

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix AG-001-0MA06

Agriculture, forestry and soils

MA06: Hulseheath to Manchester Airport

Agriculture, forestry and soils assessment

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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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1 Introduction

- 1.1.1 This report is an appendix to the agriculture, forestry and soils assessment. It presents the following for the Hulseheath to Manchester Airport community area (MA06):
- agriculture and soils baseline data for agricultural land, including open spaces and natural soils within urban areas; and
 - a summary of the farm holding impact assessment.
- 1.1.2 Additional data used for the agriculture, forestry and soils assessment are set out in Background Information and Data (BID) report Agriculture, forestry and soils baseline data (BID AG-002-0MA06)¹.

¹ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background and Information Data, Agriculture, forestry and soils baseline data*. BID AG-002-0MA06. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement>.

2 Soils and agricultural land classification

2.1 Background

- 2.1.1 An element of the assessment of the effects of the route of the Proposed Scheme upon agriculture is concerned with the consideration of the quantity and quality of the agricultural land affected. The determination of the quality of agricultural land is undertaken by the application of a secondary evaluation of the interaction of soil and other physical parameters in accordance with a prescribed methodology. That methodology is set out in guidelines² prepared by the Ministry of Agriculture, Fisheries and Food (MAFF) in 1988 which enables the classification of land by qualitative grade in accordance with the Agricultural Land Classification (ALC) system. This establishes the inherent productive capability of agricultural land which can be considered on a consistent basis throughout England and Wales.
- 2.1.2 The approach taken to the collection and collation of baseline data on soil types present, and the other physical characteristics of topography, climate and drainage in the Hulseheath to Manchester Airport area is described. The baseline data are described and how the MAFF evaluation methodology has been applied to provide the definitive classification of the quality of agricultural land affected by the route of the Proposed Scheme. This provides the baseline for the assessment of the effects of the project on agricultural land and soils which is detailed in Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06), Section 4 Agriculture, forestry and soils.
- 2.1.3 This document should be read with reference to the Agriculture, forestry and soils baseline data contained in the Background Information and Data (BID AG-002-0MA06)¹ and the Volume 5, Agriculture, forestry and soils Map Book (AG-02-306 and AG-04-319 to AG-04-322).

2.2 Soils and agricultural land classification surveys - methodology

- 2.2.1 During the EIA process, soil and ALC information has been considered on two levels. The soils and agricultural land quality baseline conditions reported have been established from initial desktop studies and then with regard to subsequent site-specific surveys, where necessary and possible. The data are presented in this context with that derived from the material and interpretation of publicly available sources addressed first, followed by that derived from site specific surveys whereby the initial desk-based work has been extended and/or validated.

² Ministry of Agriculture, Fisheries and Food (MAFF) (1988), *Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land*.

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- 2.2.2 At both levels the data have been evaluated in accordance with the MAFF methodology for assessing the quality of agricultural land. The review of available existing ALC information has concentrated on the extent of detailed post-1988 survey information. There were substantive changes to the ALC system in 1988 which rendered previously available information less useful.
- 2.2.3 The ALC system is concerned with the classification of agricultural land according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The main limiting factors are climate, the physical character of a site, and soil. These factors and their interactions enable land to be attributed to one of five qualitative grades, with Grade 1 being the highest quality and Grade 5 the lowest. Grade 3 land which is the most extensive grade is divided into two subgrades; 3a and 3b.
- 2.2.4 Of relevance to the assessment of the environmental effects of the route of the Proposed Scheme is that land falling within Grades 1 and 2 and Subgrade 3a of the ALC is determined by planning policy to comprise the best and most versatile (BMV) agricultural land.
- 2.2.5 The physical factors influencing the agricultural capability of land are considered within the ALC assessment methodology as follows. The main climatic factors are temperature and rainfall. Site factors are gradient, microrelief and flood risk. Relevant soil characteristics are texture, structure, depth and stoniness. These factors can act either separately or in combination influence agricultural capability. The most important interactive limitations are soil wetness and droughtiness.
- 2.2.6 Soil wetness expresses the extent to which excess water imposes restrictions on crop growth and cultivations. The ALC methodology provides an approach which combines an assignment of soil to one of six categories of wetness class (WC) (I-VI with I being the most freely draining), the texture of the topsoil (sandy textures being freely draining and clays generally poorly draining), and the climatic regime expressed in terms of the number of days when the soil cannot absorb additional water (Field Capacity Days, FCD).
- 2.2.7 A similar approach is adopted towards the consideration of soil droughtiness. This seeks to determine the extent to which a combination of climate, soil and crop requirements provide adequate reserves of soil moisture during the growing season. The magnitude and duration of any shortfall represents a potential limitation of the land to maintain particular crops.
- 2.2.8 Soil droughtiness is determined in the ALC methodology with reference to an indicative drought risk based on two crops, winter wheat and maincrop potatoes. The average soils moisture balance for these crops is calculated on the basis of two parameters. Firstly, the measure of the quantity of water held in the soil profile which can be taken up by the specified crop, and secondly the moisture deficit which is the balance between rainfall and potential evaporation calculated over a critical part of a growing season. Land quality is derived from the moisture balance, this being the difference between the two parameters, with a negative difference relating to increasingly poorer quality in the ALC system.

