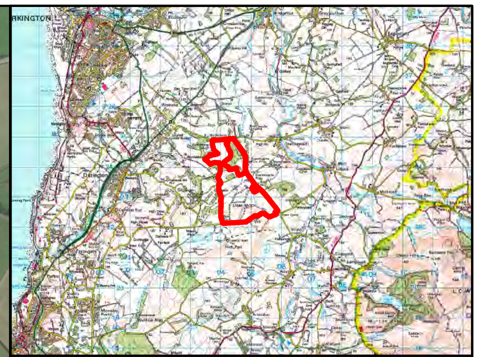
4.1.10 This is consistent with aims and objectives for improving soil health in the Government's 25 Year Plan for the Environment and the Soils in Planning Construction Task Force's (including Cornwall Council, Lancaster University, and The Landscape Institute et al) *'Building on soil sustainability: Principles for soils in planning and construction'.*

4.1.11 The impact of the Proposed Development on agricultural land and soils is considered a potentially reversible, temporary, albeit relatively long-term, and typically time-limited development. It would have a much lower impact than a permanent built development, including soil sealing and permanent loss of agricultural land.

4.1.12 The Proposed Development will allow for continued agricultural use where applicable and/or encourage biodiversity improvements around arrays. A DCO Requirement will secure appropriate agricultural land management and biodiversity enhancement during the operational lifetime of the Proposed Development and thus retain some degree of agricultural use, as well as requiring the Site to be decommissioned and restored to its former condition and ALC grade when the operational phase expires.

4.1.13 It is considered that the inherent soil, site, and climatic properties required to determine the ALC grade would remain unaffected by the Proposed Development and not alter the ALC grade in the long term. Therefore, the reversible Proposed Development on agricultural land at this Site would not significantly harm national agricultural interests in terms of paragraph 5.11.12-5.11.13 of EN-1 and 2.10.33 of EN-3 (See section 2.0).

Figures



Legend

Order Limits

Agricultural Land Classification (ALC) Grades: Post 1988 Survey

Grade 3b

Grade 4

Grade 5

Other

Project Title

Dean Moor Solar Farm

Client

FVS Dean Moor Limited

Title

DEAN MOOR SOLAR FARM
DEVELOPMENT CONSENT ORDER
Composite ALC

Scale: 1:12,500 @ A3	Date: 24/10/2024
Drawn: TL	Checked: JL
Figure: 1	Rev: A

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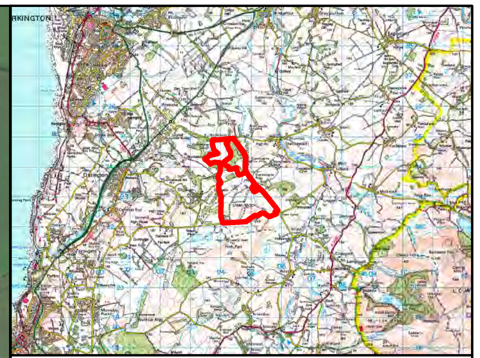

Legend

- Order Limits
- Study Area
- Augur Location
- Augur and Topsoil Sample Location
- Soil Pit

Project Title

Dean Moor Solar Farm

Client

FVS Dean Moor Limited

Title

DEAN MOOR SOLAR FARM
DEVELOPMENT CONSENT ORDER
Augur and Soil Pit Locations -
North Area, July 2024

Scale: 1:7,500 @ A3	Date: 24/10/2024
Drawn: TL	Checked: JL
Figure: 2	Rev: A

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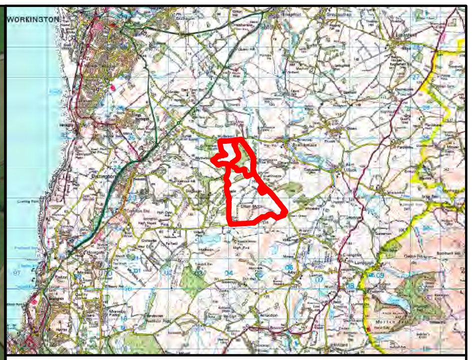
Appendix A Site Boundary



Legend

- Order Limits
- Road
- Field Area A
- Field Area B
- Field Area C
- Field Area D
- Potato Pot Wind Farm

Project Title

Dean Moor Solar Farm

Client

FVS Dean Moor Limited

Title

DEAN MOOR SOLAR FARM
DEVELOPMENT CONSENT ORDER

Solar Farm Area Plan

Scale: 1:12,500 @ A3	Date: 22/10/2024
Drawn: TL	Checked: JL
Figure: 3.1	Sheet 1 of 1 — Rev: A

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Appendix B Agricultural Land Classification detailed Post 1988 ALC Survey, Branthwaite, Dean Moor (Ref. 2FCS 50Y9, September 1990)

AGRICULTURAL LAND CLASSIFICATION

CUMBRIAN COAL LOCAL PLAN

DEAN MOOR, BRANTHWAITE

MAFF LEEDS REGIONAL OFFICE

September 1990

Ref 2FCS 50/9

Lds.AL2.Dean.Moor

CONTENTS

MAP

AGRICULTURAL LAND CLASSIFICATION

CUMBRIAN COAL LOCAL PLAN:- DEAN MOOR, BRANTHWAITE, CUMBRIA

1. Introduction and Site Characteristics

Dean Moor is located about 7 km south east of Workington centred around grid reference NY 047230, immediately south of the existing Potato Pot open cast coal site. The eastern, northern and southern boundaries are formed by the minor roads, whilst woodland forms much of the western boundary. It covers a total area of 206.6 hectares, nearly all of which is currently in agricultural use.

ALC survey work was carried out in September 1990 when soils were examined using hand auger borings at points predetermined by the National Grid. The density of borings was one per hectare. In addition small soil examination pits were dug to study soil structure in more detail.

1.1 Relief and Climate

Average altitude is about 140 m a.o.d. but ranges from a minimum of 110 m a.o.d. on the northern boundary to a maximum of 210 m a.o.d. on the southern edge of the site.

Salient climatic parameters at Dean Moor vary according to altitude and are as follows:-

Altitude (m)		110	130	200
Average Annual Rainfall (mm)		1359	1418	1627
Accumulated Temperature above 0°C (Jan-June)		1282	1259	1180
Field Capacity Days		289	297	327
Moisture Deficit (mm)	Wheat	53	46	25
	Potatoes	30	21	0

The above combinations of rainfall and temperature place an overall climatic limitation of subgrade 3b on land between 110 m and 130 m a.o.d and Grade 4 on land above 130 m a.o.d.

Relief is moderately undulating on the central and northern parts of the site and slopes are rarely steep enough to limit the use of agricultural machinery. The southern part of the site, however, consists of a steeply to very steeply sloping (16-30°) north facing hillside cut by a narrow gill with precipitous slopes exceeding 36°. In much of this area gradient imposes an overall limitation on ALC grade.

1.2 Geology, Soils and Drainage

North of the hillside forming the southern part of the site, the underlying Coal Measures are largely hidden by a superficial layer of glacial and post glacial drift. This consists mainly of medium to heavy textured, moderately stony boulder clay. Topsoils tend to be of medium, sometimes peaty clay loam, over a clay loam or sandy clay loam, slowly permeable subsoil (Soil Wetness Class IV or V). Moderate stoniness is common throughout many soil profiles and often makes augering below 80 cm depth difficult.

The steeply sloping escarpment in the south is underlain by Coal Measure shales at the foot of the hillside and by the reddish Whitehaven Sandstone on the higher ground. Soils on the Coal Measure consists of medium or heavy, sometimes humose clay loam topsoils over gleyed, slowly permeable clay or shale subsoils (Wetness Class V). Soils on the sandstone vary from deep peat (Wetness Class VI) to thin peaty soils over sandstone rubble.

1.3 Land Use

The northern and eastern lower lying parts of the site, below about 150 m a.o.d, are almost all under productive improved pasture. The high ground in the south consists largely of rough moorland vegetation containing a few partially improved areas. There is also an area of rough boggy ground in the north west corner of the site and a small patch of newly planted woodland in the central northern area.

1.4 Agricultural Land Classification

1.4.1 Subgrade 3b (41.7 hectares, 20% of total area)

Subgrade 3b land is widespread on the lower lying land in the north. Topsoils consist of medium clay loam or silty clay loam over a similar or heavier textured slowly permeable subsoil (Wetness Class IV). Soil wetness along with the overriding climatic limitation are the principal limiting factors on this land.

1.4.2 Grade 4 (128.7 hectares, 62.5% of total area)

Grade 4 land occurs across the central part of the site below the escarpment and as smaller areas on the high ground adjoining the southern boundary. Soils on the lower lying land are similar to those in the subgrade 3b area, but are limited to Grade 4 by the overall climatic limitation applying to all land above 135 m a.o.d. On the higher ground soils consist generally of thin peaty topsoils over relatively free draining sandy loam or sandstone rubble. These are also restricted to Grade 4 by the overall climatic limitation. The smaller area of Grade 4 land in the north west corner is restricted to this grade by wetness.

1.4.3 Grade 5 (35.1 hectares, 17% of total area)

Land in this Grade occurs mainly on the sandstone area in the south. Soils on the gently and moderately sloping areas consists of deep peat or peaty topsoils over waterlogged gleyed slowly permeable heavy clay loam subsoils. Soils of this type fall within Wetness Class VI and are restricted to the Grade by severe wetness problems which are very difficult to remedy. On the very steeply sloping ground, especially in Thief Gill, soils are relatively well drained, but are restricted to Grade 5 by slopes in excess of 18°.

1.4.4 Non Agricultural Land (1.1 hectares) 0.5% of total area.

This consists of the area of newly planted woodland in the central northern part of the site.

