Extra MSA Group

Warrington Motorway Service Area, J11 M62

Environmental Statement

Part 2 – Agricultural Land and Soils Technical

Paper 10

Revision 03 22 August 2019

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1. Introduction

1.1. This Paper of the Environmental Statement (ES) has been prepared by Wardell Armstrong LLP (WA) on behalf of Extra MSA Group to assess the potential effects of the Proposed Development (as described in the Project Description; ES Part One Report, Section 2) relative to Agricultural Land and Soils (including underlying peat deposits).

1.2. This Agricultural Land and Soils Paper has been prepared by Chartered Scientist Dr Eleanor Reed BSc (Hons), MSc, PhD, CSci (Principal Environmental Scientist (Soils)) of Wardell Armstrong, who has over 10-years' experience in soil science and has worked on numerous EIA projects throughout the UK and internationally; and technically reviewed by Dr Helen Simpson BSc (Hons), PhD (Associate Director) at Wardell Armstrong.

1.3. The baseline is considered and the potential environmental effects of the Proposed Development upon the current uses are identified, during the construction phase. Mitigation measures to reduce any negative environmental effects are identified as appropriate.

1.4. This Paper considers the following aspects of Agricultural Land and Soils:

- Existing agricultural land quality on Site and in the vicinity of the Site (established from a review of published data sources and a site survey);
- The suitability of the Proposed Development in the context of existing land quality and soil (and peat) resources; and
- Soil and peat handling activities during the construction and operational phases of the development and the resulting effects on soil and peat resources.

1.5. Although this Paper presents all of the information necessary to understand the effects on soils, peat and agriculture, the assessment should be considered in conjunction with the peat deposits and geology underlying the Site (as set out in Paper 1: Ground Conditions and Contamination); the hydrology of the Site (as set out in Paper 3: Water Resources); and, in relation to the potential excavation and reuse of peat resources, Ecology (as set out in Paper 5: Ecology and Nature Conservation).

2. Documents Consulted

National Policy

2.1. Under Section 15 of the National Planning Policy Framework (NPPF 2019): Conserving and enhancing the natural environment[4], Paragraph 170 states that planning policies and decisions should contribute to and enhance the natural and local environment by:

> "a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
>
> b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;
>
> e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and
>
> f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

2.2. The footnote to Paragraph 171 also states that "Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality".

2.3. The only reference to peat in the NPPF is with regards to peat extraction as a resource, in which Paragraph 204 states:

"Planning policies should:

a) provide for the extraction of mineral resources of local and national importance, but not identify new sites or extensions to existing sites for peat extraction;…

d) not grant planning permission for peat extraction from new or extended sites"

2.4. There is no reference to peats with respect to encountering this resource during the planning process when extraction is not the purpose of the planning application.

2.5. In relation to guidance on soils and agricultural land, the National Planning Practice Guidance (PPG) which accompanies the NPPF 2019 has been revised in July 2019. In the Natural Environmental Guidance Note, the PPG states that:

"a local planning authority must consult Natural England before granting planning permission for large-scale non-agricultural development on best and most versatile land that is not in accord with the development plan."

2.6. Therefore, knowledge of the Agricultural Land Classification (ALC) grading of the Site, is necessary to be able to determine whether the requirements of planning policy are being met; and the PPG advocates the use of the ALC to enable informed choices to be made about the future use of agricultural land within the planning system (PPG: 001 Reference ID: 8-001-20190721).

2.7. The PPG also recognises soil as an essential natural capital asset that provides important ecosystem services, for example as a growing medium for food, timber and other crops, as a store for carbon and water, as a reservoir of biodiversity and as a buffer against pollution, recommending the use of Defra's Code of Practice for the Sustainable Use of Soils on Construction Sites Guidance (PPG: 002 Reference ID: 8-002-20190721).

Local Policy

2.8. Local planning policy is set out within the Warrington Borough Council (WBC) Local Plan Core Strategy, adopted in July 2014. The Site is located in the Warrington Green Belt and Section 2.27 of the Local Plan recognises that "Warrington has extensive areas of high-grade agricultural land which have been well protected to date primarily through an established and

adopted Green Belt". The related policy, Policy CS 2: Overall Spatial Strategy - Quantity and Distribution of Development states that:

"development [within the Green Belt] will only be allowed where it is considered to be appropriate in accordance with national policy."

2.9. In addition, the Local Plan highlights the importance of Protecting the Countryside in Policy in Policy CC2, which states that

"Development proposals in the countryside which accord with Green Belt policies set out in national planning policy will be supported provided that; ….it can be demonstrated that there would be no detrimental impact on agricultural interests"

2.10. There are no further policies which specifically relate to the protection of soils and agricultural land, however, although not formally set out in a planning policy, Section 10 of the Local Plan sets a vision for 'Securing a High Quality Environment' which is 'natural and durable' by 2027, which states that:

"The borough is exercising careful stewardship of the natural environment and has acted to safeguard and enhance vital natural resources including water, air, and soil which help to both mitigate and adapt to climate change."

2.11. The 2013 WBC Supplementary Planning Document on Environmental Protection is concerned with soils in relation to contaminated land and potential impacts to human health, rather than the maintenance of the soil resource.

Legislation

2.12. The only legislation specifically related to agricultural land quality is the Town & Country Planning (Development Management Procedure) (England) Order 2015 (Statutory Instrument 2015/595). This triggers a requirement to consult Natural England where a development would lead to the direct or cumulative (taken to be circumstances in which the development is likely to lead to further loss) permanent loss of more than 20 ha of BMV agricultural land.

Guidance

2.13. Natural England Technical Information Note 49 (TIN049), promotes the use of the ALC for assessing the quality of farmland, to ensure informed choices are made about its future use within the planning system. It advocates the use of soil survey to inform environmental assessment, particularly where development is around the edge of towns. TIN049 states that where development is proposed on agricultural or other potential crop producing land, if that development is not for agricultural purposes and is not in accordance with the provisions of a development plan, and involves the direct or cumulative loss of more than 20 ha of BMV agricultural land, Natural England must be consulted in accordance with the Schedule 4, paragraph (y) of the Statutory Instrument 2015 No. 595.

2.14. Relevant guidance in relation to classifying agricultural land and soils (including peat); and standard best practice are listed below:

- MAFF, (1988); 'Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land';
- Defra, (2009); 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'; and
- SEPA (2011); 'Restoration Techniques Using Peat Spoil from Construction Works'.
- IUCN UK Peatland Programme and Yorkshire Peat Partnership (2019); 'Conserving Bogs: The Management Handbook' (2nd Edition).

2.15. The ALC was devised by MAFF (1988) and is the standard method for determining the quality of agricultural land in England and Wales according to its versatility, productivity and workability, based upon inter-related parameters including climate, relief, soil characteristics and drainage; i.e. ALC assesses land quality based upon the type and level of agricultural production the land can potentially support.

2.16. The ALC places land into one of five grades: Grade 1 (excellent); Grade 2 (very good); Grade 3 (good to moderate) which is divided into Subgrades 3a (good) and 3b (moderate); Grade 4 (poor); and Grade 5 (very poor).

2.17. Best and most versatile (BMV) agricultural land is defined as land of excellent to good agricultural quality (ALC Grades 1, 2 and Subgrade 3a) and is afforded a degree of protection in the NPPF (2019).

2.18. Although not specifically stated in the National or Local Policy, peat resources are considered to be of conservation interest due to their ability to sequester vast quantities of carbon when in a non-disturbed state.

Data sources

2.19. Information regarding the agricultural land and soil (including peat deposits) resource present in and surrounding the Site was obtained from the following published sources:

- Defra interactive mapping available at magic.gov.uk (for access to MAFF/Defra detailed ALC survey data);
- MAFF (1988). Agricultural Land Classification (ALC) of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land;
- MAFF (1993). Provisional Agricultural Land Classification 1:250,000 map, North West region;
- Met Office (1989). Climatological Data for Agricultural Land Classification (ALC): Grid point datasets of climatic variables at 5km intervals for England and Wales; and
- Soil Survey of England and Wales (1984). Soils and their Use in Northern England, with accompanying 1:250,000 map, Sheet 1.

2.20. Additionally, historic soil survey and field scale ALC data for the Site contained within the supporting ES of an application for an eastern extension to the adjacent former Risley Landfill Site were considered. The data were collated by SLR Consulting in February 2006 and submitted to WBC by the landfill operator (Biffa).

- SLR (2006) Risley Landfill Site Environmental Statement Chapter 11: Agriculture. (Planning Application 2006/08766)

3. Consultations

3.1. Table 3.1 presents a summary of the correspondence undertaken with statutory consultees in regard to the preparation of this Technical Paper and associated appendices.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
WBC Scoping Opinion (ES Part One Report; Appendix 18)	10th January 2019	Natural England	Written scoping response	Peat – Natural England advise that development on peat should be avoided. It is an irreplaceable habitat with a high biodiversity value but also performs an important role in carbon storage and water catchment management	N/A
	13th February 2019	WBC – Ecology Unit	Written scoping response	Will need to be Assessed. In terms of how the underlying substrate on the site (peat) is to be treated to facilitate the development an Assessment of potential options should be made. Excavating, storing and transporting peat carries risks of the peat drying, losing structure and losing integrity which could release carbon into the atmosphere. If it is to be translocated for use in bog and mire restoration schemes it will need to be excavated, stored and transported carefully. On the other hand retaining the peat in-situ but sealing it underneath metalled surfaces removes any potential for the peat to be restored to become 'active' and store more carbon in future.	N/A

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
Presence of peat including peaty topsoil and deeper peat deposits within the Site.	18th March 2019	Greater Manchester Ecology Unit (GMEU)	Meeting held at Tameside MBC Council Offices, Ashton-under-Lyne	Discussed the agricultural status of the site. Discussed the importance of peat management in line with a peat management hierarchy: • Avoidance • Reuse on site • Reuse off site (habitat creation or restoration) • Reuse off site (other applications such as horticulture) • Disposal GMEU provided WA with a list of known peatland restoration sites within the locale, in which peat could be beneficially re-used (i.e. potential receptor sites).	GMEU are satisfied with the methodology and outcome of the soil survey and resulting ALC grades assigned to the land. Avoid impact on peat where possible, if unavoidable, ensure the beneficially re-use of the peat on -site or off-site at suitable receptor sites.
Brook realignment and treatment of sub-surface peat deposits	09th April 2019	Environment Agency	Meeting held at EA Warrington Office	Discussed ecological survey methodology with respect to Development in general terms. Discussed opportunities for biodiversity enhancement via diversion of Silver Lane Brook. Discussed status of sub surface peat deposits.	No issue regarding survey scope or proposed Brook realignment. Confirmation to be provided to EA that the sub surface peat deposits do not meet the criteria for classification as a component of the Manchester Mosses SAC.
Status of Sub surface Peat deposits with regards to possible inclusion within Manchester Mosses SAC.	10th – 12th April 2019	GMEU	Telephone call and emails.	Discussion on whether or not the site can be considered to be a component of the Manchester Mosses SAC suite and fits the JNCC criteria for degraded peat bogs still capable of natural regeneration.	GMEU have confirmed that the site **does not meet the JNCC criteria** as it is not capable of natural regeneration and the current land use is not one of the land cover types falling within the definition.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
Discussions with Natural England's Planning team and Peatlands Specialist Dr Paul Thomas	4th June 2019	Paul Thomas and Janet Baguley	Site meeting and follow up email received 10th June 2019.	Status of peat habitats was discussed and whether or not the site can be considered to be EU Annex I habitat, and whether the peat resource can be considered to be 'irreplaceable' as per NPPF19.	**Natural England confirm that there are no Annex I Habitats on the proposed development site**. **Natural England cannot confirm that the habitats on the proposed development site do not meet the criteria to be considered 'irreplaceable' as defined by the NPPF** as a good proportion of the site has been confirmed as deep peat. The NPPF does provide examples of habitats that are 'irreplaceable' but the list is not definitive so the definition is open to interpretation. **Natural England advise that relocating peat is undesirable** as it will lose the ability to hold water and will degrade. There are no local nature reserves/sites where it would feasible or desirable to re-locate peat. The most desirable mitigation (if the development was to go ahead) would be wetland creation on a neighbouring parcel of land. • Consider retaining peat in situ so it does not lose carbon. • Wet woodland is a potential consideration for habitat creation on the development site. • Water from the brook and the proposed SUDS scheme are not compatible with peat, only rainfall. • Natural England advise that the proposed development site is fundamental to our Lowland Wetland Nature Recovery Network as it is suitable for restoration that will bolster the lowland wetland ecological network.

Table 3-1: Summary of Consultations and Discussions

3.2. The presence of peat on Site presents geotechnical constraints to the placement of structures sensitive to settlement, such as buildings, roads and car parks. Therefore, the development layout has been designed to take account of this and has been evolved through discussions with key consultees such as Natural England, the Greater Manchester Ecology Unit (GMEU) and the Environment Agency (Table 3-1). The peat hierarchy prioritises the avoidance of peat resources where possible and then ranks options for the re-use of disturbed peat in terms of most to least beneficial (see Section 6). Through the iterative design and consultation process the Proposed Development has been designed to maximise the area of undisturbed (avoided) peat, with disturbed peat to be retained within the Site for beneficial reuse in the creation of peatland type habitat.

4. Methodology and Approach

4.1. There is no sector specific guidance on the assessment of impacts to agricultural land use and soils, including peat. However, the following section provides information on the guidance associated with the gathering of agricultural baseline information, for the analysis of this information.

Receptors

4.2. The receptors considered in the assessment are the agricultural land and the soil resources (including peat deposits) present within the Site. The receptors are identified in accordance with Table 4-1.

Designation	Receptors
International	Receptors are not identified at this level.
National	ALC Grade 1 agricultural land (Excellent quality).
Regional	ALC Grade 2 agricultural land (Very Good quality).
County	ALC Subgrade 3a agricultural land (Good quality).
Borough / District	ALC Subgrade 3b agricultural land (Moderate quality). WBC Local Plan describes soils as a vital natural resource that the Council will seek to protect; and therefore, the soils within the Site are considered to be of importance at the Borough level. The buried peat deposits within the Site are heavily managed (through drainage and ditches) and no longer display any characteristics of active peat formation. They are therefore considered to be of importance at the Borough level.
Local/Neighbourhood	ALC Grades 4 and 5 agricultural land (Poor and Very Poor quality)

Table 4-1: Receptors

Environmental Impacts

4.3. The following aspects have been assessed for the Proposed Development:

- Loss of agricultural land;
- Loss of soil and peat resources; and
- Damage to soil and peat resources.

Magnitude	Environmental Impact		
	Loss of Agricultural Land	Loss of Soil and Peat Resource	Damage to Soil and Peat Resources
Substantial	No impact identified at this level	<5% of soil and peat resources maintained in a condition suitable for reuse	Permanent irreversible damage to soil or peat quality for example through handling, stockpiling and heavy machinery traffic
High	Total agriculture land take >20 ha of which >20 ha is BMV	<25% of soil and peat resources maintained in a condition suitable for reuse	Long-term (> two years) reversible damage to soil or peat quality for example through handling, stockpiling and heavy machinery traffic
Moderate	Total agriculture land take >20 ha of which <20 ha is BMV	25 - 50% of soil and peat resources maintained in a condition suitable for reuse	Medium-term (6 months to two years) reversible damage to soil or peat quality for example through handling, stockpiling and heavy machinery traffic
Minor	Total agriculture land take (all Grades) <20 ha	51 - 95% of soil and peat resources maintained in a condition suitable for reuse	Short-term (3 to 6 months) reversible damage to soil or peat quality for example through handling, stockpiling and heavy machinery traffic
Negligible	Total agriculture land take (all Grades) <5 ha	>95% of soil and peat resources maintained in a condition suitable for reuse	Small-scale reversible (< 3 months) damage to agricultural soils or peat.

Magnitude	Environmental Impact		
	Loss of Agricultural Land	Loss of Soil and Peat Resource	Damage to Soil and Peat Resources
Neutral	No net loss of agricultural land	No net loss of soil and peat resources greater than would be experienced during normal agricultural operations within the Site including retention of peat resources *in situ.*	No damage or very small-scale surface damage to agricultural soils equivalent to that done by typical farm machinery traffic / normal agricultural operations within the Site. Or peat resource stabilised *in situ* and not released for reuse, rendering any changes to the structure of the peat (physical damage) immaterial

Table 4-2: Environmental Impacts

4.4. The magnitude of impacts has been determined for each of the receptors in terms of magnitude of change from the baseline. The criteria are explained below and the impacts defined in Table 4-2.

4.5. There are no defined criteria for the assessment of effects on agricultural land (understood as a loss of agricultural land due to a permanent change to non-agricultural use due to built development or associated land use change). Therefore, the assessment of the impacts of the Proposed Development on agricultural landtake will be based on professional experience.

4.6. Statutory Instrument 2015 No. 595, The Town and Country Planning (Development Management Procedure) (England) Order 2015, Schedule 4, Part (y), requires that the local planning authority consults Natural England if the area of a proposed permanent development exceeds 20 ha of BMV land. Although the guidance does not state that this threshold should be used to determine the significance of loss, for the purpose of EIA, it is a guide to consider significance where 20 ha or more of BMV is affected by a development. Therefore, the loss of agricultural land has been assessed by estimating the amount and quality of land that may be affected by the Proposed Development, using the 20 ha threshold.

4.7. There are no defined criteria, or policy guidance on the assessment of the effects of development on soil or peat resources. Therefore, the assessment of the impacts of the

Proposed Development on soils (including the buried peats) within the Site will be based on professional experience and criteria which have been adopted in other assessments that have previously been agreed and accepted as best practice on other developments.

4.8. As set out within the Scoping Stage, the impact on agricultural business (farm viability) has not been assessed in this Paper. This is due to the Proposed Development been located on an area of agricultural land currently tenanted by one tenant; in which the tenancy agreement is short-term (one year), with no rights of renewal or security of tenure. As the landlord has the right to terminate the tenancy at any time, with a two-month notice period, it is considered the potential impact of the Proposed Development will be no different than is currently expected in a short-term agreement. Therefore, in accordance with the WBC Local Policy CC2 "Protecting the Countryside", it is deemed that there would be no detrimental impact on agricultural interests and this is not considered further.

Significance of Effects

4.9. The significance of effect is determined using the significance matrix in Section 6 of the Environmental Statement Part 1 Report. This identifies the receptor level across the top of the matrix and the magnitude of environmental impact down the side and where they meet within the matrix identifies the significance of the effect.

4.10. Effects that have been determined to be substantial, high or moderate are considered to have a significant effect and require specific mitigation in addition to good design and measures in a Construction Environment Management Plan (CEMP) or equivalent to address them. Effects that are identified as minor and negligible are not considered to have a significant effect and no further mitigation is required. Neutral effects do not require mitigation.

Impact Prediction Confidence

4.11. It is also of value to attribute a level of confidence by which the predicted impact has been assessed. The criteria for these definitions are set out in Table 4-3.

Confidence Level	Description
High	The predicted impact is either certain i.e. a direct impact, or believed to be very likely to occur, based on reliable information or previous experience.

Low	The predicted impact and its levels are best estimates, generally derived from first principles of relevant theory and experience of the assessor. More information may be needed to improve confidence levels.

Table 4-3: Confidence Levels

5. Baseline Information

Site Description and Context

5.1. The agricultural land within the Site comprises a large, roughly rectangular, field. Through the evolution of field patterns and land descriptions, available historical plans indicate that the drainage of the peat and conversion from moss habitat to agricultural land within the Site occurred sometime between 1849 and 1894. The land has therefore been in agricultural use for at least 125 years (see also Paper 9: Archaeology and Cultural Heritage). Aerial imagery is available for the period 2005 to 2019 and shows the land to have been in continuous arable use since at least 2005. Additionally, there is a small, triangular, area of rough grassland to the west of Silver Lane Brook, which is a remnant of a larger agricultural field which was removed by the development of the Risley Landfill Site. This remnant land was removed from agricultural use by the operation of the landfill site and is therefore considered to be non-agricultural. All other land within the Site is considered to be non-agricultural, being either hardstanding or areas of restored landfill, which are to be developed for amenity use. Further details of the Site can be found in the Project Description; ES Part One Report; Section 2.

Baseline Survey Information

Desk Study – Soils

5.2. The Soil Survey of England and Wales (1984) maps the majority of the soils in the Site as being characterised by soils of the Turbary Moor association. These are described as being found on lowland raised bog peats, variously modified from their original condition by drainage, peat cutting and reclamation for agriculture; and are the typical soil association of reclaimed raised mosses in the area, Drawing SH11739/015: Soil Associations (see Appendix 10.1). The presence of this association in the areas of agricultural land within the Site was confirmed by the SLR soil survey data contained within the 2006 Risley Landfill Site Environmental Statement Chapter 11: Agriculture (Planning Application 2006/08766; Appendix 10.10).

5.3. The Turbary Moor association comprises deep earthy fibrous peat soils with high groundwater levels where uncultivated. The soils are permeable, and through the introduction of ditches and field drains can be well drained (groundwater can be controlled), and the land improved for arable cropping. Like all peats, they can hold large amounts of available water and so are

non-droughty for all crops. A summary of the main characteristics of this soil is presented in Table 5-1.

Soil Association	Soil Series	Geology	Soil characteristics	Wetness Class	Erosion risk
Turbary Moor (1021)	Turbary Moor, Longmoss	Raised Bog Peat	Deep Earthy peats	when improved by pumped ditches and field drains, these soils are permeable and well drained (Wetness Class I).	Risk of wind erosion

Table 5-1: The Soil Associations based on the Soil Survey of England and Wales

5.4. It is noted that soils of the Salop association are mapped as being present along the western boundary of the Site. However, as the natural soils in this area were subject to removal due to the development of the Risley Landfill Site, there is the potential for the restored soil profile in this area to be of a different type than was present when the soils mapping was produced.

5.5. It should be noted that the scale of the soils mapping is such that it is not accurate to the field level and does not pick up small-scale local variations in soil type. However, it does provide a good indication of the soils likely to be present within the Site and in the wider area.

Desk Study – ALC

5.6. The most current and detailed published ALC data covering the Site and the wider Warrington Borough is the Provisional ALC mapping provided by Defra (1:250,000 scale). The Provisional mapping is intended for strategic use as it does not identify variations in ALC grade of less than approximately 80 ha and hence is not accurate at the field scale. Furthermore, the mapping does not provide a subdivision of Grade 3 into Subgrade 3a (BMV) and Subgrade 3b (non-BMV). It therefore cannot be used to accurately define the ALC grading of the Site, but instead provides a general indication of the predominant ALC grading of the wider area.

5.7. The Provisional mapping shows all agricultural land within the Site as being Grade 1 (excellent quality); immediately bordered by units of Grade 3 (good to moderate quality) land to the east; Grade 5 (very poor quality) land to the west; and Grade 2 (very good quality) land to the north, Drawing SH11739/014: Provisional ALC (see Appendix 10.2). The Site is therefore considered to be in an area of transition between ALC Grades.

5.8. This variation is further evidenced by the 2006 Risley Landfill Site Environmental Statement Chapter 11: Agriculture soil survey which identified a graduated change in ALC Grade across

the large agricultural field, from Grade 1 in the southeast corner through Grade 2, Subgrade 3a and finally Subgrade 3b in the northwest corner (Appendix 10.10. The small triangular area of rough grassland to the west of the site was identified as Grade 4. The data showed Subgrade 3a to cover the majority of the Site.

5.9. Additionally, in 1991, the land immediately west of the Site was subject to a detailed soil and ALC survey by MAFF (now Defra) which showed that, prior to the landfill being constructed and restored, the natural agricultural land within the landfill boundary was predominantly Subgrade 3b, with the area bordering the agricultural land within the Application Site to be Subgrade 3b to the south and Subgrade 3a to the north. This again indicates the variable nature of the ALC grading in the vicinity of the Site.

Site Survey – Soils

5.10. A detailed soil survey was undertaken on the 8th and 9th January 2019 by two competent soil surveyors using a combination of augered soil cores and soil profile pits. Auger cores were taken using a 70 mm diameter hand-held Edelman auger, capable of sampling to a maximum depth of 120 cm; the soil profile pits were excavated, using a spade, to a depth sufficient to evaluate the full soil profile. A total of thirteen cores and two profile pits were inspected. As shown on Drawing SH11739/031: Agricultural Land Classification (see Appendix 10.3), the survey points were distributed evenly across the Site giving a survey density of approximately one point per hectare of agricultural land, as per recommendations set out in standard survey and ALC guidance and methodology. The purpose of the survey was to provide details of soil profile characteristics and to inform the ALC assessment.

5.11. Further information on peat depth and peat characteristics were collected on an approximate 50 m grid. These data were collected using a peat (or Russian) auger excavated to the full depth of the peat profile (terminated when the underlying clay deposits were identified). A total of 46 cores were excavated, and the resulting peat depth plan is contained in Drawing SH11739/018: Peat Depth (see Appendix 10.4).

5.12. To ensure the accurate assignment of ALC grade and to provide data on the characteristics of the peat, thirteen soil samples were analysed for particle size distribution and key soil chemical characteristics by NRM Laboratories, accredited by UKAS to the internationally recognised standard for competence; ISO/IEC 17025. This included four composite topsoil samples from the southeast, south west, south-central and north of the Site taken during the

soil survey; and nine samples from Peat Survey Points 6 and 15, one from each peat horizon identified. These data are enclosed in Appendix 10.7; NRM Soil/Peat Analysis Results).

5.13. The lab data indicates the deeper peat has a high organic carbon content. Due to the current anaerobic conditions of the deeper peat, the carbon is currently locked up in the organic matter. However, if this wet, anoxic peat is disturbed and dries out (oxidises), the carbon will undergo degradation and be lost from the peat.

5.14. The soil survey confirmed the presence of peat topsoils (defined as organic-rich clay loams) across the entire Site, with an average depth of 0.36 m. The organic-rich topsoil is characterised by highly degraded, amorphous acidic black peat, with a low content of coarse fibres and wood remains and a low to moderate content of fine fibres. These soils are characteristic of the Turbary Moor Soil Association, as described in paragraph 5.2 and Table 5-1.

5.15. Although identified as a peat, the lack of an active living (peat forming) layer, known as the acrotelm, means this topsoil can be treated as an organic-rich soil resource as opposed to a peat resource. Primarily as this resource will not contain viable peat-plant propagules essential to assist in the restoration of peatland vegetation. The organic-rich topsoils are either developed over deeper peat deposits or over clays. There are 42,000 m^3 of organic-rich topsoil resource within the Site.

5.16. Where the peat extends below the topsoil, it is characterised by an increasing water content with depth together with an increasing content of fibres and wood remains, highlighting the reduced degradation of the deeper peat (Photograph 10.1). The laboratory data also indicates the deeper peat has a high organic carbon content. As the peat is buried at depth beneath agricultural land it is not an actively forming peat bog nor does it support sensitive habitats or species. The peat is deepest (1.75 m below ground level; a thickness of 1.39m) towards the southeast of the Site, but thins out towards the north (Drawing SH11739/018: Peat Depth (see Appendix 10.4). There are 45,300 m^3 of peat resources within the Site.

5.17. Where present (towards the north of the Site), the mineral subsoil is characterised by a slowly permeable clay, which has a strongly developed, coarse prismatic structure of very firm consistence, and shows evidence of gleying (indicative of periodic waterlogging; Photograph 10.2).

5.18. The site has undergone drainage, which has historically lowered the water table across the Site enabling the land to be cultivated, however its current efficiency is questionable due to the wet surface ground conditions in areas. This drainage has resulted in the drying, shrinkage and wastage of the peat and associated carbon loss. Further peat losses occur during cultivation and wind erosion (fen blow). The peat erosion coupled with the continued cultivation of the site, incorporates the deeper organic-rich peat into the plow layer, enabling the accelerated degradation of the peat and continued loss of carbon to the atmosphere.

Photograph 10.1: peat profile (Survey Point 15)

Photograph 10.2: organo-mineral soil profile (Survey Point 5)

Site Survey – ALC

Agroclimatic data

5.19. Agroclimatic data was taken from the nearest meteorological stations and interpolated to obtain site specific values (Table 5-2). This was then used to establish whether the agricultural land quality of the Site is limited by climate and, in conjunction with soil profile characteristics, wetness and droughtiness. It was found that the climate does not pose a limitation to the ALC on Site.

Average annual rainfall (mm)	877
Accumulated Temperature (°C)	1424
Field Capacity Duration (days)	207
Moisture Deficit Wheat (mm)	87
Moisture Deficit Potatoes (mm)	73

Table 5-2: The interpolated agroclimatic data for the Site

5.20. The local climate is reasonably warm, but moderately wet. The main derived climatic constraint is the long period (207 days) during the winter when rainfall exceeds evapo-transpiration and during which the soils will remain moist or wet, which would restrict the opportunities for land work and livestock grazing in most years.

Direct ALC limitations

5.21. There is no limitation to land quality due to topsoil texture, soil depth, site gradient, topsoil stoniness or flood risk (summer and winter). For the ALC assessment for each survey point refer to Appendix 10.6 (ALC Methodology, Soil Profile Description and ALC calculations).

Interactive ALC limitations

5.22. There is no limitation to land quality due to droughtiness Appendix 10.8 (Droughtiness calculations).

5.23. The soil properties indicate that the Wetness Class would sit between Wetness Class II and IV, with a lower wetness class assigned to soils with a higher water table, i.e. an increased proportion of the soil profile remains below the water table. Due to the fluctuating nature of the water table beneath peats, it is difficult to accurately determine the Wetness Class without long-term monitoring via permanent piezometers; and even where these data are available it is often inconclusive. The entire Site was assigned a Wetness Class IV based on the high rainfall in the area (Table 5-2), coupled with the site observations of ground conditions and vegetation growth; including wet soil profiles (Appendix 10.6; ALC Methodology, Soil Profile Description and ALC calculations) and a notably wet area with a patch of rushes growing.

5.24. Wetness predominantly limits the land quality to Grade 3a, with a small area to the north limited to Subgrade 3b.

ALC

5.25. A summary of the ALC determined from the soil survey are provided in Table 5-3**Error! Reference source not found.** and illustrated in Drawing SH11739/031: Agricultural Land Classification (see Appendix 10.3).

5.26. As identified in the 2006 Risley Landfill Site Environmental Statement Chapter 11: Agriculture soil survey soil survey (Appendix 10.10), the majority of land within the Site was classed as Subgrade 3a (BMV), with Subgrade 3b (non-BMV) land present to the north of the Site. However, unlike the 2006 Risley Landfill Site Environmental Statement Chapter 11: Agriculture soil survey, land of higher Grades (Grade 1 and 2) was not identified. This is due to the allocation of a lower Wetness Class (Class IV) across the whole Site (which was largely determined from the current land use and can be primarily attributed to the reduced efficiency of the agricultural drainage and subsequent increased soil wetness); whereas the 2006 Risley Landfill Site Environmental Statement Chapter 11: Agriculture soil survey assigned higher wetness classes (Class II and III) in the southeast.

ALC or other land category	Area (ha)	Percent (%)
Subgrade 3a	10.2	66.7
Subgrade 3b	1.5	9.6
Non-agricultural	3.3	21.5
Hardstanding	0.3	2.2
Total	15.3	

Table 5-3: Summary of ALC and the Site

Likely Evolution of the Baseline

5.27. It is anticipated that without the Proposed Development the identified baseline scenario for soils and agriculture within the Site will not change significantly as a result of natural processes and systems. However, the baseline does have the potential to alter due to changes in land use and farming practices. These changes may include, but are not limited to, a shift from arable to pastoral agricultural practices, or a change in the agricultural drainage regime. In this case, given the observed gradual decline in the functionality of the drainage system based on the change in ALC grade between the 2006 Risley Landfill Site Environmental Statement Chapter 11: Agriculture soil survey and the 2019 survey; and aerial imagery, it can be assumed that the Site soils would continue to get wetter unless the drainage is restored and maintained (typically through jet washing to remove sediment from the underground drainage and dredging for the ditches), however this would lead to further peat and carbon losses over time.

5.28. In addition, there is also the potential for long-term changes to the baseline due to climate change. These could potentially lead to alterations in agricultural land quality (ALC grade), for example through increased levels of soil wetness in the winter and increased droughtiness in the summer. Changes in rainfall may also affect decomposition rates and soil organic matter content. However, it is considered that the lifetime of the Proposed Development is not long enough for any natural changes in the land use and land quality to be sufficient to alter the findings of the assessment.

5.29. The baseline has the potential to change in the period between submission of the planning application and the start of construction due to new developments being brought forward within the vicinity of the Site, for example through the loss of agricultural land to development. If, after ES submission, further developments emerged that had any potential for significant effects on agricultural land and soils, there would be a requirement for those schemes to

consider the cumulative effect of their proposals in combination with those of the Proposed Development.

5.30. In summary, as there is little potential for the baseline presented in this technical paper to change significantly, it is reasonable to adopt the current baseline for use in the assessment.

6. Alternatives Considered

6.1. The soil survey identified the presence of 45,300 m^3 of peat on Site. As described previously, the upper topsoil layer is considered to be an organic-rich topsoil resource as opposed to a peat resource; and will be managed as a soil resource. However, the deeper peat (below the topsoil layer), which is currently stable and therefore a carbon store; should be considered a valuable and irreplaceable resource. (It is noted that these deep peats are not an irreplaceable habitat, as defined in the NPPF19, as the site does not support any peatland habitats and the arable farmland and smaller areas of neutral grassland and riparian habitat within the Site are widespread, common and typical of lowland farmland). Therefore, specific handling of this peat, in order to prevent the degradation and subsequent loss of carbon is required.

6.2. As described in the Project Description; ES Part One Report, Section 2 the management of peat in a construction site is usually considered by means of a Peat Reuse hierarchy. The hierarchy prioritises the avoidance of peat resources where possible, and then ranks options for the re-use of disturbed peat in terms of most to least beneficial, Table 6-1. The hierarchy used for the Proposed Development is based upon that presented in Scottish Environmental Protection Agency (SEPA) guidance document 'Developments on Peat and Off-Site Uses of Waste Peat', with the addition of the Rank 5 option, stabilisation, as this technique of combining peat with 'concrete' to create a stable development platform has been successfully used on a range of developments.

	Rank	Description
Most Preferred	1	**Avoidance** of (disturbance to) the peat resource.
	2	**Re-use onsite** for beneficial / ecological uses (e.g. peatland type habitat creation, site reinstatement).
	3	**Re-use off-site** for beneficial / ecological uses (habitat creation, restoration of existing peatland, erosion control).
Least Preferred	4	**Recycling (also referred to as 'other reuse off Site')** includes mixing with other materials to form a soil substitute or use in other relevant works (e.g. use as a horticultural medium, agricultural land improvement, blending).
	5	**Stabilisation.** Mixing with 'concrete' to form a solid / stable development platform

	Rank	Description
	6	**Disposal** (only to be considered after all other options have been explored and discounted).

Table 6-1: Peat Reuse Hierarchy

6.3. As shown in Table 3-1, the consideration of alternative options for the reuse of peat has been undertaken in consultation with Natural England (NE), Greater Manchester Ecological Unit (GMEU) and the Environment Agency (EA).

6.4. The various alternatives considered for the reuse of peat within the site are discussed by rank.

6.5. As explained in Table 6-1, the Rank 6 option (disposal) should only be considered once all other options have been explored and discounted; the disposal of the peat resources present within the Site has therefore never been considered as a viable option.

6.6. During the early stages of the iterative design process the use of stabilisation techniques (Rank 5 option) was considered for a portion of the peat resource. Preliminary geotechnical trials using peat samples from the Site in a range of mixes using a variety of cement binder percentages from 5% to 20% with other additives such as pulverized fuel ash or sand; showed that this technique could be successfully used to create a stable development platform within the Site. However, as the stabilisation (mixing of peat with other materials) could not be reversed, it was considered that this option was not suitable.

6.7. Early stages of the iterative design process also considered that the Rank 4 option, recycling would from part of the peat reuse strategy for the Site and would be fully investigated at reserved matters. To this end, initial discussions regarding the potential use of the peat as a soil improver on the adjacent former landfill site were undertaken, however this is discounted as the current nutrient poor status of the soils within the landfill site is resulting in the development of a desirable species rich flora, which would be hindered by the introduction of nutrient rich peats. The recycling option was also considered not desirable by NE.

6.8. The Rank 3 option, beneficial reuse off-Site, was discussed with GMEU in March 2019 and information regarding known peatland restoration sites within the locale, in which peat could be beneficially re-used (i.e. potential receptor sites) was exchanged. However, in June 2019 (Table 3-1) Natural England advised that relocating the peat would be undesirable and that in their opinion there were no local peatland sites where it would feasible or desirable to re-locate peat. The option of working with local peatland sites was therefore also discounted.

But, as Natural England had stated that the most desirable mitigation (should the Local Planning Authority be minded to grant planning consent) would be wetland creation on a neighbouring parcel of land, this option was investigated at some length. An options appraisal of six parcels of land close to the Site was undertaken; including land within the neighbouring former landfill site; two similar areas of agricultural land over deep peat to the east and south east of the Site which could potentially be suitable for peat habitat restoration; and three areas to the north, north east and west of the Site which could potentially be underlain by clay deposits allowing for the creation / excavation of specially prepared peat receptor areas (water retentive peat basins within clays). The areas are shown in Appendix 10.11: Drawing SH11739 032 Parcels Considered in the Options Appraisal. The options appraisal and further work on the nature of the superficial geology of the potential sites, showed that none of the six identified options was suitable. The landfill was discounted due to issues such as potential disturbance to the landfill cap, surcharging issues and the accentuation of landfill settlement. It was determined that the restoration of peat areas would be hindered by the presence of HS2 if this came forward, and that the impacts to local hydrology of blocking drainage could not be determined. Finally, from British Geological Survey (BGS) survey records the superficial geology is highly variable across short distances with significant deposits of sands and gravels interbedded with the clays, and from the desk based data, the three identified 'peat basin' sites were unsuitable for this purpose.