Resource Planning Group
Leeds Regional Office

CUMBRIAN COAL LOCAL PLAN
DEAN MOOR, BRANTHWAITE

Agricultural Land Classification

Agricultural Land

Agricultural Grades		Agricultural Land Quality	Area within the site (ha.)
Grade 1		*Excellent*	Nil
Grade 2		*Very Good*	Nil
Grade 3	Sub-Grade 3a	*Good*	Nil
	Sub-Grade 3b	*Moderate*	41·7
Grade 4		*Poor*	128·7
Grade 5		*Very Poor*	35·1

Land in Other Categories

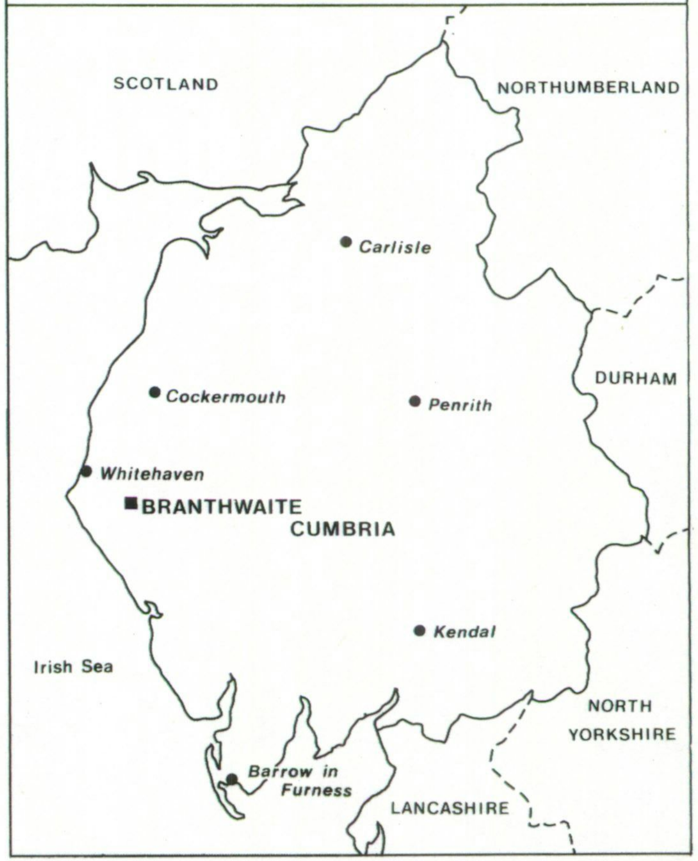
		Area within the site (ha.)
Urban *Including housing industry, commerce, derelict land, sports facilities, transport.*		Nil
Non-agricultural *Including golf courses, parks, sports fields, allotments, airfields.*		Nil
Woodland *Farm woodland*	W	1·1
Commercial woodland		Nil
Agricultural buildings *Including glasshouses*		Nil
Open water		Nil
Land not surveyed		Nil

SCALE–1:10,000

100 0 100 200 300 400 500 600 700

Metres

Location Map

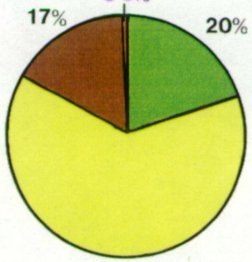


Ministry of Agriculture, Fisheries and Food.

Statistics

Area of Agricultural Land : 205·5 ha.

Area of Other Land: 1·1 ha.



Method of Classifying Agricultural Land

1 The physical limitations to agriculture are assessed: CLIMATE, TOPOGRAPHY, SOIL

2 The most limiting factor is identified and it's degree of limitation assessed: NO or MINOR → VERY SEVERE

3 The degree of limitation determines: FINAL AGRICULTURAL GRADE

Further details contained in revised Agricultural Land Classification MAFF 1988

Information compiled by Resource Planning Group, Farm and Countryside Service, Leeds R.O.
Map produced by Resource Planning Cartographic Unit.
Project Number **84/90**

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SOURCE MAPS	
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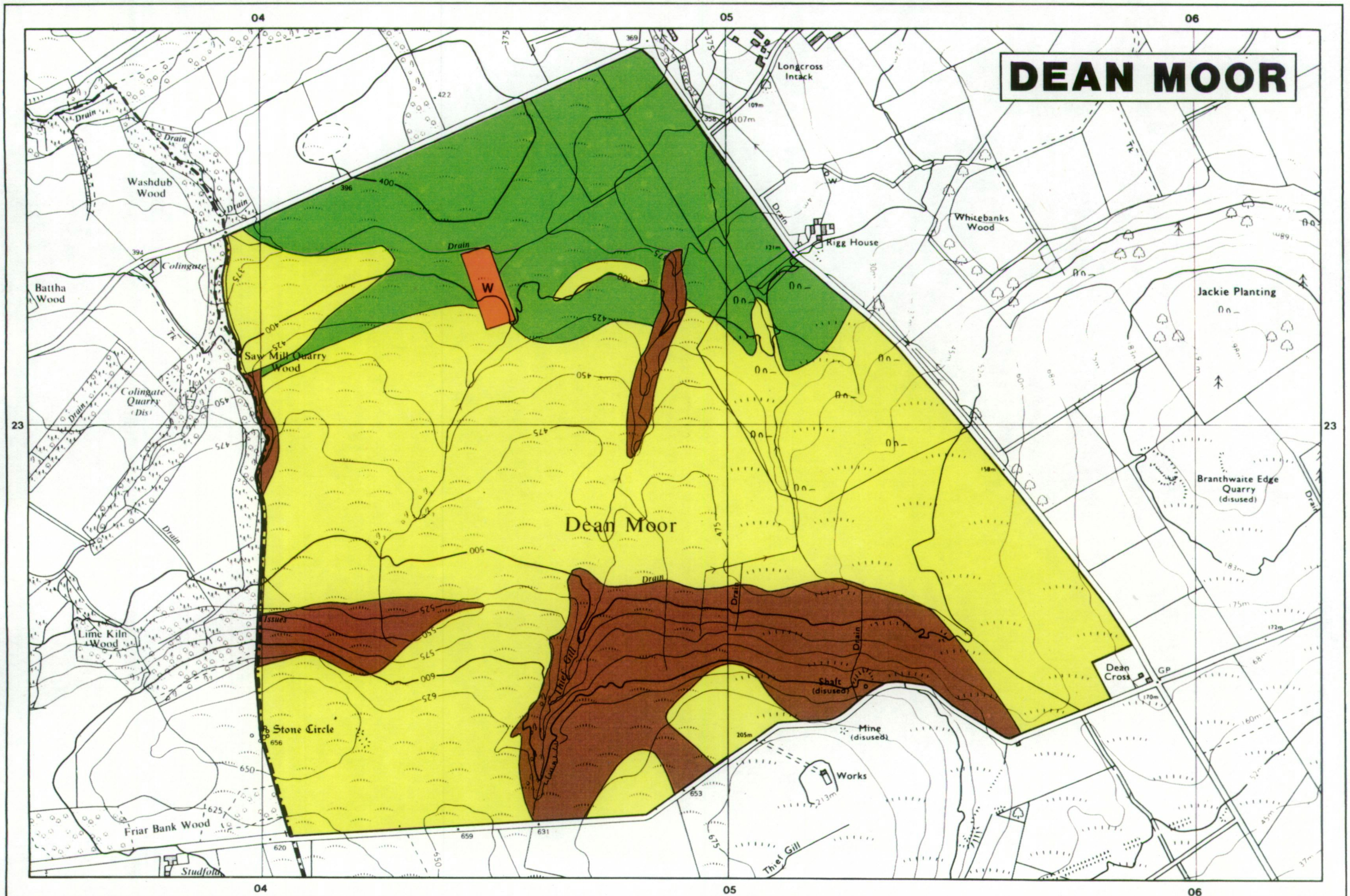
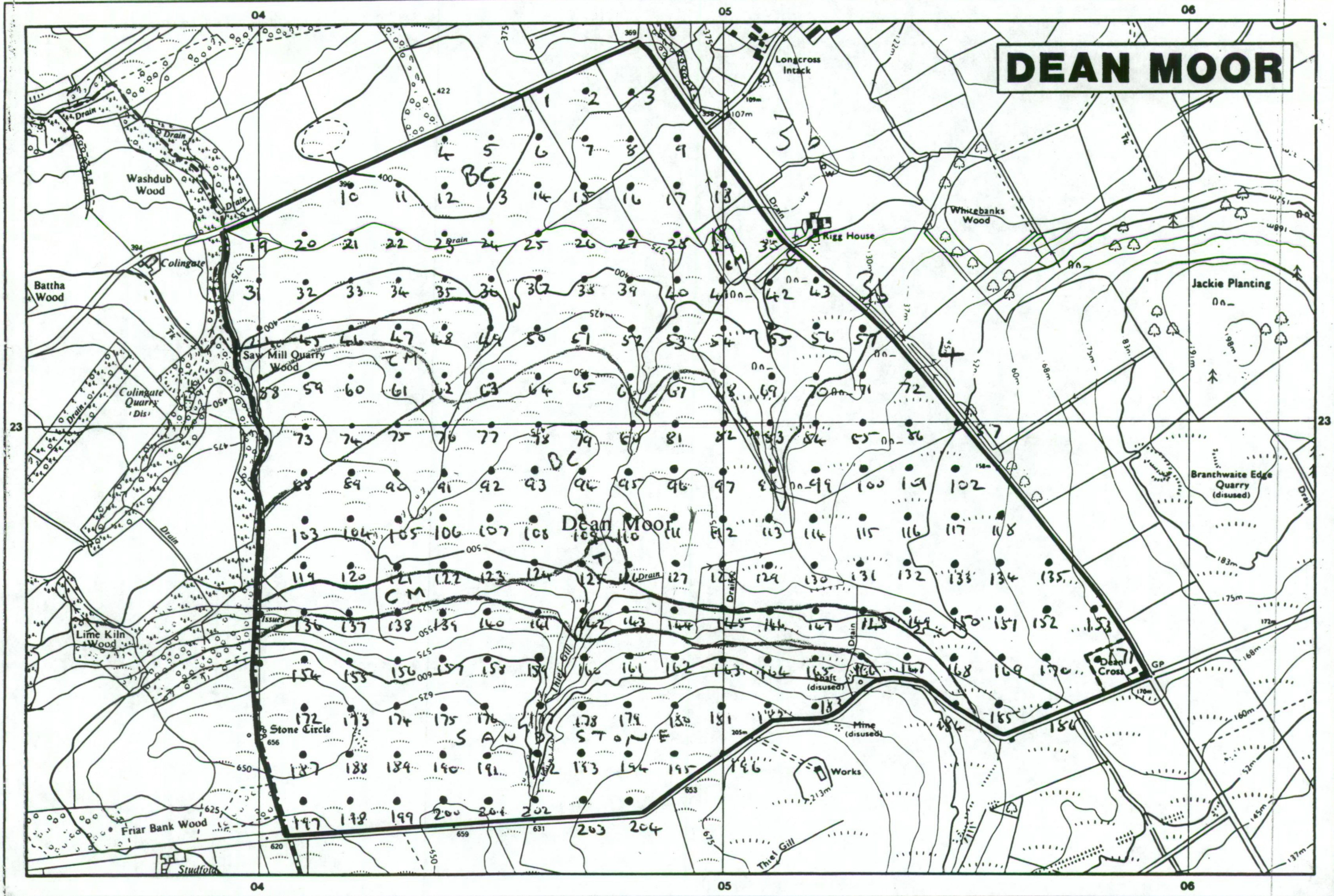
NY02 SW	NY02 SE



DEAN MOOR
Dean Moor
Washdub Wood
Battha Wood
Colingate
Colingate Quarry (Dis)
Saw Mill Quarry Wood
Lime Kiln Wood
Friar Bank Wood
Studfold
Stone Circle
Issues
Thief Gill
Shaft (disused)
Mine (disused)
Works
Dean Cross
GP
Longcross Intack
Rigg House
Whitebanks Wood
Jackie Planting
Branthwaite Edge Quarry (disused)
Drain
W
04
05
06
23



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Appendix C MAFF ALC08490 Soil Profile Logs

JOBNO	SOILPIT	PROFILE	GRIDREF	LANDUSE	IMPERM	WETNESS	WORKAB	STONES2	STONES26	STONES62I	STONES20	LITH	GRADIENT	MICROREL	ASPECT	FROST	EXPOSURE	FLOODFRE	FLOODSEA	FLOODDUI	DISTURBEI	CHEMPROI	EROSION	ALCGRADE	AWC	COMMENTS
		102		GS	25	5	0	0	0	0	0		1											4		
		101		GS	25	5	0	0	0	0	0		1											4		
		100		GS	30	5	0	0	0	0	0		1											4		
		099		GS	30	5	0	0	0	0	0		2											4		
		098		RSH	0	1	0	0	0	0	0		1											5		
		097		GS	25	5	0	0	0	0	0		2											4		
		096		GS	30	5	0	0	0	0	0		3											4		
		095		GS	0	1	0	0	0	0	0		4											4		
		094		GS	25	5	0	0	0	0	0		4											4		
		093		GS	30	5	0	0	0	0	0		2											4		
		092		GS	30	5	0	0	0	0	0		3											4		
		091		GS	0	1	0	0	0	0	0		2											4		
		090		GS	30	5	0	0	0	0	0		2											4		
		089		GS	35	4	0	0	0	0	0		2											4		
		088		GS	35	4	0	0	0	0	0		1											4		
		119		BOG	25	5	0	0	0	0	0		5											45		
		120			20	5	0	0	0	0	0		3											45		
		121		GS	30	5	0	0	0	0	0		2											4		
		122		GS	25	5	0	0	0	0	0		2											4		
		123		GS	35	4	0	0	0	0	0		3											4		
		124		GS	35	5	0	0	0	0	0		7											4		
		125		GS	28	5	0	0	0	0	0		11											4		
		202		PAS	40	4	0	0	0	0	0		1											4		
		201		GS	35	4	0	0	0	0	0		1											4		
		200		PAS	0	1	0	0	0	0	0		2											4		
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		191		PAS	60	4	0	0	0	0	0		5											4		
		192		PAS	0	1	0	0	0	0	0		38											4		
		177		PAS	0	1	0	0	0	0	0		40											4		
		176		PAS	50	4	0	0	0	0	0		1											4		
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		156		PAS	50	4	0	0	0	0	0		14											4		
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		069		GS	30	4	0	0	0	0	0		3											4		
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		043		GS	30	4	0	0	0	0	0		3											3B		
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		036			0	0	0	0	0	0	0		0													
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		034		GS	45	4	0	0	0	0	0		4											3B		
		033		GS	0	1	0	0	0	0	0		9											3B		
		032			30	5	0	0	0	0	0		0											4		
		059		GS	35	4	0	0	0	0	0		2											4		
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		056			40	4	0	0	0	0	0		4											3B		
		055		PP	0	3	0	0	0	0	0		3											3B		
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		048		PPS	20	5	0	0	0	0	0		4											4		
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		044		RGF	70	4	0	0	0	0	0		4											4		
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		076		PP	20	5	0	0	0	0	0		4											4		
		077		PP	20	5	0	0	0	0	0		4											4		
		078		PP	20	5	0	0	0	0	0		2											4		
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		142		RGR	10	5	0	0	0	0	0		30											5		
		160		RGR	10	5	0	0	0	0	0		25											5		
		178		RGR	0	5	0	0	0	0	0		9											5		
		193		RGR	0	5	0	0	0	0	0		2											5		
		203		RGR	0	5	0	0	0	0	0		2											5		
		204		RGR	0	3	0	0	0	0	0		0											4		
		195		RGR	0	6	0	0	0	0	0		0											5		
		180		RGR	0	3	0	0	0	0	0		3											4		
		179		RGR	0	6	0	0	0	0	0		0											5		
		162		RGR	0	5	0	0	0	0	0		5											5		
		161		RGR	0	5	0	0	0	0	0		7								5					
		144		RGR	0	5	0	0	0	0	0		10											5		
		127		RGR	0	5	0	0	0	0	0		4											4		
		183		RGR	0	5	0	0	0	0	0		10											5		
		182		RGR	0	2	0	0	0	0	0		8											4		
		181		RGR	0	2	0	0	0	0	0		0											4		
		196		RGR	0	2	0	0	0	0	0		1											4		
		163		RGR	0	2	0	0	0	0	0		8											4		
		164		RGR	0	5	0	0	0	0	0		11											5		
		165		RGR	0	2	0	0	0	0	0		13											4		
		166		RGR	0	5	0	0	0	0	0		36											5		
		148		RGR	10	5	0	0	0	0	0		5											4		
		147		RGR	10	5	0	0	0	0	0		13											45		
		146		RGR	60	4	0	0	0	0	0		18											5		
		145		RGR	65	4	0	0	0	0	0		22											5		
		128		RGR	10	5	0	0	0	0	0		2											4		
		129		RGR	20	5	0	0	0	0	0		1											4		
		130		LEY	20	5	0	0	0	0	0		3											4		
		131		LEY	60	4	0	0	0	0	0		0											4		
		072		PP	35	4	0	0	0	0	0		3											4		
		071		PP	25	5	0	0	0	0	0		4											4		
		018		PP	35	4	0	0	0	0	0		3											3B		
		017		PP	45	4	0	0	0	0	0		0											3B		
		016		LEY	40	4	0	0	0	0	0		0											3B		