6.9. Therefore, through the iterative design and consultation process the Proposed Development was reviewed and redesigned such that all peat resources would be retained within the Site. An initial design to place a proportion of the excavated peat into the base of a SuDS pond (whilst allowing sufficient freeboard for SuDS capacity) was discussed with Natural England, but discounted due to NE's concern over the potential effects of runoff from the Proposed Development (potential contamination *etc.*).

6.10. Consequently, the site layout was redesigned, shifting all built development further to the west and creating a Peat Habitat Zone (Appendix 10.5: Drawing SH11739/034: Peat Depth and Site Layout) This design change maximised the area of undisturbed (avoided) Peat, whist allowing for all disturbed Peat to be retained within the Site for beneficial reuse in the creation of peatland type habitat (Project Description; ES Part One Report, Section 2). Therefore, all Peat resources within the Site will be addressed through the Rank 1 and Rank 2 options of the hierarchy.

7. Potential Environmental Effects

Construction Phase

7.1. Potential environmental effects are determined before any mitigation (Design or Construction) is considered.

7.2. The potential impact on agricultural land arising during the construction phase of the Proposed Development is considered to be:

- Loss of agricultural land.

7.3. This could occur as a consequence of either built development or change of land use to non-agricultural. Due to the nature of the Proposed Development, the loss of Subgrade 3a and 3b agricultural land will be permanent and extend across the full 15 ha Site; a **minor negative impact**. The agricultural land is considered to be of Borough to County-level importance.

7.4. The long-term effects to farm business and farm viability have been scoped out of the assessment.

7.5. There is 42,000 m^3 of organic-rich topsoil and a further 45,300 m^3 of peat which could potentially be handled and disturbed for the development.

7.6. The potential impacts on soil and peat resources arising during the construction phase of the Proposed Development include:

- Loss of soil / peat resource for reuse.

7.7. The incorrect removal, handling and storage of soils and peat could result in a direct loss of these resources. This loss could occur through erosion, excess trafficking on plant wheels, or unauthorised export. The loss of soil / peat resource could result in the impairment of the remaining soils' / peats' function, quality and resilience.

7.8. Incorrect handling of soils and peat could also result in the mixing of mineral and organic soils, mixing of soil horizons, and/or the contamination of soil/peat with overburden or construction materials. These mixed or contaminated soils/peat could no longer be of a quality suitable for reuse and could also be effectively 'lost'. In the absence of mitigation, all of the soil / peat

resource could be lost; a **substantial negative environmental impact,** leading to the significance of effect being **high to moderate adverse.**

- Damage to soil and/or peat resources resulting in impairment of their function, quality and resilience.

7.9. The incorrect management of soils and peat during construction could also result in damage through the impairment of their function, quality and resilience. This could be caused *in situ* or through soil /peat removal, handling, storage and subsequent reinstatement. The potential adverse effects include, but are not limited to:

- damage to soil structure and compaction, potentially creating conditions conducive to excessive drying or wetness;
- drying leading to excess erosion, oxidation and loss of carbon;
- loss of soil nutrients;
- loss of soil biota (for example bacteria, fungi, earthworms) and/or reduction of its activity; and
- mixing of materials reducing potential for reuse and future productivity.

7.10. Based on the agricultural land quality, the soils are considered to be of Borough to County-level importance and the peat of Borough-level importance. In the absence of mitigation, all of the soil and peat resources could be permanently damaged; a **substantial negative environmental impact** leading to the significance of effect being **high to moderate adverse.**

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
1) Loss of agricultural land to built development or change of land use to non-agricultural	County to Borough	*Minor Negative*	*Minor Adverse*	*High*
2) Loss of soil / peat resource	*Soil* – County to Borough	*Substantial Negative*	*High to Moderate Adverse*	*High*
	Peat – Borough	*Substantial Negative*	*Moderate Adverse*	*High*
3) Damage to soil resource resulting in	*Soil* – County to Borough	*Substantial Negative*	*High to Moderate Adverse*	*High*

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
impairment of their function, quality and resilience	*Peat - Borough*	*Substantial Negative*	*Moderate Adverse*	*High*

Table 7-1: Significance of Effect - Construction Phase

7.11. The significance of effects on agriculture and soil receptors are presented in Table 7-1.

7.12. In summary, in the absence of mitigation, the loss of agricultural land is not significant; whilst the potential loss and damage to the soil and peat resources would be significant.

Operational Phase

7.13. All agricultural land within the Site will undergo a permanent change of use to non-agricultural as a consequence of the construction phase of the Proposed Development. Therefore, as there would be no agricultural land present within the Site after completion / during operation there would be no further impact to (loss of) agricultural land. The potential effects on agricultural land after completion / during operation are consequently not discussed further in this Paper, as the loss of agricultural land is considered to have been fully considered in the assessment of construction phase effects.

7.14. After construction, the soils and peat remaining on Site would most likely only experience very low levels of disturbance due to works connected with the maintenance of landscaped areas. The scale of this disturbance would be lower than is likely currently experienced within the Site due to agricultural activities, it is therefore considered that the low scale works which would occur after completion would result in no loss of or damage to soils and peat or impairment of function. Consequently, it is considered that there would be no effects on soils after completion of the Proposed Development and this topic is not discussed further in this Paper.

7.15. In summary, there are no significant impacts as a result of the Operational Phase.

8. Proposed Mitigation

Construction Phase

Agricultural Land

8.1. The loss of agricultural land within the Site due to the Proposed Development cannot be mitigated.

Soil Resources

8.2. A full topsoil strip to a depth of 360 mm will be undertaken across the full development area (including the Peat Habitat Zone), resulting in the handling of 42,000 m^3 of organic-rich topsoil, this will minimise the possibility of soil and peat mixing and subsequent degradation and loss of these resources. Soils which lie beyond the development area (for instance those soils within the pipeline easement to the east of the Site) will be retained in situ.

8.3. The topsoil resources within the Site would be protected against damage by the adoption of industry standard measures for the management of soil, such as those set out in Defra's 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Typical working methods and techniques used to protect soil resources include, but are not limited to, the following:

- The handling of topsoil resources only when sufficiently dry to prevent compaction and damage to soil structure; or implementing strict procedures for the wet-handling of soils incorporating amelioration and restoration measures to reverse any damage which may occur for example through compaction.
- The handling and maintenance of deeper peats in a wet state to prevent drying and oxidation.
- The separate stripping, handling, storage and transportation of different soil layers (topsoils, subsoils and peat) and soil types if there is variation across the Site.
- Appropriate seeding of soil storage mounds if required for a period longer than six months, to prevent erosion and to maintain soil structure, nutrient content and biological activity;

- De-compacting of the subsoil before topsoil re-instatement; and
- Minimising the number of machine movements across topsoil and defining haul routes to reduce compaction and retain soil structure.

8.4. Soil handling should aim to maintain or enhance ecosystem services such as carbon sequestration; minimise risks to ecosystem services (such as loss of habitat, water quality, storage or ground stability); and retain excavated peat in storage as close to the point of extraction as practicable.

8.5. Topsoil resources will be re-used where possible on site in the landscaping of open spaces, with any surplus topsoil removed from site and made available for beneficial reuse elsewhere. Furthermore, the establishment of permanent vegetative cover within the landscaping areas (both areas with natural and restored soil profiles) would mitigate further topsoil and peat loss which is currently experienced at the Site due to cultivation (wind erosion and continued incorporation of the deeper peat into the plow layer, see paragraph 5.18).

8.6. As described in the discussion of the Alternatives Considered (above) the layout of the Proposed Development has been designed to maximise the area of peat which is retained *in situ* and remains undisturbed by development. This includes all peat resources which occur within the pipeline easement and undeveloped areas to the south of the Site; and which lie within the Peat Habitat Zone. The disturbed peat from within the development area would be placed over the *in situ* peat within the Peat Habitat Zone, held in place by the construction of a retaining bund (as described in Project Description; ES Part One Report, Section 2).

8.7. Through the iterative design and consultation process the Proposed Development has been designed to maximise the area of undisturbed (avoided) peat, with disturbed peat to be retained within the Site *in situ,* for beneficial reuse in the creation of peatland type habitat. The area of undisturbed peat equates to approximately 50.1% (22,700 m^3) of the peat resource on site, including the deepest peat areas to the south east as illustrated in Drawing SH11739/034: Peat Depth and Site Layout (see Appendix 10.5).

8.8. The remaining 22,600 m^3 (49.9 %) of peat which occurs within the development area will be directly transferred into a specially prepared area within the site (Peat Habitat Zone). The specialised design of the Peat Habitat Zone along with the direct transfer of peat from the development area minimises the potential for peat damage, drying or carbon loss and ensures that the Peat Habitat Zone will remain in a wettened state. As all topsoil would be stripped

in advance of these works, the peat is placed directly over peat with no mixing of the degraded agricultural soils. Further details of the design of the Peat Habitat Zone can be found in the Project Description; ES Part One Report, Section 2and illustrated in Drawing SH11739/06: Peat Depth in the Peat Habitat Zone (see Appendix 10.9).

8.9. The direct transfer of the peat from the development area to the specially prepared Peat Habitat Zone would ensure no double handling of the resource and minimise the potential for damage to the peat, peat drying or carbon loss. Within the Peat Habitat Zone, a mosaic of habitats such regenerating scrub, dry and wet heathland areas and bog pools, will be created as a peatland type habitat. By creating a diversity of topography and habitats, the area will be more resistant to seasonal change as well as climate change. The detailed design of this area will be continued through Reserved Matters.

8.10. In the absence of any England-specific guidance, where the disturbance of deeper peat cannot be avoided, the Scottish Environmental Protection Agency (SEPA) has set out good practice guidance for upland blanket peats, which can be applied to lowland peats (SEPA "Restoration Techniques Using Peat Spoil from Construction Works", July 2011). Similarly, advice on the construction of peat retention bunds is also provided by the IUCN UK Peatland Programme (IUCN UK Peatland Programme and Yorkshire Peat Partnership "Conserving Bogs: The Management Handbook" (2nd Edition), 2019).

8.11. The SEPA guidance sets out the main considerations including the type of peat (amorphous or fibrous), which will have a significant influence on the method of excavating, storing and reinstating; and that land restored using peat should include provision for the long-term control of groundwater. The peat soils may also become strongly acidic when oxidised (i.e. drained or exposed to the atmosphere), which can give rise to environmental issues such as acidic water runoff. This will require specific identification and separate stripping and storage.

8.12. Prior to construction, in line with good practice and the Applicant's own working procedures, soil and peat management within the Site would be defined through a detailed site-specific Soil and Peat Management Plan (SPMP). This will be produced by a qualified soil scientist prior to construction. This will ensure that the quality of the peat is maintained and it remains in a condition suitable for reuse on site to create peatland type habitat. The requirement for a SPMP can be controlled through planning condition.

8.13. By ensuring the quality of soil and peat resources are maintained at a level suitable to allow their reuse either within the Proposed Development (for example in landscaped areas) or (in the case of the soil resources only) elsewhere (subject to the receipt of the required permits or exemptions), these resources remain available for beneficial use and therefore no loss of soil/peat resource is considered to occur. The implementation of these standard measures will also ensure that upon replacement / reuse the soils and peat will also be able to deliver a range of vital ecosystem services.

8.14. Loss of soil and peat due to unauthorised export would be controlled through the Site security measures that would be in place during the construction phase which would ensure no material is taken off Site without prior knowledge and agreement with the Applicant.

9. Potential Residual Effects

Potential Residual Effects – Construction Phase

9.1. The permanent loss of all 11.7 ha of agricultural land within the Site as a result of the Proposed Development cannot be mitigated. However, although the land would no longer be in agricultural production, the area of unsealed land (for example the Peat Habitat Zone and landscaping areas) has the potential to support the Proposed Development through sustaining or indeed improving regulatory (i.e. carbon sequestration and flood attenuation), supporting (i.e. habitat creation) and cultural services (i.e. recreational value). As well as supporting wider mitigation strategies for the development, i.e. supporting the open space which would be used as aesthetic mitigation. The creation of peatland type habitats within the Peat Habitat Zone in combination with the permanent vegetative cover to be established within the landscaping areas is considered a **Minor Benefit** based on the creation of a high value ecosystem and prevention of peat degradation due to the cessation of arable cropping activities which are currently causing a progressive degradation of the peat resource. As a result, the creation of a high value ecosystem has been added to the table of effects (Table 9-1).

9.2. As the mitigation measures to prevent the loss of and damage to the soil resource described above are considered to be standard industry practice and therefore would be automatically implemented during construction of the Proposed Development, it is considered appropriate to re-assess the significance of effects with this standard mitigation in place.

9.3. There is 42,000 m^3 of organic-rich topsoil on Site (Paragraph 5.15). The nature of the Proposed Development will allow for up to 15,840 m^3 of topsoil reuse in landscaping of open spaces (assuming a placement of topsoils to a depth of 360 mm – consistent with their current depth, unless deviation is specifically required to meet landscaping specifications); with approximately 26,160 m3 of topsoil surplus to requirements and requiring removal from Site.

9.4. Similarly, it is proposed that all of the peat resource will be retained *in situ* or reused on site in the Peat Habitat Zone.

9.5. Any excess topsoil will be removed from site and made available for beneficial reuse elsewhere. Providing these soils are handled when in a suitable condition, they will retain a proportion of their structure and functional ability to provide benefits through ecosystem services.

9.6. The site layout has been carefully designed such that 22,700 m^3 (50.1%) of the peat will be avoided / remain *in situ*, whilst the remaining 22,600 m^3 (49.9 %) which occurs within the development area will be directly transferred into a specially prepared area within the site (Peat Habitat Zone). Furthermore, the handling and placement of Peat will be carried out in accordance with a site-specific Management Plan (or similar) to be produced by a qualified soil scientist prior to construction, which will further minimise potential damage, loss or drying of the peat resource.

9.7. The standard mitigation measures, as set out in Defra (2009), would reduce the risk of damage to topsoil structure and soil deformation (compaction and smearing) to a level where no damage or very small-scale surface damage (equivalent to that done by a typical farm machinery traffic) would be likely to occur. The standard mitigation measures, as set out in SEPA (2011), would reduce the risk of damage to the peat to a level where small-scale reversible damage would be likely to occur. Consequently, the magnitude of effect would be reduced to Negligible and the residual effect to the soil and peat would also be reduced to **Negligible**.

9.8. Coupled with the re-use of any surplus topsoil with an appropriate soil recycling contractor, the standard mitigation measures, as set out in Defra (2009), would minimise the loss of soil resources such that over 95% of soil resources are retained in a state suitable for reuse; resulting in a negligible magnitude of effect (the <5% loss is due to unavoidable small-scale losses arising from factors such as trackout of soils on construction vehicle wheels). The residual effect to the soil and peat would also be reduced to be a **Negligibl**e

9.9. The overall impact of the proposal in terms of Agricultural Land and Soil issues during the construction phase is highlighted in Table 9-1.

9.10. In summary, there will be no Significant residual effects at the Construction Phase.

Nature of Impact	Receptor	Environmental Impact without Mitigation	Significance of Potential Effect	Confidence Level	Mitigation	Residual Significance of Effect
1i) Loss of agricultural land to built development or change of land use to non-agricultural	*County to Borough*	*Minor Negative*	*Minor Adverse*	*High*	*n/a*	*Minor Adverse*

Nature of Impact	Receptor	Environmental Impact without Mitigation	Significance of Potential Effect	Confidence Level	Mitigation	Residual Significance of Effect
1ii) Creation of a high value ecosystem	*County to Borough*	*Minor Benefit*	*Minor Benefit*	*High*	*n/a*	*Minor Benefit*
2) Loss of soil / peat resource	*Soil – County to Borough*	*Substantial Negative*	*High to Moderate Adverse*	*High*	*Standard industry practice (Defra, 2009)*	*Negligible*
	Peat - Borough	*Substantial Negative*	*Moderate Adverse*	*High*	*Standard industry practice (SEPA, 2011)*	*Negligible*
3) Damage to soil or peat resource resulting in impairment of their function, quality and resilience	*Soil – County to Borough*	*Substantial Negative*	*High to Moderate Adverse*	*High*	*Standard industry practice (Defra, 2009)*	*Negligible*
	Peat - Borough	*Substantial Negative*	*Moderate Adverse*	*High*	*Standard industry practice (SEPA, 2011)*	*Negligible*

Table 9-1: Residual Significance of Effect - Construction Phase

10. Additive Impacts (Cumulative Impacts and their Effects)

10.1. For the purposes of this ES we define the additive cumulative effects as:

> ***'Those that result from additive impacts (cumulative) caused by other existing and/or approved projects together with the project itself***

10.2. The developments that are likely to have a cumulative impact when considered with the Proposed Development have been scoped with the Local Authority and Key Consultees during the preparation of this ES (a full list is included within Section 9 of the ES Part One Report). The following table includes the agreed list of cumulative developments that have been assessed in respect of Agricultural Land and Soils.

10.3. At Scoping it was considered that due to the spatial proximity of land safeguarded for the HS2 route to the Site and its context set within agricultural land, that there was justification for HS2 to be included in the assessment of Cumulative effects (See Table 10-1: Cumulative Development). However, the Proposed Development Red Line Boundary has since been altered, so that there is no overlap between the Development boundaries.

No.	Cumulative Development	Details	Status	Justification for Inclusion in Cumulative Assessment
3	HS2 (adjacent to the Site)	Land safeguarded for the HS2 route Government consultation.	Current programme: Advanced works Q4 2022 Development Q4 2024 Commissioning Q4 2031 – Q3 2033	Given the spatial proximity of the Development to the site and its context set within agricultural land, it is deemed relevant to the Agricultural Land and Soils assessment

Table 10-1: Cumulative Development

10.4. The zone of influence for cumulative effects to agricultural land (permanent agricultural land take) is measured at a local scale. The zone of influence for cumulative effects to soil resources

is considered to be the development boundary of the Proposed Project, as cumulative effects would only occur if the same area of soil resource were impacted (disturbed) by multiple developments.

10.5. Other cumulative developments as presented in Section 9 of the ES Part One Report are not considered as they are not located on Agricultural Land and will therefore not impact agricultural land or soil receptors.

10.6. As there are no developments which will encroach into the development boundary of the Proposed Development, the potential cumulative impact on soil and peat resources can be scoped out.