015		PP	0	4	0	0	0	0	0	3		B4	
014		PP	20	5	0	0	0	0	0	4			4
013		PP	20	5	0	0	0	0	0	5		4B	
012		PP	45	4	0	0	0	0	0	4		3B	
011		PP	35	4	0	0	0	0	0	3		3B	
010		PP	15	5	0	0	0	0	0	3			4
031		RGR	15	5	0	0	0	0	0	2			4
058		PPS	85	2	0	0	0	0	0	3			4
030			0	0	0	0	0	0	0	0		3B	
029		P	30	4	0	0	0	0	0	1		3B	
009		P	30	4	0	0	0	0	0	1		3B	
008		P	50	4	0	0	0	0	0	1		3B	
007		P	0	2	0	0	0	0	0	2		3A	
006		P	40	4	0	0	0	0	0	6		3B	
005		P	30	0	0	0	0	0	0	3		3B	
004		P	30	4	0	0	0	0	0	1		3B	
019		P	50	4	0	0	0	0	0	2		3B	
020		P	30	4	0	0	0	0	0	2		3B	
021			0	0	0	0	0	0	0	0		3B	
022		P	35	3	0	0	0	0	0	2		3B	
023		P	55	4	0	0	0	0	0	2		3B	
025		P	0	3	0	0	0	0	0	2		3B	
025			0	0	0	0	0	0	0	0		3B	
026			0	0	0	0	0	0	0	0		3B	
027		P	30	4	0	0	0	0	0	1		3B	
028		P	50	4	0	0	0	0	0	1		3B	
001		P	30	4	0	0	0	0	0	7		3B	
002		P	50	4	0	0	0	0	0	4		3B	
003		P	50	4	0	0	0	0	0	3		3B	
	197	P	30	5	0	0	0	0	0	2			4
	187	P	0	5	0	0	0	0	0	3			4
	172	P	45	4	0	0	0	0	0	1			4
	154	P	50	4	0	0	0	0	0	10			4
	136	P	0	1	0	0	0	0	0	18			5
	137	P	45	4	0	0	0	0	0	20			5
	155	P	0	4	0	0	0	0	0	4			4
	173	P	60	4	0	0	0	0	0	2			4
	188	P	50	4	0	0	0	0	0	2			4
	198	P	0	0	0	0	0	0	0	2			4
	199	P	50	4	0	0	0	0	0	2			4
	189	P	80	4	0	0	0	0	0	2			4
	174	P	0	4	0	0	0	0	0	4			4
	156	P	45	4	0	0	0	0	0	9			4
	138	P	0	4	0	0	0	0	0	2			5
	105	P	30	4	0	0	0	0	0	1			4
	104	P	35	4	0	0	0	0	0	2			4
	103	P	25	4	0	0	0	0	0	2			4
	106	P	30	4	0	0	0	0	0	2			4
	107	P	20	4	0	0	0	0	0	2			4
	108	P	20	5	0	0	0	0	0	2			4
	109	P	20	5	0	0	0	0	0	2			4
	110	P	30	4	0	0	0	0	0	2			4
	111	P	25	5	0	0	0	0	0	2			4
	112	P	25	5	0	0	0	0	0	1			4
	113	P	25	5	0	0	0	0	0	4			4
	114	P	30	4	0	0	0	0	0	3			4
	115	P	35	4	0	0	0	0	0	3			4
087		P	35	4	0	0	0	0	0	3			4
086		P	35	4	0	0	0	0	0	2			4
085		P	35	4	0	0	0	0	0	3			4
084		P	40	4	0	0	0	0	0	1			4
053			0	0	0	0	0	0	0	1			4
070		P	30	5	0	0	0	0	0	1			4
082		P	60	4	0	0	0	0	0	1			4
081		P	35	4	0	0	0	0	0	1			4
080		P	35	4	0	0	0	0	0	1			4
079		P	55	4	0	0	0	0	0	1			4
067		P	80	4	0	0	0	0	0	1			4
066		P	40	4	0	0	0	0	0	2			4
065		P	50	4	0	0	0	0	0	0			4
064		P	80	0	0	0	0	0	0	2			4
063		P	50	4	0	0	0	0	0	2			4
062		P	55	4	0	0	0	0	0	2			4
061		P	40	4	0	0	0	0	0	2			4
060		P	50	4	0	0	0	0	0	2			4
	102	GS	25	5	0	0	0	0	0	1			4
	101	GS	25	5	0	0	0	0	0	1			4
	100	GS	30	5	0	0	0	0	0	1			4
099		GS	30	5	0	0	0	0	0	2			4
098		RSH	0	1	0	0	0	0	0	1			5
097		GS	25	5	0	0	0	0	0	2			4
096		GS	30	5	0	0	0	0	0	3			4
095		GS	0	1	0	0	0	0	0	4			4
094		GS	25	5	0	0	0	0	0	4			4
093		GS	30	5	0	0	0	0	0	2			4
092		GS	30	5	0	0	0	0	0	3			4
091		GS	0	1	0	0	0	0	0	2			4
090		GS	30	5	0	0	0	0	0	2			4
089		GS	35	4	0	0	0	0	0	2			4
088		GS	35	4	0	0	0	0	0	1			4
	119	BOG	25	5	0	0	0	0	0	5			45
	120		20	5	0	0	0	0	0	3			45
	121	GS	30	5	0	0	0	0	0	2			4
	122	GS	25	5	0	0	0	0	0	2			4
	123	GS	35	4	0	0	0	0	0	3			4
	124	GS	35	5	0	0	0	0	0	7			4
	125	GS	28	5	0	0	0	0	0	11			4
	202	PAS	40	4	0	0	0	0	0	1			4
	201	GS	35	4	0	0	0	0	0	1			4
	200	PAS	0	1	0	0	0	0	0	2			4
	190	PAS	60	4	0	0	0	0	0	1			4
	191	PAS	60	4	0	0	0	0	0	5			4
	192	PAS	0	1	0	0	0	0	0	38			4
	177	PAS	0	1	0	0	0	0	0	40			4
	176	PAS	50	4	0	0	0	0	0	1			4
	175	PAS	60	4	0	0	0	0	0	2			4
	156	PAS	50	4	0	0	0	0	0	14			4
	157	PAS	0	1	0	0	0	0	0	5			4
	158	PAS	50	4	0	0	0	0	0	5			4
	141	PAS	30	5	0	0	0	0	0	10			4
	140	BOG	50	4	0	0	0	0	0	9			4
	139	PAS	30	5	0	0	0	0	0	17			4
	184	PAS	40	4	0	0	0	0	0	20			5
	185	PAS	35	4	0	0	0	0	0	8			4
	186	PAS	50	4	0	0	0	0	0	4			4
	170	PAS	35	4	0	0	0	0	0	2			4
	155	GS	35	4	0	0	0	0	0	3			4
	152	GS	25	5	0	0	0	0	0	1			4
	151	GS	35	4	0	0	0	0	0	2			4
	150	GS	30	5	0	0	0	0	0	1			4
	133	GS	45	4	0	0	0	0	0	2			4
	134	GS	35	4	0	0	0	0	0	1			4
	135	GS	35	4	0	0	0	0	0	2			4
	118	GS	30	5	0	0	0	0	0	2			4
	117	GS	40	4	0	0	0	0	0	2			4
	116	P	30	4	0	0	0	0	0	1			4
	132	GS	30	5	0	0	0	0	0	1			4
	149	BOG	55	5	0	0	0	0	0	6			5
	167	PAS	55	4	0	0	0	0	0	25			5
	168	PAS	30	5	0	0	0	0	0	10	Y		5

	169	GS	35	4	0	0	0	0	0	2			4
069		GS	30	4	0	0	0	0	0	3			4
068		GS	0	1	0	0	0	0	0	1			4
043		GS	30	4	0	0	0	0	0	3		3B	
042		GS	0	1	0	0	0	0	0	1		3B	
041		GS	0	1	0	0	0	0	0	1		3B	
040		GS	60	4	0	0	0	0	0	1		3B	
039		GS	40	4	0	0	0	0	0	3		3B	
038		GS	45	4	0	0	0	0	0	3		3B	
037		GS	35	4	0	0	0	0	0	1		3B	
036			0	0	0	0	0	0	0	0			
035		GS	40	4	0	0	0	0	0	3		3B	
034		GS	45	4	0	0	0	0	0	4		3B	
033		GS	0	1	0	0	0	0	0	9		3B	
032			30	5	0	0	0	0	0	0			4
059		GS	35	4	0	0	0	0	0	2			4
058		PPS	85	2	0	0	0	0	0	3			4
000			0			0	0	0	0	0			0
051		PP	20	5	0	0	0	0	0	3			4
056			40	4	0	0	0	0	0	4		3B	
055		PP	0	3	0	0	0	0	0	3		3B	
054		PP	15	5	0	0	0	0	0	2			4
053		PP	15	5	0	0	0	0	0	5			4
052		PP	15	5	0	0	0	0	0	4			4
057		PP	45	4	0	0	0	0	0	3		3B	
050		PP	20	5	0	0	0	0	0	7			4
049		PPS	20	5	0	0	0	0	0	4			4
048		PPS	20	5	0	0	0	0	0	4			4
047		PPS	20	5	0	0	0	0	0	5			4
046		PPS	40	4	0	0	0	0	0	5		3B	
045		RG	65	4	0	0	0	0	0	7			4
044		RGF	70	4	0	0	0	0	0	4			4
073		PPS	50	4	0	0	0	0	0	5			4
074		PPS	15	5	0	0	0	0	0	1			4
075		PPS	15	5	0	0	0	0	0	3			4
076		PP	20	5	0	0	0	0	0	4			4
077		PP	20	5	0	0	0	0	0	4			4
078		PP	20	5	0	0	0	0	0	2			4
	126	RG	0	3	0	0	0	0	0	0			4
	143	RGR	10	5	0	0	0	0	0	22			5
	142	RGR	10	5	0	0	0	0	0	30			5
	160	RGR	10	5	0	0	0	0	0	25			5
	178	RGR	0	5	0	0	0	0	0	9			5
	193	RGR	0	5	0	0	0	0	0	2			5
	203	RGR	0	5	0	0	0	0	0	2			5
	204	RGR	0	3	0	0	0	0	0	0			4
	195	RGR	0	6	0	0	0	0	0	0			5
	180	RGR	0	3	0	0	0	0	0	3			4
	179	RGR	0	6	0	0	0	0	0	0			5
	162	RGR	0	5	0	0	0	0	0	5			5
	161	RGR	0	5	0	0	0	0	0	7	5		
	144	RGR	0	5	0	0	0	0	0	10			5
	127	RGR	0	5	0	0	0	0	0	4			4
	183	RGR	0	5	0	0	0	0	0	10			5
	182	RGR	0	2	0	0	0	0	0	8			4
	181	RGR	0	2	0	0	0	0	0	0			4
	196	RGR	0	2	0	0	0	0	0	1			4
	163	RGR	0	2	0	0	0	0	0	8			4
	164	RGR	0	5	0	0	0	0	0	11			5
	165	RGR	0	2	0	0	0	0	0	13			4
	166	RGR	0	5	0	0	0	0	0	36			5
	148	RGR	10	5	0	0	0	0	0	5			4
	147	RGR	10	5	0	0	0	0	0	13			45
	146	RGR	60	4	0	0	0	0	0	18			5
	145	RGR	65	4	0	0	0	0	0	22			5
	128	RGR	10	5	0	0	0	0	0	2			4
	129	RGR	20	5	0	0	0	0	0	1			4
	130	LEY	20	5	0	0	0	0	0	3			4
	131	LEY	60	4	0	0	0	0	0	0			4
072		PP	35	4	0	0	0	0	0	3			4
071		PP	25	5	0	0	0	0	0	4			4
018		PP	35	4	0	0	0	0	0	3		3B	
017		PP	45	4	0	0	0	0	0	0		3B	
016		LEY	40	4	0	0	0	0	0	0		3B	
015		PP	0	4	0	0	0	0	0	3		B4	
014		PP	20	5	0	0	0	0	0	4			4
013		PP	20	5	0	0	0	0	0	5		4B	
012		PP	45	4	0	0	0	0	0	4		3B	
011		PP	35	4	0	0	0	0	0	3		3B	
010		PP	15	5	0	0	0	0	0	3			4
031		RGR	15	5	0	0	0	0	0	2			4
058		PPS	85	2	0	0	0	0	0	3			4
030			0	0	0	0	0	0	0	0		3B	
029		P	30	4	0	0	0	0	0	1		3B	
009		P	30	4	0	0	0	0	0	1		3B	
008		P	50	4	0	0	0	0	0	1		3B	
007		P	0	2	0	0	0	0	0	2		3A	
006		P	40	4	0	0	0	0	0	6		3B	
005		P	30	0	0	0	0	0	0	3		3B	
004		P	30	4	0	0	0	0	0	1		3B	
019		P	50	4	0	0	0	0	0	2		3B	
020		P	30	4	0	0	0	0	0	2		3B	
021			0	0	0	0	0	0	0	0		3B	
022		P	35	3	0	0	0	0	0	2		3B	
023		P	55	4	0	0	0	0	0	2		3B	
025		P	0	3	0	0	0	0	0	2		3B	
025			0	0	0	0	0	0	0	0		3B	
026			0	0	0	0	0	0	0	0		3B	
027		P	30	4	0	0	0	0	0	1		3B	
028		P	50	4	0	0	0	0	0	1		3B	
001		P	30	4	0	0	0	0	0	7		3B	
002		P	50	4	0	0	0	0	0	4		3B	
003		P	50	4	0	0	0	0	0	3		3B	
	197	P	30	5	0	0	0	0	0	2			4
	187	P	0	5	0	0	0	0	0	3			4
	172	P	45	4	0	0	0	0	0	1			4
	154	P	50	4	0	0	0	0	0	10			4
	136	P	0	1	0	0	0	0	0	18			5
	137	P	45	4	0	0	0	0	0	20			5
	155	P	0	4	0	0	0	0	0	4			4
	173	P	60	4	0	0	0	0	0	2			4
	188	P	50	4	0	0	0	0	0	2			4
	198	P	0	0	0	0	0	0	0	2			4
	199	P	50	4	0	0	0	0	0	2			4
	189	P	80	4	0	0	0	0	0	2			4
	174	P	0	4	0	0	0	0	0	4			4
	156	P	45	4	0	0	0	0	0	9			4
	138	P	0	4	0	0	0	0	0	2			5
	105	P	30	4	0	0	0	0	0	1			4
	104	P	35	4	0	0	0	0	0	2			4
	103	P	25	4	0	0	0	0	0	2			4
	106	P	30	4	0	0	0	0	0	2			4
	107	P	20	4	0	0	0	0	0	2			4
	108	P	20	5	0	0	0	0	0	2			4
	109	P	20	5	0	0	0	0	0	2			4
	110	P	30	4	0	0	0	0	0	2			4
	111	P	25	5	0	0	0	0	0	2			4
	112	P	25	5	0	0	0	0	0	1			4
	113	P	25	5	0	0	0	0	0	4			4
	114	P	30	4	0	0	0	0	0	3			4

115	P	35	4	0	0	0	0	0	3	4
087	P	35	4	0	0	0	0	0	3	4
086	P	35	4	0	0	0	0	0	2	4
085	P	35	4	0	0	0	0	0	3	4
084	P	40	4	0	0	0	0	0	1	4
053		0	0	0	0	0	0	0	1	4
070	P	30	5	0	0	0	0	0	1	4
082	P	60	4	0	0	0	0	0	1	4
081	P	35	4	0	0	0	0	0	1	4
080	P	35	4	0	0	0	0	0	1	4
079	P	55	4	0	0	0	0	0	1	4
067	P	80	4	0	0	0	0	0	1	4
066	P	40	4	0	0	0	0	0	2	4
065	P	50	4	0	0	0	0	0	0	4
064	P	80	0	0	0	0	0	0	2	4
063	P	50	4	0	0	0	0	0	2	4
062	P	55	4	0	0	0	0	0	2	4
061	P	40	4	0	0	0	0	0	2	4
060	P	50	4	0	0	0	0	0	2	4

JOBNO	SOILPIT	BORING	HORIZON	TEXTURE	TOPDEPTH	BTMDEPTH	COLOUR	MOTCOL	MOTABUN	MOTCONT
		102	1	mcl	0	25	10YR42	O	F	D
		102	2	hcl	25	100	10YR53	OG	M	D
		101	1	mcl	0	15	10YR42	O	F	D
		101	2	mcl	15	30	10YR52	O	F	D
		101	3	hcl	30	100	10YR53	OG	M	D
		100	1	mcl	0	20	10YR42	O	F	D
		100	2	mcl	20	30	10YR52	O	F	D
		100	3	hcl	30	100	10YR53	OG	M	D
		099	1	mcl	0	15	10YR42	O	G	F
		099	2	mcl	15	30	10YR52	O	F	D
		099	3	hcl	30	100	10YR53	OG	M	D
		098	1	msl	0	35	10YR43			
		098	2	rock	35	0	SAN.ST			
		097	1	mcl	0	10	10YR42	O	F	D
		097	2	mcl	10	25	10YR52	O	F	D
		097	3	hcl	25	100	10YR53	OG	M	D
		096	1	mcl	0	10	10YR42	O	F	F
		096	2	mcl	10	30	10YR52	O	F	D
		096	3	hcl	30	100	10YR53	OG	M	D
		095	1	mcl	0	10	10YR42	O	F	D
		095	2	msl	10	30	10YR52	O	C	D
		095	3	scl	30	65	10YR52	OG	C	D
		094	1	mcl	0	15	10YR42	O	F	D
		094	2	mcl	15	25	10YR52	O	F	F
		094	3	hcl	25	70	10YR53	OG	M	D
		093	1	mcl	0	25	10YR42	O	F	D
		093	2	hcl	25	100	10YR53	OG	M	D
		092	1	mcl	0	20	10YR42			
		092	2	mcl	20	30	10YR53	O	F	D
		092	3	hcl	30	80	10YR53	OG	M	D
		092	4	no	80	0	NO			
		091	1	mcl	0	15	10YR42	O	F	F
		091	2	mcl	15	55	10YR43	OG	M	D
		091	3	scl	55	65	10YR53	OG	M	D
		090	1	mcl	0	20	10YR42	O	F	D
		090	2	mcl	20	30	10YR52	O	F	D
		090	3	hcl	30	100	10YR53	OG	M	D
		089	1	mcl	0	15	10YR42	O	F	D
		089	2	mcl	15	35	10YR52	O	C	D
		089	3	hcl	35	100	10YR53	OG		M
		088	1	mcl	0	10	10YR42	O	F	D
		088	2	mcl	10	30	10YR52	O	F	D
		088	3	hcl	30	100	10YR53	OG	M	D
		119	1	pt	0	10	10YR41			
		119	2	mcl	10	25	10YR52	O	F	D
		119	3	hcl	25	100	10YR53	OG	M	D
		120	1	mcl	0	20	10YR42	O	F	D
		120	2	hcl	20	100	10YR53	OG	M	D
		120	3	no	100	100	NO			
		121	1	mcl	0	10	10YR42	O	F	D
		121	2	mcl	10	30	10YR52	O	F	D

121	3	hcl	30	100	10YR53			
122	1	mcl	0	8	10YR42	O	F	F
122	2	mcl	8	30	10YR52	O	F	D
122	3	hcl	30	100	10YR53	OG	M	D
123	1	mcl	0	30	10YR42	O	F	D
123	2	hcl	30	100	10YR53	OG	M	D
124	1	mcl	0	30	10YR52	O	F	D
124	2	hcl	30	100	10YR53	OG	M	D
125	1	mcl	0	20	10YR52	O	F	D
125	2	hcl	20	55	10YR53	ZG	M	D
202	1	pt	0	40	10YR21			
202	2	m.hcl	40	100	75YR54	O	C	D
201	1	pt	0	35	10YR21			
201	2	zc	35	100	75YR54	G	F	F
200	1	pt	0	30	10YR21			
190	1	pt	0	40	10YR21			
190	2	msl	40	60	10YR53	G	F	F
190	3	zc	60	100	75YR54	G	C	D
191	1	pt	0	25	10YR21			
191	2	mcl	25	50	10YR53	OG	F	F
191	3	h.mcl	50	100	10YR53	OG	C	D
192	1	msl	0	30	10YR53	O	F	F
192	2	msl	30	45	10YR51	O	F	D
177	1	mcl	0	20	10YR54			
177	2	mcl	20	60	10YR53			
176	1	pt	0	30	10YR21			
176	2	mzcl	30	40	10YR54	G	C	D
176	3	hcl	40	100	10YR54		C	D
176	4	no	100	0	NO			
175	1	pt	0	15	10YR42			
175	2	mscl	15	40	5YR32			
175	3	msl	40	80	75YR54			
141	1	mcl	0	25	10YR52	O	F	D
141	2	hcl	25	100	10YR53	G	M	P
140	1	pt	0	40	10YR21			
140	2	mcl	40	50	10YR52	OG	M	D
140	3	zc	50	100	10YR53	G	M	P
139	1	mcl	0	35	10YR52	OG	M	P
139	2	hcl	35	100	10YR53	OG	M	P
184	1	mcl	0	35	10YR42	O	F	F
184	2	m.hcl	35	100	10YR52	OG	M	D
184	3	no	100	0	NO			
185	1	mcl	0	20	10YR42			
185	2	mcl	20	35	10YR52	OG	C	F
185	3	hcl	35	100	10YR53	OG	M	D
186	1	mcl	0	20	10YR42			
186	2	mcl	20	35	10YR43			
186	3	msl	35	100	10YR52	OG	M	D
186	4	no	100	0	NO			
170	1	mcl	0	30	10YR42			
170	2	hcl	30	100	10YR53	OG		D
152	1	mcl	0	20	10YR42	O	F	D

	152	2	hcl	20	50	10YR53	GO	C	D
	151	1	mcl	0	20	10YR42	O	F	F
	151	2	hcl	20	100	10YR53	OG	M	D
	150	1	mcl	0	30	10YR42	O	F	F
	150	2	hcl	30	100	10YR52	OG	C	D
	133	1	pty.cl	0	30	10YR42			
	133	2	msl	30	45	10YR52			D
	133	3	hcl	45	100	10YR53	OG	C	D
	134	1	mcl	0	30	10YR42	O	F	F
	134	2	mcl	30	45	10YR52	O	C	D
	134	3	hcl	45	100	10YR53	OG	M	D
	135	1	mcl	0	20	10YR42	O	F	F
	135	2	hcl	20	40	10YR52	OG	M	D
	135	3	hcl.c	40	100	10YR53	OG	M	D
	118	1	mcl	0	20	10YR42	O	F	F
	118	2	mcl	20	45	10YR52	O	C	D
	118	3	scl	45	55	10YR53	OG	M	D
	118	4	hcl	55	100	10YR53	OG	C	D
	117	1	mcl	0	25	10YR42	O	F	F
	117	2	mcl	25	40	10YR52	OG	C	D
	117	3	hcl	40	100	10YR53	OG	M	D
	116	1	mcl	0	20	75YR20			
	116	2	hcl	20	60	10YR43	O	C	D
	116	3	mcl	60	100	10YR54	O	C	D
	132	1	mcl	0	20	10YR41	O	F	F
	132	2	hcl	20	100	10YR53	OC	M	D
	149	1	pt	0	55	75YR21			
	149	2	mcl	55	100	10YR52			D
	167	1	mcl	0	10	10YR42			
	167	2	mcl	10	60	75YR64			
	167	3	mscl	60	100	10YR64			
	168	1	mcl	0	10	10YR42			
	168	2	m.hcl	10	40	10YR53	O	F	D
	168	3	hcl	40	100	10YR53	OG	M	D
	169	1	mcl	0	20	10YR42	O	F	F
	169	2	mcl	20	45	10YR53	O	C	D
	169	3	hcl	45	100	10YR53	OG	M	D
069		1	mcl	0	20	10YR52	O	F	D
069		2	hcl	20	75	10YR53	OG	M	D
069		3	mcl	75	100	10YR54	O	C	D
068		1	mscl	0	25	10YR43			
068		2	msl	25	45	10YR56			
068		3	s.stone	45	0	YELLOW			
043		1	mcl	0	25	10YR53	O	F	D
043		2	c	25	75	10YR43	OG	M	D
043		3	hcl	75	100	10YR53	OG	M	D
042		1	mcl	0	20	10YR54	O	F	D
042		2	scl	20	45	10YR56			
041		1	mcl	0	25	10YR42	O	F	D
041		2	mcl	25	65	10YR52	O	M	P
041		3	mscl	65	75	75YR21	O	F	D
040		1	mcl	0	35	10YR43	O	F	D