10.7. The Site will undergo a permanent land use change from agricultural to non-agricultural. As there would be no agricultural land present within the Site during the Operational Phase there would be no potential cumulative impact in the medium (6-10 years) to long term (>11 years), and consequently not discussed further in this Paper.

10.8. As such, only the Construction phase will be considered and the potential short-term cumulative impacts assessed for agricultural land use change.

Limitations

10.9. It is important to note that there was limited available detailed data available for the cumulative assessment to be undertaken.

Short Term

10.10. Short term cumulative impacts consider the potential impacts which would occur immediately, within the first 5 years of the Proposed Development.

10.11. The HS2 development is scheduled to undergo construction in Q4 2022, thus will likely occur within the first 5 years of the Proposed Development.

10.12. HS2 consider environmental impacts at a Community Area. The Proposed Development is located within HS2 Community Area MA04: Broomedge to Glazebrook, therefore, the zone of influence for cumulative effects to agricultural land (permanent agricultural land take) is

measured at a local scale according to the Community Area MA04: Broomedge to Glazebrook.

10.13. The total potential agricultural land take at the local scale as a result of the Proposed Development (11.7 ha) and HS2 (63 ha; HS2 (2018) would be 74.7 ha.

10.14. The total potential BMV agricultural land take at the local scale as a result of the Proposed Development 10.2 ha and HS2 44.0 ha (HS2, 2018) would be 50.2 ha.

10.15. The Provisional ALC mapping in Appendix 10.2 shows the agricultural land local to the Site to vary in quality from Grade 1 to Grade 5; which using the criteria in Table 4-1 means that, as a worst case, the land through which HS2 passes must be considered as containing at least a proportion of Grade 1 land (National significance). As the cumulative loss of agricultural land to HS2 and the Proposed Development would be greater than 20 ha of which more than 20 ha is of BMV quality the scale of the environmental impact is considered to be high. Therefore, the significance of the effect would be **substantial adverse**.

10.16. However, it is important to note that using the criteria set out in this assessment, the loss of agricultural land as a consequence of HS2 alone would be substantial adverse, and consequently any scheme considered cumulatively with HS2 would result in a substantial adverse cumulative effect. Whereas losses to the Proposed Development are considered to be minor adverse.

Summary

10.17. The zone of influence for cumulative effects to agricultural land (permanent agricultural land take) is measured at a local scale. Due to the spatial proximity of land safeguarded for the HS2 route to the Site and its context set within agricultural land, that there was justification for HS2 to be included in the agricultural land assessment of Cumulative effects. Other cumulative developments as presented in Section 9 of the ES Part One Report are not considered as they are not located on Agricultural Land and will therefore not impact agricultural land or soil receptors

10.18. The permanent loss of BMV agricultural land due to the cumulative assessment will potentially exceed the 20 ha threshold and any effect would, therefore be considered significant. This is

due to the 44 ha permanent BMV land take resulting from HS2. However, it is important to note that HS2 is considered a major strategic transport project.

10.19. As there are no developments which will encroach into the development boundary of the Proposed Development, the potential cumulative impact on soil and peat resources can be scoped out.

11. Conclusion

11.1. The baseline soils and agricultural quality has been determined through a desk based and survey assessment. The potential environmental effects of the Proposed Development upon the current uses have been identified, during the construction and operational phases. Mitigation measures to reduce any negative environmental effects have been identified where necessary.

11.2. The following aspects of soils and agricultural land were assessed:

- Loss of agricultural land of Best and Most Versatile (BMV) quality; and
- The potential disturbance, damage and loss of soil and peat resources

11.3. The overall impact of the proposal in terms of Agricultural Land and Soil issues during the construction phase is highlighted in Table 9-1.

11.4. The Site covers an area of approximately 15.3 ha, of which approximately 11.7 ha is agricultural land. The permanent loss of BMV agricultural land as a result of the Proposed Development would not exceed 20 ha and is therefore considered to be **not significant.**

11.5. The soil survey which identified organic-rich clay loam topsoils over either peat deposits or over clays. There is 42,000 m^3 of organic-rich topsoil and a further 45,300 m^3 of peat which could potentially be handled for the development.

11.6. The organic-rich topsoil will be stripped to a depth of 0.36 m across the full development area. Up to 15,840 m^3 of this topsoil would be reused on site in landscaped and greenspace areas; with the surplus exported for beneficial use elsewhere through an appropriate soil recycling contractor.

11.7. In the absence of appropriate construction mitigation measures, there is the potential for the damage to the topsoils to occur during handling; the resultant effect could be significant.

11.8. In the absence of appropriate construction mitigation measures, there is the potential for the loss of the topsoils to occur during handling, including loss through unapproved soil export; erosion; mixing; and contamination; the resultant effect could be significant.

11.9. The topsoil resources within the Site would be protected against damage during soil handling activities by the adoption of industry standard soil and peat management measures, such as those set out in Defra's 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.

11.10. Through the iterative design and consultation process the Proposed Development has been designed to maximise the area of undisturbed (avoided) peat, with disturbed peat to be retained within the Site for beneficial reuse in the creation of peatland type habitat. The area of undisturbed peat equates to approximately 50.1% of the peat resource on site, including the deepest peat areas to the south east.

11.11. The remaining 49.9% of peat within the development area will need to be excavated to allow the construction works for the Proposed Development and directly placed within the Peat Habitat Zone to create a peatland type habitat. As a result, all peat resources within the Site will be addressed through the Rank 1 and Rank 2 options of the peat hierarchy.

11.12. In the absence of appropriate construction mitigation measures, there is the potential for the damage to the peat to occur during handling; the resultant effect could be significant.

11.13. In the absence of appropriate construction mitigation measures, there is the potential for the loss of the peat to occur during the handling of the peat, including loss through unapproved peat export; erosion; mixing; and contamination; the resultant effect could be significant.

11.14. Through the implementation of standard control and management measures for the handling and storage of soil and peat, soil/peat loss, and the associated impairment of the remaining soils' and peats' function, quality and resilience, would be reduced. Consequently, the effect of the Proposed Development in terms of disturbance or damage to soil and peat properties would be **not significant**, with the residual impact considered **negligible.**

11.15. The implementation of standard control measures for the handling and storage of soil and peat resources would ensure that soil loss, and the associated impairment of the remaining soils' function, quality and resilience, would be reduced. The above measures would minimise the loss of soil resources such that over 95% of soil resources would be retained in a state suitable for reuse and the effect of the Proposed Development in terms of loss of soil and peat resources would be **not significant,** with the residual impact after mitigation considered **negligible.**

11.16. With the standard mitigation measures, as set out in Defra and SEPA in place, the Proposed Development at the Application Site would not result in any adverse significant effects on the agricultural land or soil resources.

11.17. Prior to construction, soil and peat management within the Site would be defined through a detailed site-specific Soil and Peat Management Plan (SPMP) will be produced. This will ensure that the quality of the soil and peat is maintained and it remains in a condition suitable for reuse.

12. Reference List

Construction Code of Practice for the Sustainable Use of Soils on Construction Sites; Accessed on 11/01/2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707134/pb13298-code-of-practice-090910.pdf

Defra interactive mapping available at magic.gov.uk (for access to MAFF/Defra detailed ALC survey data)

HS2 (2018). High Speed Rail (Crewe to Manchester and West Midlands to Leeds). Volume 2: Community Area report MA04: Broomedge to Glazebrook

IUCN UK Peatland Programme and Yorkshire Peat Partnership (2019); 'Conserving Bogs: The Management Handbook' (2nd Edition).

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

MAFF (1993). Provisional Agricultural Land Classification 1:250,000 map, North West region

Met Office (1989). Climatological Data for Agricultural Land Classification (ALC): Grid point datasets of climatic variables at 5km intervals for England and Wales

National Planning Policy Framework (NPPF) (2019) Accessed on 28/03/2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

National Planning Practice Guidance (PPG) Accessed on 28/03/2019. https://www.gov.uk/government/collections/planning-practice-guidance

Natural England (2009). Technical Information Note 49: Agricultural Land Classification: Protecting the Best and Most Versatile Agricultural Land

SEPA (2011) Restoration Techniques Using Peat Spoil from Construction Works. Accessed on 11/01/2019. Available at https://www.sepa.org.uk/media/163263/restoration-techniques-using-peat-spoil-from-construction-works.pdf

SLR Consulting Report (2006) Chapter 11: Agriculture http://planning.warrington.gov.uk/swiftlg/apas/run/WPHAPPDETAIL.DisplayUrl?theApnID=2006/08766&backURL=%253Ca%2520href%253Dwphappcriteria.display%253FpaSearchKey%253D1412447%253ESearch%2520Criteria%253C%252Fa%253E%20%3E%20%3Ca%20href%3D%27wphappsearchres.displayResultsURL%3FResultID%3D2344910%2526StartIndex%3D1%2526SortOrder%3DAPNID%2526DispResultsAs%3DWPHAPPSEARCHRES%2526BackURL%3D%253Ca%2520href%253Dwphappcriteria.display%253FpaSearchKey%253D1412447%253ESearch%2520Criteria%253C%252Fa%253E%27%3ESearch%20Results%3C%2Fa%3E

Soil Survey of England and Wales (1984). Soils and their Use in Northern England, with accompanying 1:250,000 map, Sheet 1.

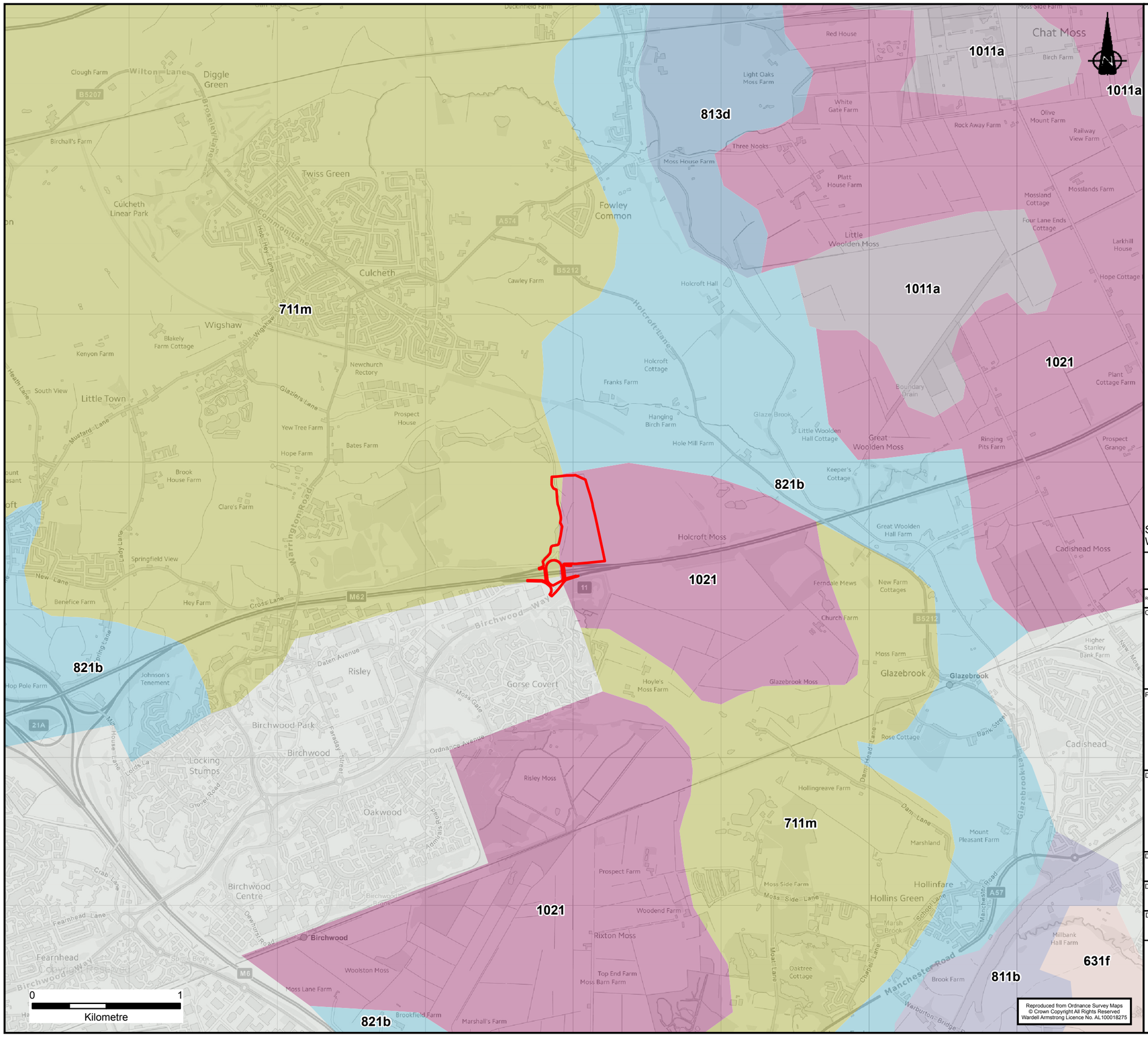
The Town and Country Planning (Development Management Procedure) (England) Order 2015 (Statutory Instrument 2015/595). Accessed on 11/01/2019. Available at: http://www.legislation.gov.uk/uksi/2015/595/schedules/made

Warrington Borough Council Local Plan Core Strategy (2014). Accessed on 28/03/2019. https://www.warrington.gov.uk/info/200564/planning-policy/1903/local-plan

Warrington Borough Council (2013) Supplementary Planning Document on Environmental Protection

13. Appendices

Appendix 10.1 – Drawing SH11739/ 15 Soil Associations



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KEY

- Site Boundary

Soil Associations

- Blackwood (821b)
- Conway (811b)
- Crannymoor (631f)
- Fladbury 3 (831d)
- Longmoss (1011a)
- Salop (711m)
- Turbary Moor (1021)
- Urban

Soil Association data reproduced from the Soils of England and Wales Sheet 1 Northern England (Soil Survey for England and Wales)

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
B	SITE BOUNDARY AMENDMENTS	JULY 2019	SW	HS	AJD
A	FIRST ISSUE	APRIL 2019	SW	HS	AJD

CLIENT

EXTRA MSA GROUP

PROJECT

WARRINGTON MSA, J11, M62

DRAWING TITLE

FIGURE 10.2
SOIL ASSOCIATIONS

DRG No.		REV
SH11739/015		B
DRG SIZE	SCALE	DATE
A3	1:25,000	22/07/2019
DRAWN BY	CHECKED BY	APPROVED BY
SW	HS	AJD

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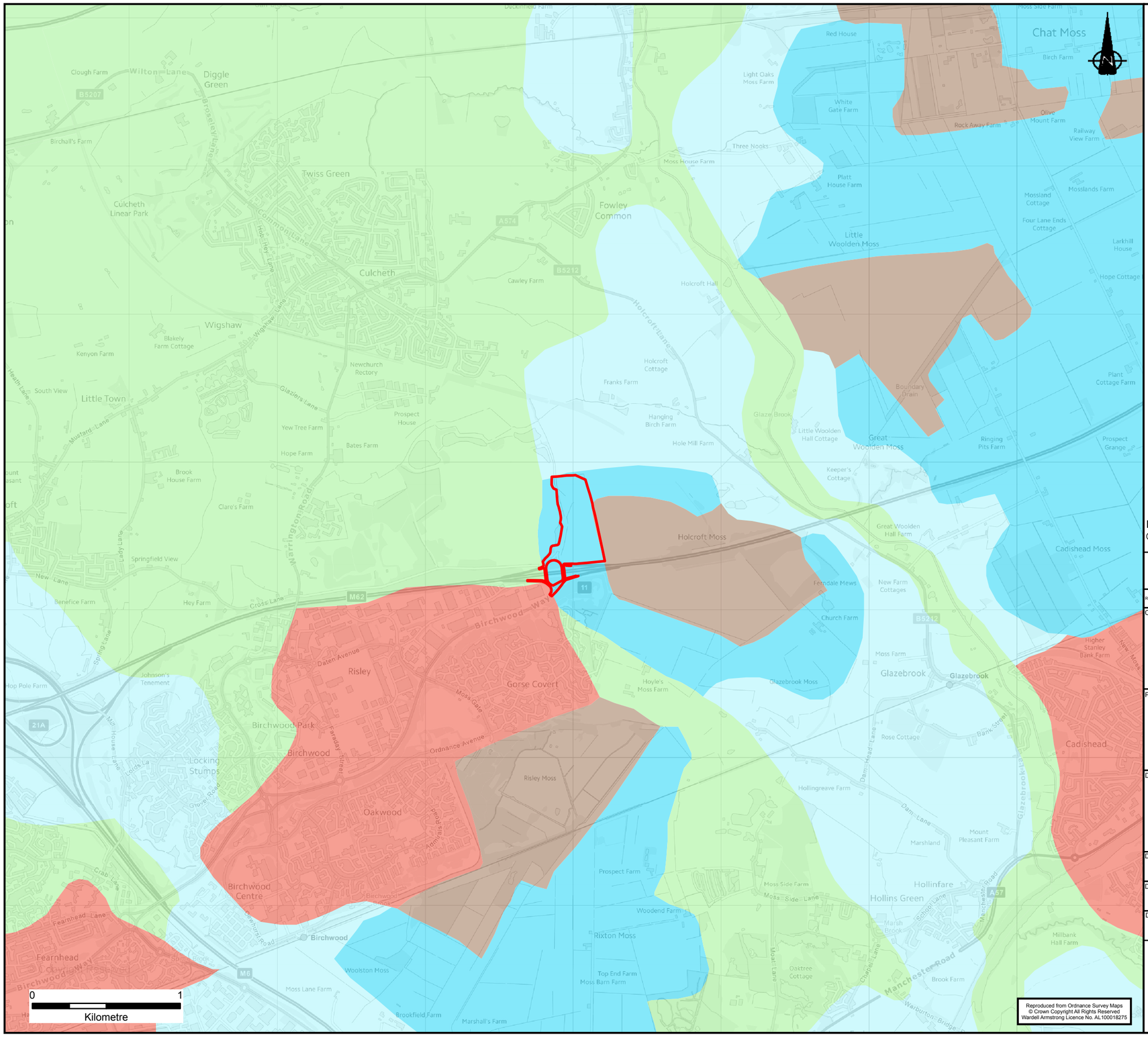
Appendix 10.2 – Drawing SH11739/ 14 Provisional Agricultural Land Classification



KEY

- Site Boundary

Agricultural Land Classification

- Grade 1
- Grade 2
- Grade 3
- Grade 5
- Urban

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
B	SITE BOUNDARY AMENDMENTS	JULY 2019	SW	HS	AJD
A	FIRST ISSUE	APRIL 2019	SW	HS	AJD

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WARRINGTON MSA, J11, M62

DRAWING TITLE

FIGURE 10.1
PROVISIONAL AGRICULTURAL LAND CLASSIFICATION

DRG No.	REV
SH11739/014	B

DRG SIZE	SCALE	DATE
A3	1:25,000	22/07/2019

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SW	HS	AJD

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Appendix 10.3 - Drawing SH11739/ 31 Agricultural Land Classification

KEY

- Site Boundary

Sample Type

- Auger Core
- Soil Profile Pit

Agricultural Land Classification

- Subgrade 3a
- Subgrade 3b
- Non-agricultural
- Roads and other hardstanding

Notes:

Survey undertaken in January 2019 by Wardell Armstrong.