040	2	mcl	35	60	10YR52	O	M	D
040	3	mcl	60	100	10YR53	O	C	D
039	1	mcl	0	30	10YR52	O	M	D
039	2	mscl	30	50	10YR62	O	M	D
039	3	hcl	50	100	10YR53	OG	M	P
038	1	mcl	0	30	10YR42	OG	C	D
038	2	mcl	30	48	10YR61	O	M	D
038	3	m.hcl	48	80	10YR52	O	M	D
037	1	mcl	0	20	10YR33	O	M	D
037	2	hcl	20	45	10YR62	O	M	D
037	3	mcl	45	100	10YR53	O	C	D
036	1	non.ag	0	0	TREE			
035	1	mcl	0	20	10YR42	O	F	F
035	2	mcl	20	45	10YR52	O	M	D
035	3	h.mcl	45	100	10YR53	OG	M	P
034	1	pty.loam	0	20	75YR21			
034	2	fscl	20	40	10YR52	OG	C	D
034	3	hcl	40	100	10YR61	O	M	D
033	1	mcl	0	30	10YR42			
033	2	mscl	30	65	10YR58			
032	1	mcl	0	25	10YR51	O	C	D
032	2	mcl	25	40	10YR52	OG	C	D
032	3	hcl	40	100	10YR53			
059	1	pt	0	20	75YR21			
059	2	mcl	20	35	10YR52	O	F	D
059	3	hcl	35	100	10YR63	OG	F	F

Appendix D ALC Soil Profile Logs for North Area, July 2024

Project Number	Project Name	Parcel
C1115	Dear Moor Solar Farm	North Area

Date of Survey	Survey Type	Surveyor(s)	Company
27/07/2024	Detailed ALC	RWA	Askew Land and Soil

Weather	Relief	Land use and vegetation
Cool, cloudy, showers.	Gently undulated.	RGR (Rough Grazing)

Grid Reference	Postcode	Altitude	Area
NY044242		117	50

MAFF prov	MAFF detailed	Flooding
Grade 4	None	Flood Zone 1 - Low Risk

AAR	AT0	MDw	MDp	FCD	Climate grade
1390	1273	51	27	294	3b

Bedrock	Superficial deposits
Pennine Middle Coal Measures	Till, Devensian

Soil association(s) 1:250,000	Detailed soil information
Brickfield 3 (713g)	None

Revision Number	Date Revised
2	17/10/2024

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	NY 03800 24800	303800	524800	88	≤7	Level	PGR	0	27	27	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								27	45	18	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
2	NY 03900 24800	303900	524800	92	≤7	Level	PGR	0	20	20	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								20	46	26	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								46	120	74	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
3	NY 04000 24800	304000	524800	92	≤7	Level	PGR	0	22	22	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								22	41	19	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								41	120	79	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
4	NY 04100 24800	304100	524800	97	≤7	Level	PGR	0	25	25	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	82	1	WC IV	4	Wetness			4
								25	45	20	10YR6/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
5	NY 03800 24700	303800	524700	85	≤7	Level	PGR	0	25	25	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								25	50	25	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
6	NY 03900 24700	303900	524700	90	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								28	45	17	10YR5/3	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
7	NY 04000 24700	304000	524700	90	≤7	Level	PGR	0	22	22	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								22	46	24	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								46	120	74	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
8	NY 04100 24700	304100	524700	96	≤7	Level	PGR	0	23	23	10YR4/1					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								23	47	24	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								47	120	73	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
9	NY 03800 24600	303800	524600	85	≤7	Level	PGR	0	30	30	10YR4/1					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								30	50	20	2.5YR5/3	CD - C	7.5YR5/6	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
10	NY 03900 24600	303900	524600	90	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								28	48	20	10YR5/3	MD - M	10YR5/8	MD - M	2.5Y6/2	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
11	NY 04000 24600	304000	524600	90	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								30	45	15	10YR5/3	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
12	NY 04100 24600	304100	524600	96	≤7	Level	PGR	0	26	26	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								26	50	24	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
13	NY 04200 24600	304200	524600	101	≤7	Level	PGR	0	26	26	10YR4/2					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								26	47	21	10YR6/3	CD - C	10YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								47	120	73	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
14	NY 03900 24500	303900	524500	90	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								30	48	18	10YR5/3	CD - C	10YR5/8	CD - C	2.5Y6/2	Yes	HCL - Cla	1			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
15	NY 04000 24500	304000	524500	90	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								28	45	17	10YR5/3	CD - C	7.5YR5/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
16	NY 04100 24500	304100	524500	96	≤7	Level	PGR	0	27	27	10YR4/2					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								27	46	19	10YR5/3	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								46	120	74	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
17	NY 04200 24500	304200	524500	101	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								30	50	20	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
18	NY 03900 24400	303900	524400	90	≤7	Level	PGR	0	32	32	10YR5/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								32	45	13	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
19	NY 04000 24400	304000	524400	90	≤7	Level	PGR	0	30	30	10YR5/2					No	HCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								30	45	15	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
20	NY 04100 24400	304100	524400	95	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								28	49	21	10YR5/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								49	120	71	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
21	NY 04200 24400	304200	524400	103	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	86	86	1	WC IV	4	Wetness			4
								30	55	25	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								55	120	65	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
22	NY 04280 24400	304280	524400	103	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	84	86	1	WC IV	4	Wetness			4
								28	53	25	2.5Y5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								53	120	67	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
23	NY 03600 24300	303600	524300	92	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	84	1	WC IV	4	Wetness			4
								30	45	15	10YR5/2	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
24	NY 03700 24300	303700	524300	93	≤7	Level	PGR	0	26	26	10YR4/2					No	HCL - Cla	4	2	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								26	48	22	10YR6/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
25	NY 03800 24300	303800	524300	91	≤7	Level	PGR	0	22	22	10YR4/1					No	HCL - Clay	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								22	41	19	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								41	120	79	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
26	NY 03900 24300	303900	524300	90	≤7	Level	PGR	0	30	30	10YR4/1					No	HCL - Clay	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								30	50	20	2.5YR5/3	CD - C	7.5YR5/6	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
27	NY 04000 24300	304000	524300	90	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Clay	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								28	48	20	10YR5/3	MD - M	10YR5/8	MD - M	2.5Y6/2	Yes	HCL - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
28	NY 04100 24300	304100	524300	95	≤7	Level	PGR	0	28	28	10YR4/2					No	HCL - Clay	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								28	45	17	10YR5/3	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
29	NY 04200 24300	304200	524300	103	≤7	Level	PGR	0	30	30	10YR5/2					No	HCL - Clay	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								30	45	15	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
30	NY 03600 24200	303600	524200	104	≤7	Level	PGR	0	28	28	10YR4/2					No	MCL - Clay	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	3b	Wetness			3b
								28	49	21	10YR5/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	HCL - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								49	120	71	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
31	NY 03700 24200	303700	524200	107	≤7	Level	PGR	0	27	27	10YR4/2					No	MCL - Clay	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	3b	Wetness			3b
								27	46	19	10YR5/3	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	HCL - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								46	120	74	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
32	NY 03800 24200	303800	524200	107	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Clay	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								30	50	20	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
33	NY 03900 24200	303900	524200	102	≤7	Level	PGR	0	25	25	10YR4/2					No	HCL - Clay	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	82	1	WC IV	4	Wetness			4
								25	45	20	10YR6/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
34	NY 04000 24200	304000	524200	102	≤7	Level	PGR	0	25	25	10YR4/1					No	HCL - Clay	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								25	50	25	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
35	NY 04100 24200	304100	524200	102	≤7	Level	PGR	0	23	23	10YR4/1					No	HCL - Clay	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								23	47	24	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								47	120	73	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
36	NY 03650 24100	303650	524100	107	≤7	Level	PGR	0	32	32	10YR5/2					No	MCL - Clay	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	3b	Wetness			3b
								32	45	13	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
37	NY 04000 23800	304000	523800	103	≤7	Level	PGR	0	20	20	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								20	46	26	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								46	120	74	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
38	NY 04100 23800	304100	523800	106	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	84	1	WC IV	4	Wetness			4
								30	45	15	10YR5/2	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
39	NY 04200 23800	304200	523800	108	≤7	Level	PGR	0	30	30	10YR5/2					No	HCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	82	83	1	WC IV	4	Wetness			4
								30	45	15	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
40	NY 04300 23800	304300	523800	113	≤7	Level	PGR	0	22	22	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								22	41	19	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								41	120	79	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
41	NY 04400 23800	304400	523800	113	≤7	Level	PGR	0	30	30	10YR4/2					No	MCL - Cla	1	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	3b	Wetness			3b
								30	50	20	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
42	NY 04500 23800	304500	523800	117	≤7	Level	PGR	0	28	28	10YR4/2					No	SCL - San	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	3b	Wetness			3b
								28	48	20	10YR5/3	MD - M	10YR5/8	MD - M	2.5Y6/2	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
43	NY 04000 23700	304000	523700	119	≤7	Level	PGR	0	23	23	10YR4/1					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								23	47	24	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								47	120	73	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
44	NY 04100 23700	304100	523700	119	≤7	Level	PGR	0	30	30	10YR4/2					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								30	45	15	10YR5/3	MD - M	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/4	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
45	NY 04200 23700	304200	523700	123	≤7	Level	PGR	0	32	32	10YR5/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								32	45	13	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
46	NY 04500 23700	304500	523700	127	≤7	Level	PGR	0	26	26	10YR4/2					No	SCL - San	4	2	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	76	77	1	WC IV	3b	Wetness			3b
								26	48	22	10YR6/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	SCL - San	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
47	NY 04000 23600	304000	523600	119	≤7	Level	PGR	0	22	22	10YR4/1					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	80	81	1	WC IV	4	Wetness			4
								22	41	19	2.5YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	HCL - Cla	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								41	120	79	2.5Y6/4	MD - M	7.5YR6/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
48	NY 04100 23600	304100	523600	119	≤7	Level	PGR	0	32	32	10YR5/2					No	HCL - Cla	0	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								32	45	13	10YR5/3	MD - M	7.5YR5/8	MD - M	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								45	120	75	2.5Y6/2	MD - M	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
49	NY 04000 23500	304000	523500	116	≤7	Level	PGR	0	26	26	10YR4/2					No	HCL - Cla	4	2	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	81	82	1	WC IV	4	Wetness			4
								26	48	22	10YR6/3	CD - C	7.5YR5/8	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								48	120	72	2.5Y6/2	MD - N	7.5YR6/8			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
50	NY 04100 23500	304100	523500	116	≤7	Level	PGR	0	30	30	10YR4/1					No	HCL - Cla	2	0	0	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	83	84	1	WC IV	4	Wetness			4
								30	50	20	2.5YR5/3	CD - C	7.5YR5/6	CD - C	2.5Y6/2	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	2.5Y6/4	MD - N	7.5YR6/8	MD - N	2.5Y6/1	Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
	END																																								

Mottle form
FF - Few Faint
FD - Few Distinct
FP - Few Prominent
CF - Common Faint
CD - Common Distinct
CP - Common Prominent
MF - Many Faint
MD - Many Distinct
MP - Many Prominent
VF - Very many Faint
VD - Very many Distinct
VP - Very many Prominent

Texture
C - Clay
CHK - Chalk
CS - Coarse Sand
CSL - Coarse sandy loam
CSZL - Coarse sandy silt loam
FP - Fibrous and semifibrous peats
FS - Fine Sand
FSL - Fine sandy loam
FSZL - Fine sandy silt loam
HCL - Clay loam (heavy)
HP - Humified peats
HZCL - Silty clay loam (heavy)
IMP - Impenetrable to roots
LCS - Loamy Coarse Sand
LFS - Loamy fine sand
LMS - Loamy medium sand
LP - Loamy peats
MCL - Clay loam (medium)
MS - Medium Sand
MSL - Medium sandy loam
MSZL - Medium sandy silt loam
MZ - Marine Light Silts
MZCL - Silty clay loam (medium)
OC - Organic clays
OL - Organic loams
OS - Organic sands
PL - Peaty loams
PS - Peaty sands
SC - Sandy clay
SCL - Sandy clay loam
SP - Sandy peats
ZC - Silty clay
ZL - Silt loam

Stone Type
CH - Chalk or chalk stones
FSST - Soft fine grained sandstones
GH - Gravel with non-porous (hard) stones
GS - Gravel with porous stones (mainly soft stone types listed above)
HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)
MSST - Soft, medium or coarse grained sandstones
SI - Soft ‘weathered’ igneous or metamorphic rocks or stones
SLST - Soft oolitic or dolomitic limestones
ZR - Soft, argillaceous or silty rocks or stones

Ped. Shape
SG - Single grain
GRA - Granular
SAB - Subangular Blocky
AB - Angular Blocky
PRIS - Prismatic
PLAT - Platy
MASS - Massive
NA - N/A

Subsoil Structure Condition
Not Applicable
Good
Moderate
Poor

Soil or Ped. Strength
Loose
Very friable
Friable
Firm
Very firm
Extremely firm
Extremely hard
N/A

Calcareousness
NON - Non-calcareous (<0.5% $CaCO_3$)
VSC - Very slightly calcareous (0.5 - 1% $CaCO_3$)
SC - Slightly calcareous (1 - 5% $CaCO_3$)
MC - Moderately calcareous (5 - 10% $CaCO_3$)
VC - Very calcareous (>10% $CaCO_3$)

Ped. Size
VF - Very Fine
F - Fine
M - Medium
C - Coarse
VC - Very Coarse
NA - N/A

Degree of Ped. Development
W - Weak
M - Moderate
S - Strong
NA - Not applicable

Wetness Class
WC I
WC II
WC III
WC IV
WC V
WC VI

ALC Grades
1
2
3a
3b
4
5
Non-Ag

Gley
None
Gley
N/A

Soil Survey						Surveyor	RWA
Easting (X)	303600	Northing (Y)	524200	Alt (m)	104	Grid Reference	NY 03600 24200
Land Use	PGR	Reference	30 (Pit 1)	Slope °	≤7	Date	27/07/2024
Bedrock	Pennine Lower Coal Measures	Superficial	None recorded	Aspect	Level		

Layer		Topsoil	2	3	4	5	6	7
Lower Depth (cm)		28	49	120				
Texture		MCL - Clay loam	HCL - Clay loam (heavy)	C - Clay				
Matrix Colour		10YR4/2	10YR5/3	2.5Y6/4				
Gley (Y/N)		No	Yes	Yes				
Ochreous Mottles	Form		CD - Common Distinct	MD - Many Distinct				
	Munsell Colour		7.5YR5/8	7.5YR6/8				
Grey Mottles	Form		CD - Common Distinct					
	Munsell Colour		2.5Y6/2					
Manganese (Y/N)		No	No	No				
% Stones (type 1)		0	0	0				
Stones > 2cm		0						
Stones > 6cm		0						
Stone Type		HR - All hard roc	HR - All hard rocks or ston	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger				
% Stones (type 2)								
Stones > 2cm								
Stones > 6cm								
Stone Type								
CaCO3		NON - Non-calca	NON - Non-calcareous (<0.	NON - Non-calcareous (<0.5% CaCO3)				
Shape of Peds.		SAB - Subangula	AB - Angular Blocky	PRIS - Prismatic				
Size of Peds.		M - Medium	C - Coarse	C - Coarse				
Subsoil Structure		Not Applicable	Moderate	Poor				
Soil or Ped. Strength		Firm	Firm	Firm				
Degree of Ped. Development		M - Moderate	M - Moderate	W - Weak				
Slowly Permeable Layer (Y/N)		No	No	Yes				

MDw	MDp	FCD
51	27	294

Wetness	Class (WC)	WC IV
	Grade (WE)	3b

Notes	Calculated Moisture Balance (MB): Wheat = 83mm; Potatoes = 84mm (Grade 1 according to droughtiness)

Soil Survey						Surveyor	RWA
Easting (X)	303900	Northing (Y)	524800	Alt (m)	92	Grid Reference	NY 03900 24800
Land Use	PGR	Reference	2 (Pit 2)	Slope °	≤7	Date	27/07/2024
Bedrock	Pennine Middle Coal Measures	Superficial	Till, Devensian	Aspect	Level		

Layer		**Topsoil**	**2**	**3**	**4**	**5**	**6**	**7**
Lower Depth (cm)		20	46	120				
Texture		HCL - Clay loam (	C - Clay	C - Clay				
Matrix Colour		10YR4/1	2.5YR5/3	2.5Y6/4				
Gley (Y/N)		No	Yes	Yes				
Ochreous Mottles	Form		MD - Many Distinct	MD - Many Distinct				
	Munsell Colour		7.5YR5/8	7.5YR6/8				
Grey Mottles	Form		MD - Many Distinct	MD - Many Distinct				
	Munsell Colour		2.5Y6/1	2.5Y6/1				
Manganese (Y/N)		No	No	No				
% Stones (type 1)		0	0	0				
Stones > 2cm		0						
Stones > 6cm		0						
Stone Type		HR - All hard roc	HR - All hard rocks or ston	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger				
% Stones (type 2)								
Stones > 2cm								
Stones > 6cm								
Stone Type								
CaCO3		NON - Non-calca	NON - Non-calcareous (<0.	NON - Non-calcareous (<0.5% CaCO3)				
Shape of Peds.		SAB - Subangular	AB - Angular Blocky	PRIS - Prismatic				
Size of Peds.		M - Medium	C - Coarse	C - Coarse				
Subsoil Structure		Not Applicable	Moderate	Poor				
Soil or Ped. Strength		Firm	Firm	Firm				
Degree of Ped. Development		M - Moderate	M - Moderate	W - Weak				
Slowly Permeable Layer (Y/N)		No	No	Yes				

MDw	MDp	FCD
51	27	294

Wetness	Class (WC)	WC IV
	Grade (WE)	4

Notes	Calculated Moisture Balance (MB): Wheat = 81mm; Potatoes = 82mm (Grade 1 according to droughtiness)

Appendix E Soil Health

DEAN MOOR SOLAR FARM

APPENDIX E: SOIL HEALTH

PLANNING INSPECTORATE REFERENCE EN010155

PREPARED ON BEHALF OF FVS DEAN MOOR LIMITED

Project Ref:	**EN010155/Appendix E: Soil Health**
Status	Draft
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Contents

1 Soil Health

1.1 Introduction

1.1.1 This Appendix E (‘Soil Health’) to Appendix ES 2.8 (ALC) has been produced for FVS Dean Moor Limited (the ‘Applicant’) to support the DCO application for the Dean Moor Solar Farm (‘the Proposed Development’) on approximately 276.5ha of land located between the villages of Gilgarran and Branthwaite in West Cumbria (the ‘Site’), which is situated within the administrative area of Cumberland Council (‘the Council’).

1.2 Soil Health

1.2.1 Soil health can be defined as a soil's ability to function and sustain plants, animals and humans as part of the ecosystem. There are five main factors that impact the health of the soil and can have a large influence over its capability and resilience to function, they are:

a. Soil structure;
b. Soil chemistry;
c. Organic matter content;
d. Soil biology; and
e. Water infiltration, retention and movement through the profile.