Aerial imagery shown for context purposes only.

Boundaries are indicative.

REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D
B	SITE BOUNDARY AMENDMENT	JULY 2019	SW	HS	AJD
A	FIRST ISSUE	APRIL 2019	SW	HS	AJD

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EXTRA MOTORWAY SERVICE AREA GROUP

PROJECT

WARRINGTON MOTORWAY SERVICE AREA,
J11 M62

DRAWING TITLE

FIGURE 10.3
AGRICULTURAL LAND CLASSIFICATION

DRG No.		REV
SH11739/031		B
DRG SIZE	SCALE	DATE
A3	1:2,500	22/07/2019
DRAWN BY	CHECKED BY	APPROVED BY
SW	HS	CR

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Appendix 10.4 - Drawing SH11739/ 18 Peat Depth

KEY

- Site Boundary
- Peat Depth Survey Area
- Survey Points

Peat Depth Interpolation

- 0.0 ≤ x < 0.5 m
- 0.5 ≤ x < 1.0 m
- 1.0 ≤ x < 1.5 m
- 1.5 ≤ x < 2.0 m

Notes:

Survey undertaken in January 2019 by Wardell Armstrong.

Depths are below ground level and therefore include the upper approximately 0.36 m of peaty agricultural topsoil.

Aerial imagery shown for context purposes only.

Boundaries are indicative.

REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D
B	SITE BOUNDARY AMENDMENTS	JULY 2019	SW	HS	CR
A	FIRST ISSUES	APRIL 2019	SW	HS	CR

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EXTRA MOTORWAY SERVICE AREA GROUP

PROJECT

WARRINGTON MOTORWAY SERVICE AREA, J11 M62

DRAWING TITLE

FIGURE 10.4
PEAT DEPTH

DRG No.	REV
SH11739/018	B

DRG SIZE	SCALE	DATE
A3	1:2,500	22/07/2019

DRAWN BY	CHECKED BY	APPROVED BY
SW	HS	CR

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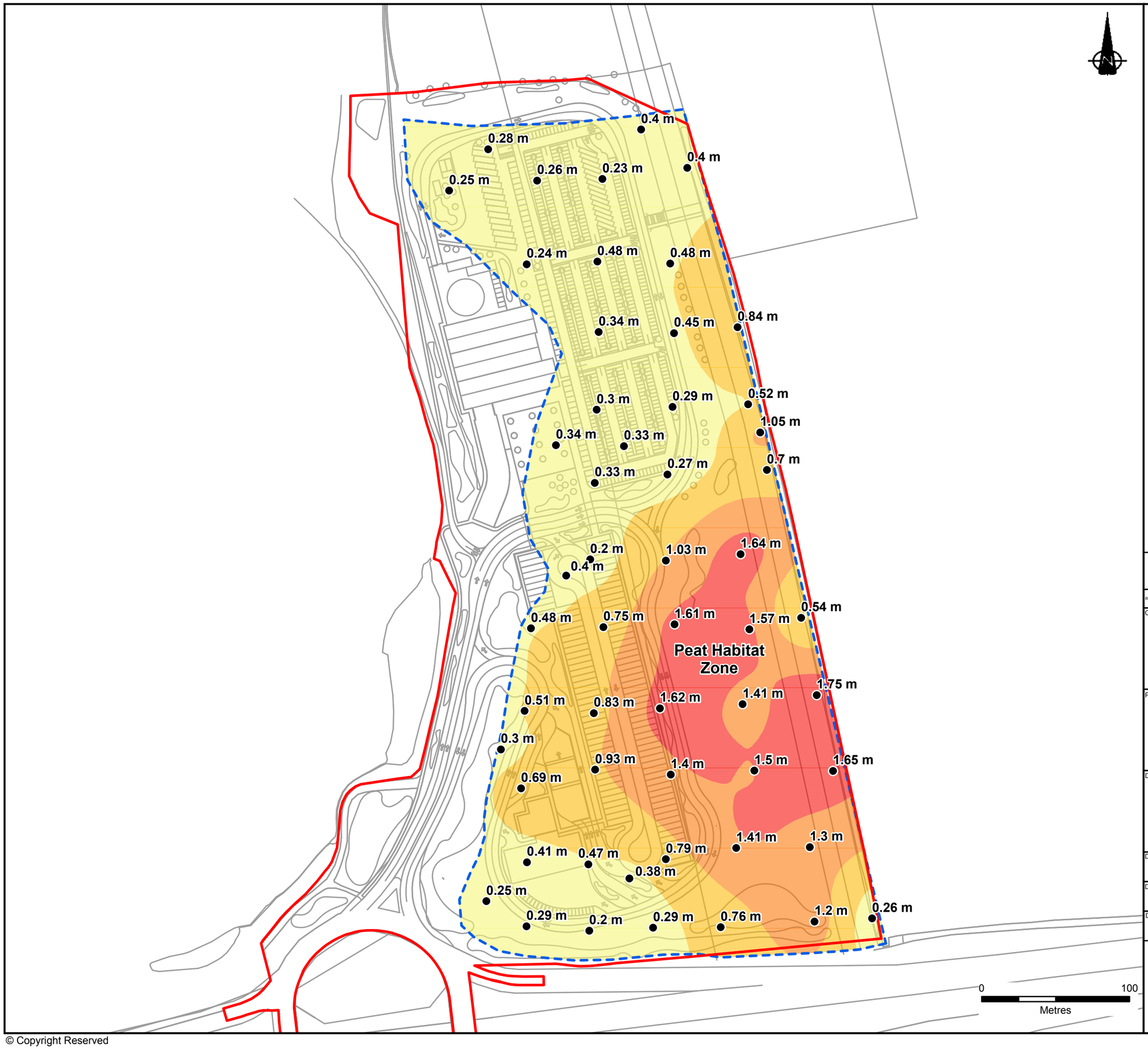
Appendix 10.5 - Drawing SH11739/ 34 Peat Depth and Site Layout



KEY

- Site Boundary
- Peat Depth Survey Area
- Survey Points

Peat Depth Interpolation

- 0.0 ≤ x < 0.5 m
- 0.5 ≤ x < 1.0 m
- 1.0 ≤ x < 1.5 m
- 1.5 ≤ x < 2.0 m

Notes:

Survey undertaken in January 2019 by Wardell Armstrong.

Depths are below ground level and therefore include the upper approximately 0.36 m of peaty agricultural topsoil.

Boundaries are indicative.

Site Layout taken from Site Layout Option B1

REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D
C	SITE LAYOUT AMENDED	07/2019	HM	HS	CR
B	SITE BOUNDARY AMENDMENTS	07/2019	SW	HS	CR
A	FIRST ISSUE	04/2019	SW	HS	CR

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EXTRA MOTORWAY SERVICE AREA GROUP

PROJECT

WARRINGTON MOTORWAY SERVICE AREA,
J11 M62

DRAWING TITLE

FIGURE 10.5
INDICATIVE PEAT DEPTH AND SITE LAYOUT

DRG No.	REV
SH11739/034	C

DRG SIZE	SCALE	DATE
A3	1:2,500	22/08/2019

DRAWN BY	CHECKED BY	APPROVED BY
SW	HS	CR

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Appendix 10.6 - ALC Methodology, Soil Profile Description and ALC calculations

AGRICULTURAL LAND & SOILS

Appendix 1: Soil Profile Descriptions and Overall ALC

Legend for non-self-explanatory terms:

Horizons - number of different horizons identified within the profile

Type - type of sample, auger core or soil profile pit dug using a spade

Depth - depth to the bottom of the (horizon number) horizon in cm

Texture - C - clay, ZC - silty clay, SC - sandy clay, CL - clay loam, SCL - sandy clay loam, ZCL - silty clay loam, SL - sandy loam, LS - loamy sand, S - sand;
CL and ZCL textures are subdivided into medium (M) and heavy (H) classes according to clay content, as follows: M medium (less than 27 % clay), H heavy (27-35 % clay); F, M and C refer to fine, medium and coarse, respectively, and are subdivisions of S, LS, SL, and SZL textures.

Matrix (main) colour - dominant colour of the soil

- **Hue** - Munsell colour hue
- **Value** - Munsell colour value
- **Chroma** - Munsell colour chroma

Mottling - spots and blotches of different colour than the dominant matrix colour

Ped faces - surfaces of the primary soil fragments into which the soil naturally breaks up upon excavating

FeMn - ferri-manganifeours concretions

Biopores - 'yes' if >0.5 % biopores greater than 0.5 mm diameter present (by area)

Stones > 2 cm up to % - maximum percentage of 2 - 6 cm diameter stones

Stones > 6 cm up to % - maximum percentage of > 6 cm diameter stones

Type - H - All hard rocks or stones (those which cannot be scratched with a finger nail); SS - Soft, medium or coarse grained sandstones; SIM - Soft 'weathered' igneous or metamorphic rocks or stones; SL - Soft oolitic or dolomitic limestones; SFS - Soft fine-grained sandstones; SAZ - Soft, argillaceous or silty rocks or stones; CH - Chalk or chalk stones; GRH - Gravel[1] with non-porous (hard) stones; GRS - Gravel[1] with porous stones (mainly soft stone types listed);1 - Gravel with at least 70% rounded stones by volume

Structure type - SG - single grain; GR - granular; SAB - subangular blocky; AB - angular blocky; PR - prismatic; PL - platy; MAS - massive

Dev - Development, how well the structure is developed; W - weak; M - moderate; S - strong

Consistence - L - loose; VFR - very friable; FR - friable; FIR - firm; VFIR - very firm; EXFIR - extremely firm; EXHD - extremely hard

Gley - depth to gleying

SPL - depth to slowly permeable layer

Wetness Class - classification of the soil according to the depth and duration of waterlogging in the soil profile, the higher the class, the longer and at the shallower depth the soil is wet

Overall ALC - this part of the table combines results of the classification for each of the limitations

Soil profile descriptions																		Soil profile descriptions continued																																		ALC for areas represented by individual survey points					
							Matrix (main) colour			Peat-specific properties					Mottling				Ped faces						Stones and rocks			Structure																													
Survey point	Type	Grad-ient	Soil distur-bed or resto-red	Horizon	Depth	Texture	Hue	Value	Chroma	Von Post	Water content (B)	Fine fibre content (F)	Coarse fibre content (R)	Wood remains (W)	Abundan-ce up to %	Hue	Value	Chroma	Colour different to matrix	Hue	Value	Chroma	FeMn up to %	Biopo-res	> 2 cm up to %	> 6 cm up to %	Type	Type	Deve-lop-ment	Ped size	Consis-tence	Calca-reous	Gley-ing	SPL	Notes	Wetness class	Climate	Gradient	Summer flood risk	Winter flood risk
1	Core	0	No	1	28	MCL	10YR	2	1	n/a	n/a	n/a	n/a	n/a	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	M	F	VFR	no	NO	NO	-	4	1	1	1	1
				2	42	MCL	10YR	5	1	n/a	n/a	n/a	n/a	n/a	0	0	0	0	no	n/a	n/a	n/a	0	no	0	0	n/a	SAB	W	M	FR	no	NO	NO						
				3	120	C	7.5YR	4	6	n/a	n/a	n/a	n/a	n/a	20	7.5YR	6	1	no	n/a	n/a	n/a	0	no	0	0	n/a	MAS			VFIR	no	NO	NO						
				4																																																
				5																																																
2	Core	0	No	1	40	LP	10YR	2	1	0	B1	F2	R1	W1	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	M	F	VFR	no	NO	NO	-	4	1	1	1	1
				2	120	C	7.5YR	4	6	n/a	n/a	n/a	n/a	n/a	20	10YR	4	6	no	n/a	n/a	n/a	0	no	0	0	n/a	MAS			EXFIR	no	NO	YES						
				3																																															
				4																																															
				5																																															
4	Core	0	No	1	45	SFP	10YR	2	1	0	B1	F2	R1	W1	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	M	F	VFR	no	NO	NO	-	4	1	1	1	1
				2	120	HP	7.5YR	5	1	H7	B4	F3	R2	W1	0	0	0	0	no	n/a	n/a	n/a	0	no	0	0	n/a	MAS			FR	no	NO	NO						
				3																																															
				4																																															
				5																																															
5	Core	0	NO	1	34	SFP	10YR	2	1	H10	B1	F2	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	50	HCL	10YR	4	1	n/a	n/a	n/a	n/a	n/a	2	10YR	4	6	NO	n/a	n/a	n/a	0	YES	0	0	n/a	AB	M	C	FIR	0	NO	NO						
				3	80	C	7.5YR	5	1	n/a	n/a	n/a	n/a	n/a	40	7.5YR	4	6	NO	n/a	n/a	n/a	0	NO	0	0	n/a	PR	S	C	VFIR	0	YES	YES	V. Similar to 6	4	1	1	1	1
				4	120	C	5YR	4	2	n/a	n/a	n/a	n/a	n/a	20	N	4	1	NO	n/a	n/a	n/a	2	NO	0	0	n/a	PR	S	VC	EXFIR	0	YES	NO						
				5																																															
6	Pit	0	NO	1	33	SFP	10YR	2	1	H10	B1	F2	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	50	MCL	10YR	5	2	n/a	n/a	n/a	n/a	n/a	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	AB	S	C	FR	0	NO	NO						
				3	75	C	10YR	5	1	n/a	n/a	n/a	n/a	n/a	40	7.5YR	5	6	NO	n/a	n/a	n/a	0	NO	0	0	n/a	PR	M	C	FIR	0	YES	YES	Water in H3	4	1	1	1	1
				4	120	C	10YR	5	1	n/a	n/a	n/a	n/a	n/a	40	7.5YR	5	4	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	EXFIR	0	NO	YES						
				5																																															
6	Pit	0	NO	1	33	SFP	10YR	2	1	H10	B1	F2	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	50	MCL	10YR	5	2	n/a	n/a	n/a	n/a	n/a	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	AB	S	C	FR	0	NO	NO						
				3	75	C	10YR	5	1	n/a	n/a	n/a	n/a	n/a	40	7.5YR	5	6	NO	n/a	n/a	n/a	0	NO	0	0	n/a	PR	M	C	FIR	0	YES	YES	Water in H3	4	1	1	1	1
				4	120	C	10YR	5	1	n/a	n/a	n/a	n/a	n/a	40	7.5YR	5	4	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	EXFIR	0	NO	YES						
				5																																														
7	Core	0	NO	1	55	HP	10YR	2	1	H10	B1	F1	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	90	HP	7.5YR	2.5	2	H10	B2	F1	R1	W2	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	GR	M	M	VFR	0	NO	NO						
				3	105	LP	10YR	3	1	H10	B3	F1	R1	W2	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	FR	0	NO	NO	Free water@85	4	1	1	1	1
				4	120	SC	7.5YR	5	1	n/a	n/a	n/a	n/a	n/a	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	FR	0	NO	NO						
				5																																														
8	Core	0	NO	1	40	HP	10YR	2	1	H10	B1	F2	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	55	MCL	7.5YR	6	1	n/a	n/a	n/a	n/a	n/a	2	10YR	4	6	NO	n/a	n/a	n/a	0	NO	0	0	n/a	AB	W	C	FR	0	NO	YES						
				3	120	C	5YR	4	2	n/a	n/a	n/a	n/a	n/a	20	5YR	4	6	NO	n/a	n/a	n/a	2	NO	0	0	n/a	PR	M	VC	VFIR	0	YES	YES	In the field of wheat	4	1	1	1	1
				4																																													
				5																																														
9	Core	0	No	1	32	SFP	10YR	2	1	0	B1	F2	R1	W1	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	W	M	VFR	no	NO	NO						
				2	65	SFP	10YR	2	1	=CAP0	B2	F2	R2	W2	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	W	F	FR	no	NO	NO						
				3	120	HP	10YR	2	1	H7	B3	F2	R2	W2	0	0	0	0	no	n/a	n/a	n/a	0	no	0	0	n/a	AB	W	C	FR	no	NO	NO	-	4	1	1	1	1
				4																																													
				5																																														
10	Core	0	NO	1	40	HP	10YR	2	1	H10	B1	F1	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	97	SFP	7.5YR	2.5	2	H6	B3	F2	R3	W1	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	SAB	W	C	FIR	0	NO	NO	H3 very fibrous, then woody in the bottom half	4	1	1	1	1
				3	120	FP	7.5YR	2.5	3	H6	B3	F3	R3	W3	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	FIR	0	NO	NO						
				4																																													
				5																																														
11	Core	0	No	1	30	SFP	10YR	2	1	0	B1	F2	R1	W1	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	M	F	VFR	no	NO	NO						
				2	120	MCL	0	0	0	n/a	n/a	n/a	n/a	n/a	0	0	0	0	no	n/a	n/a	n/a	0	no	0	0	n/a	SAB	W	M	FR	no	NO	NO	-	4	1	1	1	1
				3																																													
				4																																														
				5																																														
12	Core	0	NO	1	35	HP	10YR	2	1	H10	B1	F1	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	80	SFP	7.5YR	2.5	1	H6	B2	F2	R2	W3	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	W	M	VFR	0	NO	NO						
				3	120	SFP	10YR	2	1	H8	B5	F2	R2	W2	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	L	0	NO	NO	Gradually wetter with depth, free water@ c. 80, no mineral horizons found	4	1	1	1	1
				4																																													
				5																																														
13	Core	0	NO	1	35	HP	10YR	2	1	H10	B1	F1	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	60	SFP	10YR	2	1	H8	B2	F2	R2	W1	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	SAB	W	F	VFR	0	NO	NO	Wheat, gradually wetter with depth but little free water					
				3	110	FP	7.5YR	3	4	H4	B3	F3	R3	W3	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	FR	0	NO	NO		4	1	1	1	1
				4	120	HP	7.5YR	2.5	2	H8	B3	F2	R2	W1	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	MAS	0	0	VFR	0	NO	NO						
				5																																														
14	Core	0	No	1	25	SFP	10YR	2	1	0	B1	F2	R1	W1	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	M	F	FR	no	NO	NO						
				2	56	MCL	10YR	6	2	n/a	n/a	n/a	n/a	n/a	40	2.5YR	5	6	no	n/a	n/a	n/a	0	no	0	0	n/a	AB	M	M	FIR	no	YES	NO						
				3	120	C	7.5YR	4	6	n/a	n/a	n/a	n/a	n/a	20	7.5YR	5	1	no	n/a	n/a	n/a	0	no	0	0	n/a	PR	S	C	FIR	no	NO	YES	-	4	1	1	1	1
				4																																													
				5																																														
15	Pit	0	NO	1	38	HP	10YR	2	1	H10	B1	F1	R1	W1	0	0	0	0	NO	n/a	n/a	n/a	0	YES	0	0	n/a	SAB	M	F	VFR	0	NO	NO						
				2	50	SFP	7.5YR	2.5	2	H8	B2	F1	R2	W3	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	SAB	W	C	VFR	0	NO	NO						
				3	60	HP	5Y	2.5	1	H10	B2	F1	R1	W2	0	0	0	0	NO	n/a	n/a	n/a	0	NO	0	0	n/a	AB	W	C	FR	0	NO	NO	Free water @base of H3, H3 sedimentary peat, wood in H4, water gathering at bottom of the pit	4	1	1	1	1
				4	90	MCL	10YR	6	2	n/a	n/a	n/a	n/a	n/a	2	10YR	4	4	NO	n/a	n/a	n/a	0	NO	0	5	H	AB	W	C	FR	0	NO	NO						
				5	120	SC	10YR	6	1	n/a	n/a	n/a	n/a	n/a	40	10YR	4	6	NO	n/a	n/a	n/a	0	NO	0	0	n/a	PR	M	VC	FIR	0	YES	NO						
16	Core	0	No	1	28	SFP	10YR	2	1	0	B1	F2	R1	W1	0	0	0	0	no	n/a	n/a	n/a	0	yes	0	0	n/a	SAB	W	F	VFR	no	NO	NO						
				2	60	SFP	10YR	2	1	H4	B2	F3	R3	W3	0	0	0	0	no	n/a	n/a	n/a	0	no	0	0	n/a	AB	M	M	FR	no	NO	NO						
				3	120	HP	10YR	2	1	H7	B3	F2	R2	W2	0	0	0	0	no	n/a	n/a	n/a	0	no	0	0	n/a	AB	W	C	FR	no	NO	NO	-	4	1	1	1	1
				4																																													
				5																																														