1.2.2 A healthy soil will have a good combination of all these factors, whilst an unhealthy soil will have a problem with at least one of these. A healthy soil has plenty of air spaces (voids) within it, maintaining aerobic (oxygenated) conditions. A healthy soil will provide a buffer to extremes in temperature (as it allows movement of gases between the soil and the air above) and rainfall (as the soil is well drained). This helps to reduce the impact of extreme weather events.

1.2.3 When a soil has limited air spaces, anaerobic conditions (i.e. when oxygen is depleted) dominate, leading to waterlogging and stagnation of roots and the proliferation of anaerobic microbes and denitrification (i.e. the loss of nitrogen from the system). A healthy soil will filter water slowly, retaining the nutrients and plant protection products (‘PPP’) applied to the crop. If rainfall moves through the soil profile too quickly, or if it is prevented from entering the soil through compaction or soil sealing, surface runoff increases, taking soil, nutrients and PPP with it. This also increases the risk of flooding.

Summary

1.2.4 A healthy soil has a well-developed soil structure, where soil particles are aggregated into soil peds (structural units) separated by pores or voids. This allows the free movement of water (precipitation) through the soil and facilitates gaseous exchange between the plant roots and the air. These soils are well aerated (oxygenated), which encourages healthy plant (crop) growth and an abundance of soil fauna and aerobic microbes. These soils often have high amounts of soil organic matter (SOM), associated with an accumulation of plant and animal matter, and thus are a good store of soil organic carbon (SOC).

1.3 Soil Organic Matter (SOM)

1.3.1 Soil carbon is predominantly derived from carbon fixed by plants. This enters the soil as litter or dung, root tissue turnover, root exudates and carbon allocated to mutualistic fungi. Carbon is mixed into the soil and transformed by biological processes, but some is also carried down the profile by downward movement of rainwater. Where these biological processes are retarded, and mixing does not occur, soils can develop organic layers on their surface, and in waterlogged conditions these become deep peat deposits. Soils on limestone and chalk may also contain inorganic carbon as carbonate compounds. Some ammonia oxidising bacteria also fix carbon.

1.3.2 In all habitats, most carbon is stored in soils in the form of SOM, and peaty soils in particular, are major stores of carbon (Natural England, 2012).

1.3.3 Globally, soils contain more organic carbon than the vegetation and atmosphere combined (Swift, 2001). Ten billion tonnes of organic carbon are estimated to be stored in United Kingdom (‘UK’) soils, with over half stored in peat.

1.3.4 Soils in England and Wales store 2.4 billion tonnes of carbon of which 58% is in the top 30cm of soil (Department for Environment and Rural Affairs (Defra), 2011).

1.3.5 Soil carbon is stored in fresh and decomposing litter and as longer-lasting material stored in soil particles, in a complex with clays or in anaerobic waterlogged conditions.

1.3.6 England's deep and shallow peaty soils are estimated to contain over 580 million tonnes of carbon (Natural England, 2010), but in surface layers, denser mineral soils contain more carbon than peaty soils (Emmett et al, 2010). In peat, anaerobic conditions caused by waterlogging prevent the breakdown of phenols, which build up and inhibit other decomposition enzymes, while plants producing tannins also inhibit enzyme activity (Defra, 2010A).

1.3.7 In lowland fens where waterlogging is due to groundwater, peat can be formed from a wide range of plants that are found in waterlogged conditions.

1.3.8 In bogs, where water supply is derived from precipitation only, peat is predominantly formed from Sphagnum mosses and Cotton-grass (Eriophorum spp.), with minor components of other plants reflecting past drier conditions or periods (Natural England, 2013).

1.3.9 Cultivation of soils promotes the release of stored soil carbon by mineralisation of soil organic matter to carbon dioxide ('CO^{2}') (Lal, 2004). The conversion of grassland to arable cropland was the largest contributor to soil carbon losses from land use change in the UK between 1990 and 2000 (Ostle et al, 2009). Carbon in the subsoil (below 15 cm for grassland or 30cm plough layer for arable) is more stable and less influenced by surface processes (Defra, 2011A).

1.3.10 On mineral soils, environmental stewardship is estimated to have reduced England's agricultural greenhouse gas ('GHG') emissions by around 11%

a year (Defra, 2007), mainly through increases in soil organic carbon delivered by options such as buffer strips that take land out of cultivation.

1.3.11 The greatest benefits in terms of increase in soil carbon can be realised through land use change from intensive arable to grasslands (Conant et al, 2001), woodlands or some biofuels (Defra, 2003). Avoiding disturbance of undisturbed soils, and changing land use to grassland, heathland, woodland or wetland is likely to deliver carbon storage benefits (Natural England, 2012A), including on organo-mineral soils (Defra, 2011B). Conversion from arable to grassland may, however, be offset to some extent by methane emissions associated with livestock production.

1.3.12 There is ongoing research into how grasslands can be managed to increase carbon storage. Defra Project BD5003 (Ward et al, 2006) found that older, and particularly semi-improved, grasslands are important carbon stores compared to intensively managed, improved grasslands.

1.3.13 Soil organic matter is a key indicator of many desirable soil functions. It helps to maintain soil structure, provides and stores nutrients, supports biological activity, increases water retention and stores carbon (Gobin et al, 2011). Early results from Natural England's project BD5001 (Natural England, 2016) indicate that grassland soils in good structural condition tend to have more organic matter than soils in moderate or poor condition. Soils with more organic matter tend to be more resistant and resilient to damage, with this effect interacting with soil texture and biological properties (Defra, 2010C).

1.3.14 The best opportunities to increase carbon storage come from planting perennial crops, returning crop residues to the soil and application of organic manures (Defra, 2014).

1.3.15 In the short to medium term (up to 10 years) zero tillage (where the land is uncultivated) does not result in increased levels of soil carbon compared to conventional tillage (where the land is cultivation of the land for crops) (Defra, 2014), but global data suggests that zero tillage results in more total soil carbon storage when applied for 12 years or more (Steinbach and Alvarez, 2006).

Summary

1.3.16 The greatest benefits in terms of increase in SOM, and hence SOC, can be realised through land use change from intensive arable to grasslands. Likewise, SOM and SOC are increased when cultivation of the land for crops (tillage) is stopped, and the land is uncultivated (zero tillage). Global evidence suggests that zero tillage results in more total soil carbon storage when applied for 12 years or more. Therefore, there is evidence that conversion of land from arable to grassland which is uncultivated over the long-term (>12 years), such as that under solar PV arrays, increases SOC and SOM.

1.4 Biodiversity in the soil

1.4.1 Biological function of soils can be enhanced by simple approaches that can be integrated into real farm systems, including adapting organic matter management, cultivation approaches and cropping, with likely benefits to both farming and the environment (Natural England, 2012B).

1.4.2 Soils are habitats for millions of species, ranging from bacteria, fungi, protozoa, and microscopic invertebrates to mites, springtails, ants, worms and plants. It is estimated that more than 1 in 4 of all living species on earth is a strictly soil-dwelling organism (Decaens et al, 2006).

1.4.3 A single gram of soil can contain a billion bacterial cells from up to 10,000 species (Torsvik et al, 1990, 2002).

1.4.4 Soil biota are strongly influenced by land management. Modern farming has sought to replace many soil biota functions with less sustainable technological solutions, which lead to loss of soil biodiversity (Stockdale et al, 2006; Defra 2010c). For example, changes in land management practice and land use can have large effects on soil biodiversity over relatively short-time scales. Reducing the intensity of management, introducing no-tillage management and converting arable land to pasture usually has substantial beneficial effects (Spurgeon et al, 2013).

1.4.5 Microbial diversity in the UK reflects soil conditions, especially pH, but also vegetation, climatic and other environmental factors. Distinct specialist communities occur in more extreme soils with low diversity (Griffiths et al, 2012).

1.4.6 Current levels of understanding of soil biodiversity are low. Out of approximately 11 million species of soil organisms, an estimated 1.5% have been named and classified (Turbé et al, 2010) and most ecological roles are understood only at a general level.

Summary

1.4.7 Soils are habitats for millions of species, ranging from bacteria, fungi, protozoa, and microscopic invertebrates to mites, springtails, ants, worms and plants. Soil biota are strongly influenced by land management. Modern farming has led to the loss of soil biodiversity. Changes in land management practice and land use can have large effects on soil biodiversity over relatively short-time scales. Reducing the intensity of management, introducing no-tillage management, and converting arable land to pasture, such as grassland under solar PV arrays, has substantial beneficial effects.

1.5 Soil structure

1.5.1 Soil structure is defined by the way individual particles of sand, silt, and clay are assembled. Single particles when assembled appear as larger particles, called aggregates or peds. Soil structure is most usefully described in terms of grade (degree of aggregation), class (average size) and type of aggregates (form), or shape. The degree of aggregation ranges from structureless, through weak and moderate structure to strong structure. The shape of soil aggregates/peds is often describes as platy, prismatic/columnar, angular/subangular, or granular/crumb structure (Farming and Agriculture Organisation, FAO).

1.5.2 Soil structure refers to the way that soils are bound together. In a well-structured soil, water and air can move freely through cracks and pores. But a poor soil structure prevents water and air movement, and increases the risk of runoff (Defra, 2008). Soil structure can be improved by increasing sSOM (Cranfield University, 2001).

1.5.3 The Game and Wildlife Conservation Trust's Allerton Project (Game and Wildlife Conservation Trust, 2020) has been involved in investigating the sustainable intensification of agriculture through different experiments. Some research has focused on moving away from conventional agricultural practice, with greater emphasis on no-tillage ('no-till'). One of the fields at the Allerton Project has not been ploughed for the last 14 years and the soil structure is visibly different compared to other soils on the farm. No-till systems can help improve soil fertility, create changes to the structure and properties of the soil due to the stability of the environment, and enhance soil biology. Over time the no-till field has had the highest yields compared to the conventional field equivalent on the farm.

Summary

1.5.4 In a well-structured soil, water and air can move freely through cracks and pores. But a poor soil structure prevents water and air movement and increases the risk of runoff. Soil structure is improved when the land is uncultivated over time (no tillage), and when SOM content is increased through the accumulation of plant material, such has roots, in the soil. The aerobic (oxygenated) decomposition of SOM helps to bind soil particles together into aggregates (peds). Therefore, the conversion of land which is tilled for arable to long-term grassland (no tillage), such as that under solar PV arrays, improves soil structure over time.

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