Survey point	Topsoil texture	Soil Depth	Topsoil stoniness	Wetness	Droughti-ness	Other (see "Limited by" column)	ALC Grade	Limited by
1	1	1	1	3b	1	1	**3b**	Wetness
2	1	1	1	3a	1	1	**3a**	Wetness
4	1	1	1	3a	1	1	**3a**	Wetness
5	1	1	1	3a	1	1	**3a**	Wetness
6	1	1	1	3a	1	1	**3a**	Wetness
6	1	1	1	3a	1	1	**3a**	Wetness
7	1	1	1	3a	1	1	**3a**	Wetness
8	1	1	1	3a	1	2	**3a**	Wetness
9	1	1	1	3a	1	1	**3a**	Wetness
10	1	1	1	3a	1	1	**3a**	Wetness
11	1	1	1	3a	1	1	**3a**	Wetness
12	1	1	1	3a	1	1	**3a**	Wetness
13	1	1	1	3a	1	1	**3a**	Wetness
14	1	1	1	3a	1	3a	**3a**	Wetness Pattern (outlier)
15	1	1	1	3a	1	1	**3a**	Wetness
16	1	1	1	3a	1	1	**3a**	Wetness

Appendix 10.7 - NRM Soil/Peat Analysis Results

ANALYTICAL REPORT

Report Number	**39378-19**	**H448**	**WARDELL ARMSTRONG LLP**	**Client**	**JAKUB OLEWSKI**
Date Received	**15-JAN-2019**		**CITY QUADRANT**		
Date Reported	**21-JAN-2019**		**11 WATERLOO SQUARE**		
Project	**SH11739**		**NEWCASTLE UPON TYNE**		
Reference	**JAKUB OLEWSKI**		**NE1 4DP**		
Order Number	**NT11530**				

Laboratory Reference		**SOIL418438**	**SOIL418439**	**SOIL418440**	**SOIL418441**
Sample Reference		**COMP SE FIELD WHEAT**	**COMP SW FIELD WHEAT**	**COMP N FIELD GRASS**	**COMP S CEN TRAL GRASS**
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
pH water [1:2.5]		6.0	5.6	5.8	5.6
Available Phosphorus (Index)	mg/l	17.6 (2)	25.2 (2)	24.6 (2)	14.6 (1)
Available Potassium (Index)	mg/l	31.8 (0)	23.0 (0)	37.5 (0)	21.4 (0)
Available Magnesium (Index)	mg/l	118 (3)	67.7 (2)	62.6 (2)	72.1 (2)
Textural Class		Sandy Silt Loam	Sandy Silt Loam	Clay Loam	Sandy Silt Loam
Sand 2.00-0.063mm	% w/w	33	47	31	33
Silt 0.063-0.002mm	% w/w	50	40	45	52
Clay <0.002mm	% w/w	17	13	24	15
Organic Matter LOI	% w/w	59.2	61.5	70.1	40.7
Total Nitrogen	% w/w	1.40	1.60	1.31	1.09
Total Carbon	% w/w	29.0	30.1	28.3	21.8
Carbon:Nitrogen Ratio	:1	20.8	18.8	21.6	19.9

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Document Control

Reported by

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ANALYTICAL REPORT

Report Number	**39379-19**	**H448**	**WARDELL ARMSTRONG LLP**	**Client**	**JAKUB OLEWSKI**
Date Received	**15-JAN-2019**		**CITY QUADRANT**		
Date Reported	**21-JAN-2019**		**11 WATERLOO SQUARE**		
Project	**SH11739**		**NEWCASTLE UPON TYNE**		
Reference	**JAKUB OLEWSKI**		**NE1 4DP**		
Order Number	**NT11530**				

Laboratory Reference		**SOIL418442**	**SOIL418443**	**SOIL418444**	**SOIL418445**	**SOIL418446**	**SOIL418447**	**SOIL418448**	**SOIL418449**	**SOIL418450**
Sample Reference		**6H1**	**6H2**	**6H3**	**6H4**	**15H1**	**15H2**	**15H3**	**15H4**	**15H5**
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
pH water [1:2.5]		5.4	5.4	5.6	5.9	5.7	4.3	4.4	4.5	4.9
Available Phosphorus (Index)	mg/l	23.0 (2)	6.0 (0)	4.6 (0)	10.6 (1)	22.8 (2)	8.0 (0)	6.8 (0)	6.6 (0)	2.8 (0)
Available Potassium (Index)	mg/l	23.0 (0)	71.3 (1)	52.4 (0)	69.7 (1)	17.3 (0)	<15 (0)	32.3 (0)	32.3 (0)	52.8 (0)
Available Magnesium (Index)	mg/l	62.4 (2)	88.5 (2)	113 (3)	301 (5)	57.3 (2)	33.0 (1)	29.3 (1)	49.0 (1)	146 (3)
Textural Class		Clay Loam	Clay Loam	Clay Loam	Clay	Sandy Silt Loam	Sandy Loam	Sandy Silt Loam	Sandy Loam	Clay Loam
Sand 2.00-0.063mm	% w/w	30	40	36	13	32	68	48	51	44
Silt 0.063-0.002mm	% w/w	51	32	32	38	50	27	35	31	27
Clay <0.002mm	% w/w	19	28	32	49	18	5	17	18	29
Soil Density	g/l	528	988	1123	1105	549	326	690	1042	1089
Organic Matter LOI	% w/w	60.2	5.3	2.4	2.0	69.9	89.2	20.1	3.9	2.0
Total Nitrogen	% w/w	1.37	0.115	0.046	0.049	1.26	1.95	0.553	0.079	0.038
Total Sulphate	mg/kg	1475	242	<200	218	1553	1511	674	<200	204
Total Sulphur	mg/kg	1905	213	99	95	1895	2230	756	161	95
Total Carbon	% w/w	28.3	2.73	0.62	0.52	26.3	38.4	11.8	2.11	0.53
Carbon:Nitrogen Ratio	:1	20.6	23.7	13.5	10.7	20.8	19.7	21.3	26.7	14.0

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

ANALYTICAL NOTES

Report Number	**39379-19**	**H448**	**WARDELL ARMSTRONG LLP**	**Client JAKUB OLEWSKI**
Date Received	**15-JAN-2019**		**CITY QUADRANT**	
Date Reported	**21-JAN-2019**		**11 WATERLOO SQUARE**	
Project	**SH11739**		**NEWCASTLE UPON TYNE**	
Reference	**JAKUB OLEWSKI**		**NE1 4DP**	
Order Number	**NT11530**			

Notes

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Appendix 10.8 - Droughtiness Calculations

Appendix 2: Droughtiness Calculations

Abbreviations:

TAv – Total amount of soil water available to plants, considered to be the volumetric soil water content between 0.05 and 15 bar suction or, in case of sands and loamy sands, 0.10 and 15 bar suction. These suctions approximate to the conditions of field capacity and wilting point (when the plants can extract no more moisture from the soil).

EAv – Easily available water, held in the soil between 0.05 and 2.0 bar suction, used for calculating cereal available water below 50 cm depth where root systems are less well developed, and the plant's ability to extract water is diminished.

Values of TAv and EAv are estimated for each horizon based on soil texture and structural condition according to the ALC guidelines (MAFF, 1988).

AP – crop adjusted available water capacity, a measure of the quantity of water held in the soil profile which can be taken up by a specific crop.

MD – the moisture deficit term used in the ALC droughtiness assessment is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.

MB – moisture balance: MB=AP-MD, MB for wheat and potatoes determines limitation by droughtiness

Data inputs										Droughtiness calculations																					
						Av. water (soil)		Av. water (stones)		AP wheat											AP potatoes										
Survey Point	Horizon	Horizon thickness	Texture	Stones %	Structural condition	TAv %	EAv %	TAv %	EAv %	TAv/EAv	Start depth	End depth	Horiz. thickn.	TAv/EAv soil	% non stone	TAv/EAv stones	Stones %	AP wheat		AP(wheat) -MD(wheat)	Start depth	End depth	Horiz. thickn.	TAv top/sub soil	non-stone %	TAv stones	Stone %	AP potatoes		AP(potato) -MD(potato)	Limited to ALC grade
1	1	28	MCL	0	GOOD	18				TAv	0	28	28	18	100	0	0	504	139	52	0	28	28	18	100	0	0	504	116	42	1
										EAv	0	28	0	0	100	0	0	0													
	2	14	MCL	0	GOOD	21	14			TAv	28	42	14	21	100	0	0	294			28	42	14	21	100	0	0	294			
										EAv	28	42	0	14	100	0	0	0													
	3	78	C	0	POOR	13	7			TAv	42	120	8	13	100	0	0	104			42	120	28	13	100	0	0	364			
										EAv	42	120	70	7	100	0	0	490													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
2	1	40	LP	0	GOOD	35				TAv	0	40	40	35	100	0	0	1400	202	115	0	40	40	35	100	0	0	1400	179	105	1
										EAv	0	40	0	0	100	0	0	0													
	2	80	C	0	POOR	13	7			TAv	40	120	10	13	100	0	0	130			40	120	30	13	100	0	0	390			
										EAv	40	120	70	7	100	0	0	490													
	3									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
4	1	45	SFP	0	GOOD	44				TAv	0	45	45	44	100	0	0	1980	383	295	0	45	45	44	100	0	0	1980	281	206	1
										EAv	0	45	0	0	100	0	0	0													
	2	75	HP	0	GOOD	33	24			TAv	45	120	5	33	100	0	0	165			45	120	25	33	100	0	0	825			
										EAv	45	120	70	24	100	0	0	1680													
	3									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
5	1	34	SFP	0	GOOD	44				TAv	0	34	34	44	100	0	0	1496	224	137	0	34	34	44	100	0	0	1496	201	127	1
										EAv	0	34	0	0	100	0	0	0													
	2	16	HCL	0	MODERATE	16	10			TAv	34	50	16	16	100	0	0	256			34	50	16	16	100	0	0	256			
										EAv	34	50	0	10	100	0	0	0													
	3	30	C	0	POOR	13	7			TAv	50	80	0	13	100	0	0	0			50	80	20	13	100	0	0	260			
										EAv	50	80	30	7	100	0	0	210													
	4	40	C	0	POOR	13	7			TAv	80	120	0	13	100	0	0	0			80	120	0	13	100	0	0	0			
										EAv	80	120	40	7	100	0	0	280													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
6	1	33	SFP	0	GOOD	44				TAv	0	33	33	44	100	0	0	1452	221	134	0	33	33	44	100	0	0	1452	198	124	1
										EAv	0	33	0	0	100	0	0	0													
	2	17	MCL	0	MODERATE	16	10			TAv	33	50	17	16	100	0	0	272			33	50	17	16	100	0	0	272			
										EAv	33	50	0	10	100	0	0	0													
	3	25	C	0	POOR	13	7			TAv	50	75	0	13	100	0	0	0			50	75	20	13	100	0	0	260			
										EAv	50	75	25	7	100	0	0	175													
	4	45	C	0	POOR	13	7			TAv	75	120	0	13	100	0	0	0			75	120	0	13	100	0	0	0			
										EAv	75	120	45	7	100	0	0	315													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
6	1	33	SFP	0	GOOD	44				TAv	0	33	33	44	100	0	0	1452	221	134	0	33	33	44	100	0	0	1452	198	124	1
										EAv	0	33	0	0	100	0	0	0													
	2	17	MCL	0	MODERATE	16	10			TAv	33	50	17	16	100	0	0	272			33	50	17	16	100	0	0	272			
										EAv	33	50	0	10	100	0	0	0													
	3	25	C	0	POOR	13	7			TAv	50	75	0	13	100	0	0	0			50	75	20	13	100	0	0	260			
										EAv	50	75	25	7	100	0	0	175													
	4	45	C	0	POOR	13	7			TAv	75	120	0	13	100	0	0	0			75	120	0	13	100	0	0	0			
										EAv	75	120	45	7	100	0	0	315													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
7	1	55	HP	0	GOOD	33				TAv	0	55	50	33	100	0	0	1650	300	213	0	55	55	33	100	0	0	1815	231	157	1
										EAv	0	55	5	0	100	0	0	0													
	2	35	HP	0	GOOD	33	24			TAv	55	90	0	33	100	0	0	0			55	90	15	33	100	0	0	495			
										EAv	55	90	35	24	100	0	0	840													
	3	15	LP	0	GOOD	35	26			TAv	90	105	0	35	100	0	0	0			90	105	0	35	100	0	0	0			
										EAv	90	105	15	26	100	0	0	390													
	4	15	SC	0	POOR	13	8			TAv	105	120	0	13	100	0	0	0			105	120	0	13	100	0	0	0			
										EAv	105	120	15	8	100	0	0	120													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													

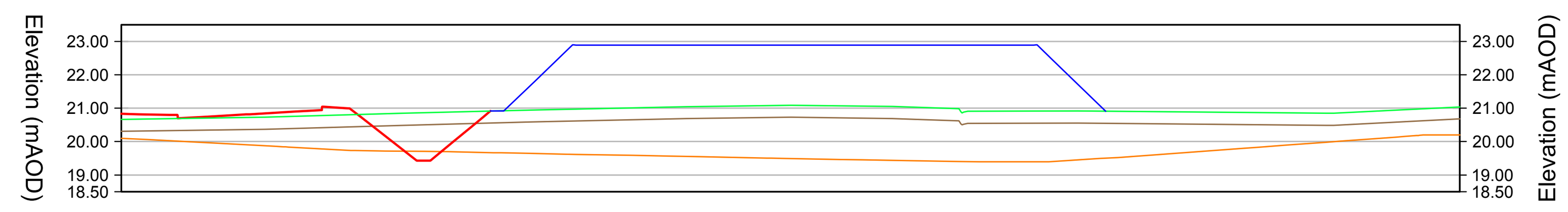
Data inputs										Droughtiness calculations																														
						Av. water (soil)		Av. water (stones)		AP wheat													AP potatoes																		Limited to ALC grade
Survey Point	Horizon	Horizon thickness	Texture	Stones %	Structural condition	TAv %	EAv %	TAv %	EAv %	TAv/EAv	Start depth	End depth	Horiz. thickn.	TAv/EAv soil	% non stone	TAv/EAv stones	Stones %	AP wheat		AP(wheat) -MD(wheat)	Start depth	End depth	Horiz. thickn.	TAv top/sub soil	non-stone %	TAv stones	Stone %	AP potatoes		AP(potato) -MD(potato)	
8	1	40	HP	0	GOOD	33				TAv	0	40	40	33	100	0	0	1320	199	111	0	40	40	33	100	0	0	1320	176	101	1
										EAv	0	40	0	0	100	0	0	0													
	2	15	MCL	0	MODERATE	16	10			TAv	40	55	10	16	100	0	0	160			40	55	15	16	100	0	0	240			
										EAv	40	55	5	10	100	0	0	50													
	3	65	C	0	POOR	13	7			TAv	55	120	0	13	100	0	0	0			55	120	15	13	100	0	0	195			
										EAv	55	120	65	7	100	0	0	455													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
9	1	32	SFP	0	GOOD	44				TAv	0	32	32	44	100	0	0	1408	405	317	0	32	32	44	100	0	0	1408	303	228	1
										EAv	0	32	0	0	100	0	0	0													
	2	33	SFP	0	GOOD	44	35			TAv	32	65	18	44	100	0	0	792			32	65	33	44	100	0	0	1452			
										EAv	32	65	15	35	100	0	0	525													
	3	55	HP	0	GOOD	33	24			TAv	65	120	0	33	100	0	0	0			65	120	5	33	100	0	0	165			
										EAv	65	120	55	24	100	0	0	1320													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
10	1	40	HP	0	GOOD	33				TAv	0	40	40	33	100	0	0	1320	421	334	0	40	40	33	100	0	0	1320	264	190	1
										EAv	0	40	0	0	100	0	0	0													
	2	57	SFP	0	GOOD	44	35			TAv	40	97	10	44	100	0	0	440			40	97	30	44	100	0	0	1320			
										EAv	40	97	47	35	100	0	0	1645													
	3	23	FP	0	GOOD	44	35			TAv	97	120	0	44	100	0	0	0			97	120	0	44	100	0	0	0			
										EAv	97	120	23	35	100	0	0	805													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
11	1	30	SFP	0	GOOD	44				TAv	0	30	30	44	100	0	0	1320	272	185	0	30	30	44	100	0	0	1320	216	142	1
										EAv	0	30	0	0	100	0	0	0													
	2	90	MCL	0	GOOD	21	14			TAv	30	120	20	21	100	0	0	420			30	120	40	21	100	0	0	840			
										EAv	30	120	70	14	100	0	0	980													
	3									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
12	1	35	HP	0	GOOD	33				TAv	0	35	35	33	100	0	0	1155	427	339	0	35	35	33	100	0	0	1155	270	195	1
										EAv	0	35	0	0	100	0	0	0													
	2	45	SFP	0	GOOD	44	35			TAv	35	80	15	44	100	0	0	660			35	80	35	44	100	0	0	1540			
										EAv	35	80	30	35	100	0	0	1050													
	3	40	SFP	0	GOOD	44	35			TAv	80	120	0	44	100	0	0	0			80	120	0	44	100	0	0	0			
										EAv	80	120	40	35	100	0	0	1400													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
13	1	35	HP	0	GOOD	33				TAv	0	35	35	33	100	0	0	1155	416	328	0	35	35	33	100	0	0	1155	270	195	1
										EAv	0	35	0	0	100	0	0	0													
	2	25	SFP	0	GOOD	44	35			TAv	35	60	15	44	100	0	0	660			35	60	25	44	100	0	0	1100			
										EAv	35	60	10	35	100	0	0	350													
	3	50	FP	0	GOOD	44	35			TAv	60	110	0	44	100	0	0	0			60	110	10	44	100	0	0	440			
										EAv	60	110	50	35	100	0	0	1750													
	4	10	HP	0	GOOD	33	24			TAv	110	120	0	33	100	0	0	0			110	120	0	33	100	0	0	0			
										EAv	110	120	10	24	100	0	0	240													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
14	1	25	SFP	0	GOOD	44				TAv	0	25	25	44	100	0	0	1100	201	114	0	25	25	44	100	0	0	1100	178	104	1
										EAv	0	25	0	0	100	0	0	0													
	2	31	MCL	0	MODERATE	16	10			TAv	25	56	25	16	100	0	0	400			25	56	31	16	100	0	0	496			
										EAv	25	56	6	10	100	0	0	60													
	3	64	C	0	POOR	13	7			TAv	56	120	0	13	100	0	0	0			56	120	14	13	100	0	0	182			
										EAv	56	120	64	7	100	0	0	448													
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0			
										EAv	120	120	0	0	100	0	0	0													

Data inputs										Droughtiness calculations																												
						Av. water (soil)		Av. water (stones)		AP wheat												AP potatoes																		
Survey Point	Horizon	Horizon thickness	Texture	Stones %	Structural condition	TAv %	EAv %	TAv %	EAv %	TAv/EAv	Start depth	End depth	Horiz. thickn.	TAv/EAv soil	% non stone	TAv/EAv stones	Stones %	AP wheat		AP(wheat) -MD(wheat)	Start depth	End depth	Horiz. thickn.	TAv top/sub soil	non-stone %	TAv stones	Stone %	AP potatoes		AP(potato) -MD(potato)	Limited to ALC grade							
15	1	38	HP	0	GOOD	33				TAv	0	38	38	33	100	0	0	1254	255	168	0	38	38	33	100	0	0	1254	226	152	1							
										EAv	0	38	0	0	100	0	0	0																			
	2	12	SFP	0	GOOD	44	35			TAv	38	50	12	44	100	0	0	528			38	50	12	44	100	0	0	528										
										EAv	38	50	0	35	100	0	0	0																			
	3	10	HP	0	GOOD	33	24			TAv	50	60	0	33	100	0	0	0			50	60	10	33	100	0	0	330										
										EAv	50	60	10	24	100	0	0	240																			
	4	30	MCL	5	MODERATE	16	10	1.0	0.5	TAv	60	90	0	16	95	1	5	0			60	90	10	16	95	1	5	153										
										EAv	60	90	30	10	95	1	5	286																			
	5	30	SC	0	POOR	13	8			TAv	90	120	0	13	100	0	0	0			90	120	0	13	100	0	0	0										
										EAv	90	120	30	8	100	0	0	240																			
16	1	28	SFP	0	GOOD	44				TAv	0	28	28	44	100	0	0	1232	399	312	0	28	28	44	100	0	0	1232	297	223	1							
										EAv	0	28	0	0	100	0	0	0																			
	2	32	SFP	0	GOOD	44	35			TAv	28	60	22	44	100	0	0	968			28	60	32	44	100	0	0	1408										
										EAv	28	60	10	35	100	0	0	350																			
	3	60	HP	0	GOOD	33	24			TAv	60	120	0	33	100	0	0	0			60	120	10	33	100	0	0	330										
										EAv	60	120	60	24	100	0	0	1440																			
	4									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0										
										EAv	120	120	0	0	100	0	0	0																			
	5									TAv	120	120	0	0	100	0	0	0			120	120	0	0	100	0	0	0										
										EAv	120	120	0	0	100	0	0	0																			

Appendix 10.9 - Drawing SH11739/ 06 Peat Depth in the Peat Habitat Zone

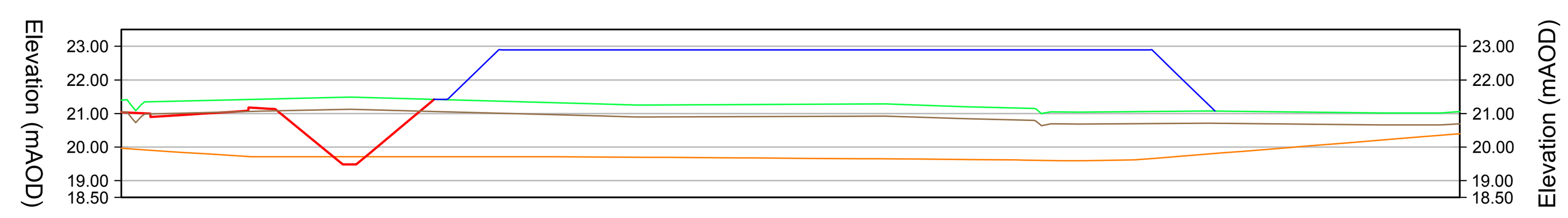
DO NOT SCALE FROM THIS DRAWING

Longsection A
(Vertical Exaggeration x2.50)



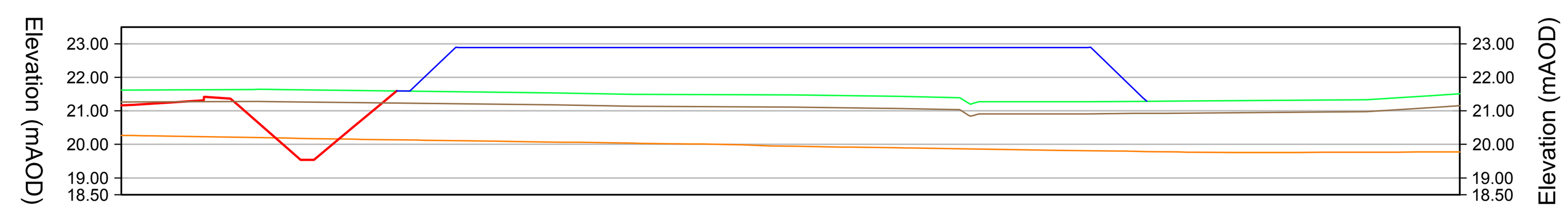
Distance (m)	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00	42.50	45.00	47.50	50.00	52.50	55.00	57.50	60.00	62.50	65.00	67.50	70.00	72.50	75.00	77.50	80.00	82.50	85.00	87.50	90.00	92.50	95.00	97.50
Existing Levels	20.68	20.70	20.71	20.73	20.75	20.78	20.81	20.84	20.86	20.89	20.92	20.94	20.96	20.99	21.01	21.03	21.05	21.06	21.08	21.09	21.08	21.06	21.05	21.02	20.98	20.91	20.91	20.91	20.91	20.90	20.89	20.89	20.88	20.87	20.86	20.85	20.89	20.94	20.99
Proposed Levels												21.47	22.43	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.29	21.31										
Base of Peat	20.05	20.00	19.94	19.89	19.83	19.78	19.73	19.72	19.71	19.69	19.67	19.65	19.63	19.61	19.59	19.57	19.55	19.53	19.51	19.49	19.47	19.46	19.44	19.42	19.41	19.39	19.39	19.41	19.48	19.53	19.61	19.68	19.76	19.83	19.91	19.98	20.05	20.13	20.20

Longsection B
(Vertical Exaggeration x2.50)



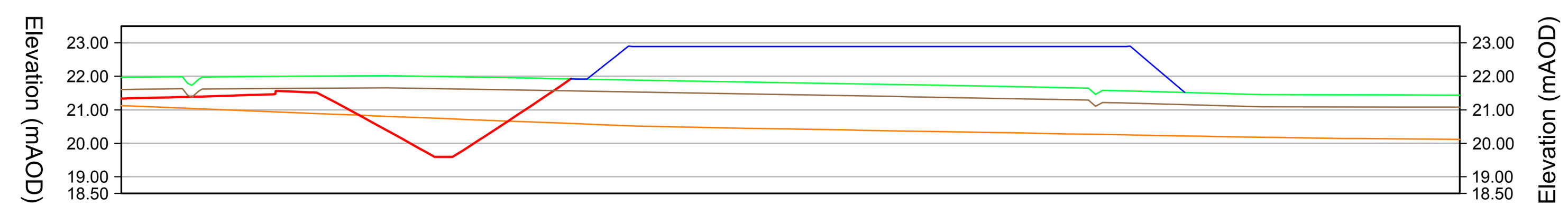
Distance (m)	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00	42.50	45.00	47.50	50.00	52.50	55.00	57.50	60.00	62.50	65.00	67.50	70.00	72.50	75.00	77.50	80.00	82.50	85.00	87.50	90.00	92.50	95.00	97.50
Existing Levels	21.35	21.37	21.40	21.42	21.44	21.47	21.48	21.45	21.43	21.40	21.37	21.35	21.32	21.29	21.27	21.26	21.26	21.26	21.27	21.27	21.28	21.28	21.28	21.24	21.21	21.18	21.16	21.05	21.04	21.05	21.06	21.07	21.07	21.06	21.05	21.03	21.02	21.02	21.02
Proposed Levels										21.67	22.63	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.70	21.73							
Base of Peat	19.89	19.83	19.77	19.71	19.71	19.71	19.71	19.71	19.71	19.71	19.71	19.71	19.71	19.71	19.70	19.69	19.69	19.68	19.67	19.67	19.66	19.65	19.65	19.64	19.63	19.62	19.61	19.60	19.59	19.61	19.67	19.75	19.83	19.91	19.99	20.07	20.15	20.23	20.31

Longsection C
(Vertical Exaggeration x2.50)



Distance (m)	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00	42.50	45.00	47.50	50.00	52.50	55.00	57.50	60.00	62.50	65.00	67.50	70.00	72.50	75.00	77.50	80.00	82.50	85.00	87.50	90.00	92.50	95.00	97.50
Existing Levels	21.63	21.63	21.64	21.64	21.63	21.62	21.61	21.60	21.58	21.57	21.56	21.55	21.54	21.52	21.50	21.49	21.49	21.49	21.48	21.48	21.46	21.45	21.43	21.42	21.40	21.27	21.27	21.27	21.27	21.28	21.29	21.30	21.30	21.31	21.32	21.33	21.33	21.38	21.45
Proposed Levels									21.95	22.90	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.87	21.91									
Base of Peat	20.25	20.24	20.22	20.20	20.19	20.17	20.15	20.14	20.12	20.11	20.10	20.08	20.07	20.06	20.04	20.03	20.01	20.00	19.97	19.94	19.93	19.91	19.90	19.88	19.87	19.86	19.84	19.83	19.81	19.80	19.78	19.77	19.76	19.76	19.76	19.76	19.77	19.77	19.77

Longsection D
(Vertical Exaggeration x2.50)



Distance (m)	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00	42.50	45.00	47.50	50.00	52.50	55.00	57.50	60.00	62.50	65.00	67.50	70.00	72.50	75.00	77.50	80.00	82.50	85.00	87.50	90.00	92.50	95.00	97.50
Existing Levels	21.98	21.79	21.98	21.99	22.00	22.01	22.01	22.02	22.00	21.98	21.97	21.95	21.93	21.91	21.90	21.88	21.86	21.84	21.83	21.81	21.79	21.78	21.76	21.74	21.72	21.70	21.69	21.67	21.56	21.57	21.54	21.51	21.48	21.45	21.45	21.45	21.44	21.44	21.44
Proposed Levels														21.99	22.78	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.18								
Base of Peat	21.08	21.04	21.00	20.96	20.92	20.88	20.84	20.80	20.76	20.72	20.68	20.64	20.61	20.57	20.53	20.50	20.48	20.46	20.44	20.43	20.41	20.39	20.37	20.36	20.34	20.32	20.30	20.29	20.27	20.25	20.23	20.21	20.20	20.18	20.17	20.15	20.14	20.13	20.12

KEY:

- EXISTING PROFILE
- TOPSOIL STRIP LEVEL (360mm DEPTH)
- BASE OF PEAT / TOP OF NATURAL CLAY
- PROPOSED SITE LEVELS
- CLAY BUND / TOP OF PEAT LEVEL

NOTES:

1. DRAWING IS FOR PLANNING PURPOSES ONLY.
2. CLAY BUND STRUCTURE SUBJECT TO DETAILED DESIGN.
3. TOP OF PEAT LEVEL SUBJECT TO AGREEMENT, LEVEL SHOWN AT 22.9m AOD.
4. BUND TO BE 1 IN 2.5 GRADE MAX.
5. FOUNDATION FOR BUND SUBJECT TO CONFIRMATION AND DETAILED DESIGN.
6. ELEVATIONS SHOWN ARE BETWEEN BASE OF PEAT/TOP OF NATURAL CLAY LEVEL AND 22.9m AOD LEVEL.
7. TOTAL DEPTHS INCLUDE IN SITU PEAT AND PEAT TRANSFERRED FROM DEVELOPMENT AREA.
8. PEAT DATA CALCULATED FROM PEAT SURVEY UNDERTAKEN BY WARDELL ARMSTRONG IN JANUARY 2019.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT
EXTRA MSA GROUP

PROJECT
MOTORWAY SERICES, WARRINGTON

DRAWING TITLE
INDICATIVE PEAT DEPTHS
WITH PEAT HABITAT ZONE

DRG No.		REV
SH11739-006		-
DRG SIZE A1	SCALE 1:500	DATE 23.07.19
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Appendix 10.10 - SLR (2006) Risley Landfill Site Environmental Statement Chapter 11: Agriculture. (Planning Application 2006/08766)

Introduction

11.1 This section deals with the effect of the proposed development on the agricultural and soil resources within the application site. It considers the characteristics and quality of the soils and the effect of the development upon the existing agricultural resource.

11.2 This Planning Application and Environmental Statement for the lateral landfill development proposal is similar to the original 2006 application submitted by the applicant to Warrington Borough Council in August 2006 (Planning Ref: 2006/08766), however it includes several minor additions to the planning application in the form of the use of an existing area to facilitate recovery of recyclable materials, and minor additions to the restoration scheme and planting. This modifications are minor and will not impact upon the 2006 agricultural assessment which has been reproduced and updated within this section of the the Environmental Statement.

11.3 This document, including the agricultural section, and the proposals have therefore already undergone rigorous assessment by the Local Planning Authority statutory and non-statutory consultees. Following the consultation period several issues relating to agriculture were raised by the CPRE however additional information was submitted to the Local Planning Authority to address the issues raised in the original application. After a review of the reasons for refusal this additional information has been included within this further submission below so that a full assessment of the proposals and the mitigation can be reviewed by the relevant consultee. No issues were raised to the original proposals by DEFRA although it is unclear whether they were officially consulted by the Local Planning Authority.

11.4 The proposed development involves a lateral development of the existing active Risley IV landfill facility, and a revision to the previously approved restoration contours across the eastern parts of the existing landfill. The Application Area for the proposals covers an area of just under 34 hectares and consists predominately of the existing landfill together with some agricultural land in arable cultivation to the east of the site. The land to the east consists of a single arable field plus a small triangular area of rough grass near the north-west corner. At the time of survey in February 2006 the main field was in stubble with a covering of grass weeds. The small triangular area near the north-west corner is rush-infested rough grass with two small semi-derelict farm buildings.

11.5 This section of the Environmental Statement is based upon a study of published information (see Appendix 11/1) and a site inspection carried out in January 2006. Land quality has been assessed using the revised guidelines and criteria for the Agricultural Land Classification system introduced in January 1989. As the majority of the Application Area comprises the existing landfill site, the agricultural survey detailed in this section of the Environment Statement refers to the agricultural land to the east of the existing landfill unless otherwise stated.

Description of the Site

11.6 From a review of published data the agricultural section of the application site is shown to be situated on the western edge of one of the raised mosses of the Lancashire Coastal Plain and is duly shown as peat on the 1:50,000 geological maps (Sheets 84 Wigan and 97 Runcorn). The underlying material is Glacial Till (Boulder Clay) which rises towards the surface in the north of the site. There is no detailed soil map for the area and so the only published source of information is Sheet 3 (Midland and Western England) of the 1:250,000 National Soil Map. This shows the site as the Turbary Moor Association (1021), the typical soil association of reclaimed raised mosses in the area.

11.7 Most of the raised mosses on the site have been drained by a combination of open ditches and underground drains. The effect of this is to cause shrinkage, initially by the removal of water but subsequently by gradual oxidation and decomposition of the peat. As a result, the surface is lowered and the natural trend of peat development is arrested and in many cases actually reversed i.e. the peat begins to "waste". Further losses occur by removal in crops and by wind blow, and from peat cutting for fuel which may have been carried out on the site in the past. The difference in height between the application field and the higher ground to the east suggests peat-cutting has probably occurred on the site at some time in the past.

11.8 These losses of peat are collectively referred to as peat wastage which has been estimated to occur at an average rate of around 1 to 1.5cm per annum in the area. The effects are most marked near the edges of the mosses where the peat starts off by being relatively thin. Wastage results in the underlying mineral substrate coming closer to surface and eventually it begins to be ploughed in with the peat so that the plough layer eventually becomes an organo-mineral soil rather than a true peat.

Soils Survey and Quality

Climatic Characteristics

11.9 Local climatic factors affecting land quality, especially by their interactions with soil factors have been interpreted from Meteorological Office 5km grid point data set for a representative point near the middle of the site (SJ 671 937) at 23mAOD and is as follows:-

- Average Annual Rainfall AAR (mm):- 877
- Accumulated Temperature ATO (day degrees):- 1424
- Moisture Deficit for wheat (mm):- 87
- Moisture Deficit for potatoes (mm):- 73
- Field Capacity Duration (days):- 207

11.10 The local climate is reasonably warm but moderately wet. The main derived climatic constraint is the large number of field capacity days which would restrict the opportunities for land work and livestock grazing in most years. The 'key' crop adjusted moisture deficits are moderately small, however, and droughtiness constraints would be small by comparison. A key feature of this

data is the long period (207 days)) during the winter when rainfall exceeds evapo-transpiration and during which the soils will remain moist or wet.

Soil Survey Methods

11.11 Soil profiles were examined using Augers across the agricultural land in the east of the application site. A total of 21 auger borings were made at the locations shown on Drawing RLE 11/1, on or close to a 100m by 100m grid. Soil profile characteristics, particularly subsoil structure and porosity, were also examined in more detail in three soil inspection pits. Pit and auger boring descriptions are provided in Appendix 11/2, and the sampling locations included as Drawing RLE 11/1, together with the ALC map.

Soil Types

11.12 The site inspection confirmed the existence of peat over most of the site. It is thickest, over 2m in places, in the southeast, but thins out towards the north where, in the north-west corner, some organo-mineral soils rather than true peats are found. From the site inspection most of the peats appeared reasonably well drained but those in the small triangular area near the north-west corner were found to be much wetter, being more or less waterlogged to the surface at the time of survey.

11.13 The drainage status of these soils depends both on the extent to which the open drains can control the ground-water and on how near the surface the slowly permeable clayey substrate is encountered. With a few localised exceptions in small surface hollows, the black peaty topsoil is generally well drained. However the peat in the lower part of the deeper peat profiles is sometimes quite wet suggesting that the open drains round the edges of the site and whatever remains of any under-drainage are no longer providing free drainage. Depending on the observed wetness of the profiles, the relatively thick peats have been allocated to Wetness Classes I (freely drained), II (moderately well drained) or III (imperfectly drained.) In the shallower peats the drainage status depends on the proximity to the surface of the underlying slowly permeable substrate. Where this occurs within about 80cm of the surface, the profiles are in Wetness Class III, but if it is found within 55cm of the surface then profile is poorly drained (Wetness Class IV). Really wet, effectively undrained profiles are placed in Soil Type B (see below).

11.14 Accordingly three main soil types were identified:-

- Soil Type A - Drained peat
- Soil Type B - Undrained peat
- Soil Type C - Organo-mineral soils

Soil Type A

11.15 Drained peat of variable thickness occurs over most of the site. It is thickest in the south-east where, judging by exposures in the eastern ditch it is well over 2m in thickness. In the north the peat becomes thinner (e.g. at Pit A2) and towards the boundary with the organo-mineral soils it consists effectively of only a peaty plough layer over the underlying mineral substrate. The peat is very

acid. Samples from two typical locations (at auger borings 2, 10 and 17) give values of around pH4.7 to 4.8 in the surface as compared to the recommended pH for arable soils of 6 to 6.5. The browner lower peat is even more acid, with values as low as 3.7.

11.16 The mineral substrate is a greyish, mottled clay or sandy clay, sometimes with a thin sandier layer at the top i.e. at the junction with the overlying peat. The peat itself is a black, amorphous and crumbly material in the surface 40cm or so. This is the result of surface oxidation and partial decomposition. Below this depth it is browner and contains recognisable plant fragments including occasional pieces of wood, indicating peat where decomposition and humification has yet to take place.

Soil Type B

11.17 This soil type occurs only in the small triangular area of rough grass near the northwest corner. Here the drainage is very poor, the whole profile is wet and rushes are beginning to invade. Such wet profiles represent effectively undrained peat (Wetness Class V).

Soil Type C

11.18 As the peat thins towards the edges of the mosses there is a tendency for the underlying mineral substrate to become progressively incorporated into the plough layer. Since this is clayey the topsoil then becomes an organic clay. Such soils are found in the north-west corner of the site.

11.19 A typical profile of Soil Type C has a very dark brown organic clay or heavy clay loam topsoil directly over a stiff, slowly permeable, grey and mottled clay. Sometimes there is a very thin sandy layer at the interface. The proximity of the slowly permeable substrate to the surface means that these profiles are in Wetness Class IV.

11.20 Soil Type C is less acid than the thicker peats, with a typical topsoil sample from auger boring 1 giving a pH value of 5.5. This is still quite acid, but superior than the pH4.4 and pH 3.7 of the surface and subsurface peats in Soil Type A.

Agricultural Land Classification (ALC)

11.21 The published 1:63,360 ALC map (Sheet 101, Manchester) shows the whole site as Grade 1 presumably in the belief that it consists entirely of well drained, deep peat. However the peat is not thick over the whole site and indeed true peat is absent in the north. In addition the site is not as uniformly well drained as would be expected for higher grade land.

11.22 Since the published maps were drawn up the ALC system has been significantly revised, particularly in respect of soil wetness, the main limitation affecting these peaty and organic soils. The guidelines indicate that the appropriate gradings for the true peats (Soil Type A) are Grade 1 for Wetness Class I and II profiles, Grade 2 for those in Wetness Class III and Subgrade 3a for those in Wetness Class IV. The organo mineral soils (Soil Type C) which are in Wetness Class IV are one subgrade lower i.e. Subgrade 3b, while the undrained peat (Soil Type B) is Grade 4. The area

shown on Drawing RLE 11/1 as Grade 4 also includes the negligibly small area of land occupied by the semi-derelict agricultural sheds.

11.23 The best land within the application area is in the south and land quality decreases further north across the site with the poorest land in the small undrained triangular area to the immediate east of the existing landfill.

11.24 Drawing RLE 11/1 shows the extent and distribution of ALC grades and sub grades within the Application Area. The percentage composition and area of the entire Application Area according to ALC grade is given in the table below. The total amount of Best and Most Versatile land (grades 1, 2 and 3a) affected is only 11.7 hectares

ALC Grade 1	1.8 ha.	5.3%
Grade 2	6.1 ha.	17.9%
Sub - Grade 3a	3.8 ha.	11.2%
Sub - Grade 3b	1.0 ha.	2.9%
Grade 4	0.8 ha.	2.4%
Non agricultural	20.5 ha.	60.3%

Soil Resource

11.25 The objective in determining the soil resource is to categorise the different sorts of materials according to their compatible or contrasting properties. This is then used to assist optimum recovery of the more valuable parts of the soil resource so that the potential for successful restoration can be realised.

11.26 However the current soil resources consist of a variable thickness of peat which averages in excess of 1m thickness over the site as a whole. The only other soil resource is the organo-mineral topsoil from the small area of Soil Type B at the northern end of the application area (within the present agricultural field). However the composition and characteristics of this material is very similar to the peat and it is likely that these materials would be combined and stripped together.

Available Resources

11.27 There is therefore only one soil resource recognised within the Application Area, the distribution of which is located entirely within the area to the east of the existing landfill.

Resources for Restoration

11.28 Peat occurs naturally in low-lying locations and when drained starts to “waste”. Utilising the material directly for restoration of the landfill would not be practical as it would need to be placed to a c.1m depth on a sloping landfill dome, a task which would have serious operational difficulties and would be impractical from a stability point of view once the material became either to dry or too wet.

11.29 Accordingly it is proposed that peat for restoration purposes would be deliberately mixed with some of the existing clayey substrate material. This would effectively produce a more stable and workable clay-peat mixture to be spread as final cover over the completed landfill.

Assessment of Effects and Mitigation Measures

11.30 During the previous application issues were raised by the CPRE (Campaign to Protect Rural England) the main points being that the "*proposal is unsustainable because by it compromises the ability of future generations to meet their own needs …..will unsustainably alter both the land and landscape*." Comprehensive additional information was subsequently submitted to the Local Planning Authority to offset this statement and addresses the issue of removing land from agricultural use. Elements of this statement are included below to ensure that all relevant information is available to both the consultees and the Local Planning Authority during the statutory consultation stage of this application.

11.31 The soil resources identified by the field survey and described above would be stripped to the full depth and placed in storage either to the north of the application area or within existing storage areas on the north eastern corner of the existing landfill. Surplus clay material would be used for the development of the perimeter screen, along with additional clays to be stripped and temporarily stored on site for landfill capping purposes. All soils would be handled in accordance with good practice for the movement of soils and re-used to form the basis of the restoration to a mixture of recreation and conservation afteruses.

11.32 The restoration proposals will meet local biodiversity and Agenda 21 initiatives and would enhance the wildlife and ecological value of the site. These benefits would affect the change in land-use from available production to primarily recreation and conservation afteruses.

11.33 The restoration proposals are for eastern development to become a mosaic of woodland, scrub and woodland edge planting. This will result in the loss of about 13.5 hectares of agricultural land of which 11.7 hectares fall within the best and most versatile category, mostly Grade 2. All the soil resources on the site will, however, be re-used within the overall restoration scheme for the landfill complex. The existing soil resources consist of an accumulation of peat which, as explained in more detail in the main section on Soils and Agriculture, is a deteriorating asset due to the natural processes of peat wastage.

11.34 The importance of protecting higher quality agricultural land has diminished greatly over recent years as the emphasis has switched from food production to encouraging a more diverse rural economy. Thus policy in the 1970s and early 1980s which was biased in favour of protecting agricultural land from development, particularly if of relatively high quality have steadily been diluted over recent years.

11.35 For example, procedural arrangements introduced in 1987, required that proposals which were not in accordance with a development plan only needed to be referred to MAFF if they were likely to result in the loss of more

than 20 hectares of best and most versatile land. The Risley proposals affect only 11.7 hectares of such land. The implication was that relatively small areas of agricultural land, even if of high quality, were of no national significance. By the late 1990s and early 2000s the involvement of DEFRA (the successor to MAFF) was much reduced and the branch responsible for undertaking field surveys to ascertain land quality was disbanded.

11.36 The Agenda 2000 agreement introduced the reductions in the levels of support previously provided through the Common Agricultural Policy (CAP) and placed an increasing emphasis on sustainable development As a result the emphasis on the protection of the "best and most versatile" agricultural land changed and the powers of MAFF to intervene in decisions on the "best and most versatile" land were reduced A fourth and final edition of PPG 7 was introduced in March 2001 and reflected these changes. Paragraph 1.7, for example stated:

'Food production and a competitive agricultural industry continue to be highly important, and provide a basis for many other economic activities in rural areas..... Farmers are increasingly diversifying into other activities to supplement their incomes. Landowners need the flexibility to consider a range of options for the economic use of their land, including non-food crops, planting more woodland, recreation and leisure enterprises, the management of the land to provide environmental benefits, and the restoration of damaged landscapes and habitats'

11.37 Paragraph 2.3 said that:-

'The guiding principle in the countryside is that development should both benefit economic activity and maintain or enhance the environment'

11.38 In February 2005 PPG 7 was replaced by Planning Policy Statement 7 Sustainable Development in Rural Areas, originally published in 2004, which reflects the changes that have taken and continue to take place in the management of the countryside and outlines the Government's objectives for the future of rural areas. These are:

- To raise the quality of life and the environment in rural areas;
- To promote more sustainable patterns of development;
- Promoting the development of the English regions by improving their economic performance so that all are able to reach their full potential;
- To promote sustainable, diverse and adaptable agricultural sectors.

11.39 These trends of reducing emphasis on agricultural land quality culminated in the publication of Planning Policy Statement 7 *Sustainable Development in Rural Areas* in February 2005. This reflects the changes that have taken place and continue to take place in the management of the countryside and sets out the Government's national policies on different aspects of land use planning in England. It no longer refers to the "best and most versatile" land as a national resource, but considers its occurrence on a site to be only one of a whole range of considerations that should be taken into account in the determination of planning applications. The wording of the relevant paragraph, Paragraph 28 is:

'The presence of best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification), should be taken into account alongside other sustainability considerations e.g. Biodiversity; the quality and character of the landscape; its amenity value or heritage interest; accessibility to infrastructure, workforce and markets; maintaining viable communities; and the protection of natural resources, including soil quality, when determining planning applications.'

11.40 Local development plans are expected, in due course, to follow national policies so that even although there may be a current local policy which appears to afford more protection to best and most versatile land, this will duly be replaced by one more in accord with national objectives.

11.41 Over the same general period as the emphasis on agricultural land quality has declined, beginning in the late 1980s but particularly since 2005 there has been recognition that mineral extraction and/or landfill sites can provide restoration opportunities which are more in accord with wider countryside objectives. Thus an emphasis on restoration to an agricultural afteruse has been steadily replaced by recognition that restoration, as is proposed at Risley, to woodland or other ecologically interesting afteruse is a more desirable course of action.

11.42 In 1983 MAFF calculated the areas of the various ALC grades (although not the subdivision of Grade 3) for regions and counties, based on the gradings at the 1km grid intersections on their published ALC maps. The percentages of Grades 1 and 2 for England as a whole, expressed as a percentage of the agricultural land, were 3.3% and 16.7% respectively. For the county of Cheshire, in which Warrington then belonged, the percentages were 0.4% and 14.8% respectively.

11.43 A similar analysis has been carried out for this Environmental Assessment using current published ALC Sheets 100 and 101 for the area of Warrington Borough Council. The assessment concluded that there is a much higher proportion of the two highest grades, 3.3% of Grade 1 and 37.2% of Grade 2 than in either the historic County of Cheshire or England as a whole.

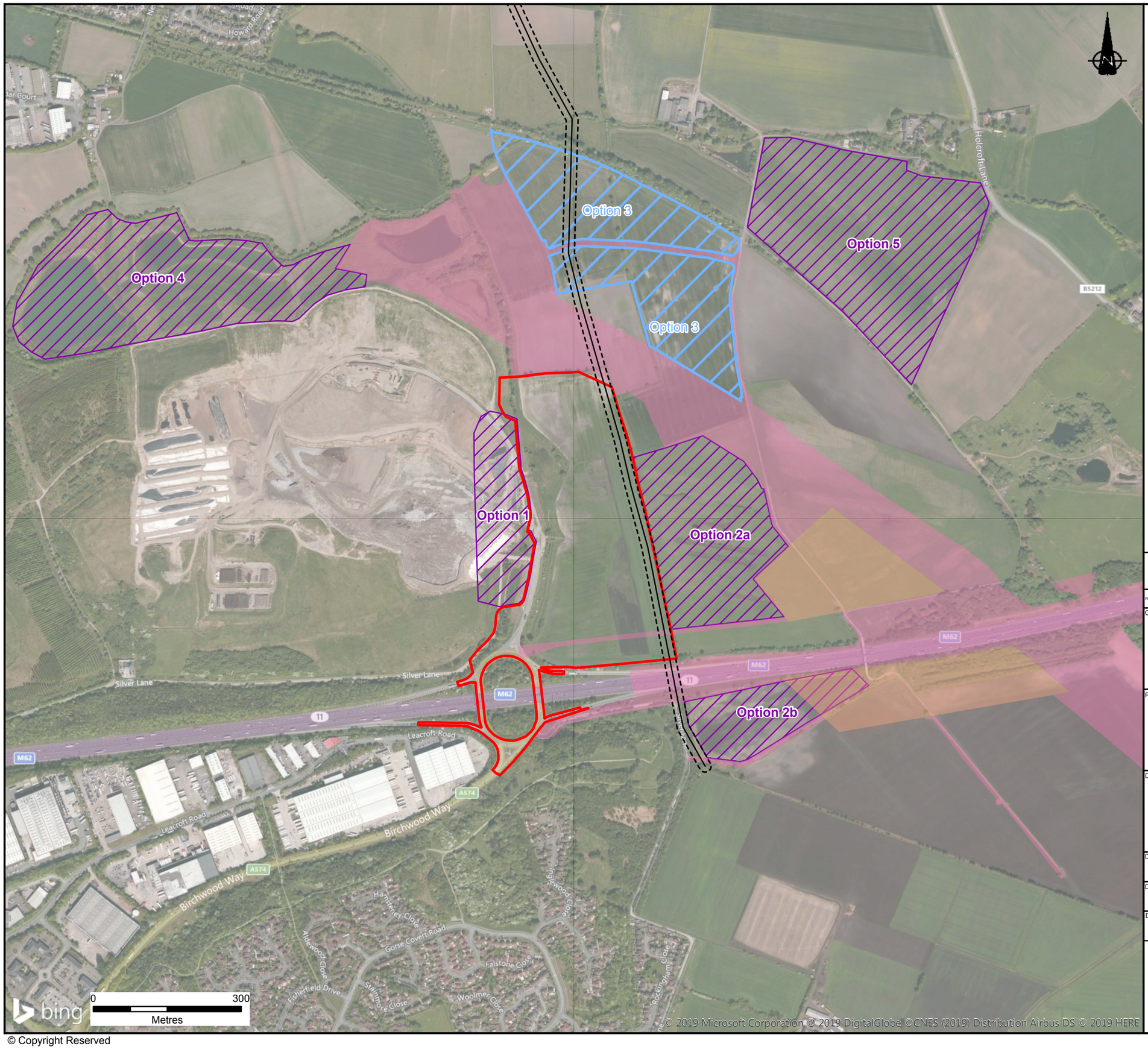
11.44 The implication of the above is that any development of agricultural land around Warrington is more likely to involve higher grade land (in this case Grades 1 and 2) than in many other parts of the country. Comparison of the published ALC maps with the current OS maps showing the present built-up area would confirm this. Two thirds of the grid intersection sample points shown as agricultural land on the ALC maps but which have subsequently been urbanised were shown as Grade 2 and only a third as Grade 3. Thus it would appear that the use of Grade 2 land for development in the Warrington area has been even greater than might have been expected from the average grades of land in the Borough. Therefore the proposals are not exceptional in affecting higher quality agricultural land.

Conclusions

11.45 We can therefore conclude that although the proposals will result in the loss of 11.7 hectares of best and most versatile agricultural land and alter the landscape the mitigating aspects are:-

- The amount of agricultural land involved is small;
- The peaty soils are a naturally deteriorating asset due to peat wastage processes;
- The importance placed on the protection of agricultural land has been greatly reduced and land quality is now only one of a whole range of considerations that should be taken into account in the determination of planning applications;
- The proposals are not exceptional in affecting higher quality agricultural land within the Warrington area;
- The restoration proposals will provide land with a considerably enhanced ecological value as compared to what presently exists.
- With regard to the landform in the longer-term, the site would be restored to a beneficial after-use that would be integrated into the existing site and its surroundings. The restoration scheme would include the creation of new woodland with public access and therefore contribute to the Mersey Forest, Community Forest initiative.
- The proposed development would be consistent with the aims of the relevant local landscape policies and the landscape and visual aims of Landscape Design Guide for New Developments, Warrington Borough Council's Supplementary Planning Document (SPD).

Appendix 10.11 - Drawing SH11739/ 32 Parcels Considered in the Options Appraisal



KEY

- Site Boundary
- Gas Pipeline
- 24 m Gas Pipeline Easement (Constraint to Development)
- Potential Enhancement Area

HS2 Construction Activities

- Land Potentially Required During Construction
- Satellie Construction Compound
- Peat Receptor Options

Notes:

Aerial imagery shown for context purposes only.

Boundaries are indicative.

HS2 construction activities taken from High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT

EXTRA MOTORWAY SERVICE AREA GROUP

PROJECT

WARRINGTON MOTORWAY SERVICE AREA, J11 M62

DRAWING TITLE

PARCELS CONSIDERED IN THE OPTIONS APPRAISAL

DRG No.	REV
SH11739/032	A

DRG SIZE	SCALE	DATE
A3	1:7,500	22/08/2019

DRAWN BY	CHECKED BY	APPROVED BY
SW	TP	TP

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