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2.3 Soils and agricultural land classification surveys - publicly available information

2.3.1 Initially, the assessment of the impacts on soils and agricultural land quality is based on publicly available data gathered by desk based studies. This relates primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:

- National Soil Map³;
- Soils and Their Use in Midland and Western England; regional reconnaissance mapping showing soil associations (groupings of spatially related soil types)⁴;
- solid and superficial deposits from the Geology of Britain viewer⁵;
- grid point meteorological data for ALC of England and Wales⁶;
- Provisional ALC of England and Wales (1:250,000)⁷;
- Defra Likelihood of Best and Most Versatile Agricultural Land mapping (1:250,000)⁸;
- agri-environment schemes⁹; and
- aerial photography.

2.3.2 Publicly available existing detailed ALC information is generally at a mapped scale of 1:10,000 based on field surveys of soils and agricultural land quality carried out by MAFF and the Soil Survey of England and Wales (SSEW). A desk based assessment of soils and agricultural land quality was based on this publicly available data.

2.3.3 MAFF has not carried out any detailed ALC surveys within the study area. However, a detailed ALC survey carried out by Reading Agricultural Consultants in 1994 determined that the quality of agricultural land surveyed around Davenport Green, including some land in the study area, is entirely Subgrade 3b. Also, there is detailed ALC survey information covering 234 ha of agricultural land approximately 200m to the south of the study area, near

³ Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*, Cranfield University: National Soil Resources Institute.

⁴ Soil Survey of England and Wales (1984), *Soils and Their Use in Midland and Western England*, Harpenden.

⁵ British Geological Survey, *Geology of Britain Viewer*. Available online at: www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html.

⁶ Meteorological Office (1989), *Grid point Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

⁷ Ministry of Agriculture, Fisheries and Food (1983), *Agricultural Land Classification of England and Wales (1:250,000)*.

⁸ Department for Environment, Food and Rural Affairs (2005), *Likelihood of Best and Most Versatile Agricultural Land (1:250,000)*.

⁹ Multi-Agency Geographical Information for the Countryside (MAGIC), Available online at: www.magic.gov.uk.

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Mobberley. This detailed ALC survey was carried out by Reading Agricultural Consultants in 1994 in connection with a public inquiry into the Manchester Airport Second Runway, which has been constructed. The quality of the agricultural land was determined to be mainly Subgrade 3b, with small, isolated pockets in Subgrade 3a and Grade 4.

- 2.3.4 Findings of the desk based studies based on publicly available information are described in the following section. The location and extent of different soil types and ALC grades/subgrades are influenced by topography and drainage, by geology and soil parent materials, and by climate which are now described in turn.

2.4 Soil parent materials

- 2.4.1 This section only considers geology as a soil parent material, which is a soil-science name for a weathered rock or deposit from and within which a soil has formed¹⁰. The soil association developed in each parent material is identified below. The soil associations are described under 'Description and distribution of soil types' below.
- 2.4.2 The most common soil parent material, which is present over the whole study area, comprises reddish glacial deposits such as till and glaciofluvial sand and gravel deposits, which are mainly overlying Bollin Mudstone within the Mercia Mudstone Group. The soils developed from and within this parent material belong to the Salop association.
- 2.4.3 There are glaciofluvial deposits along the Agden Brook, Birkin Brook, Mobberley Brook and, to a lesser extent, in the valley of the River Bollin. Where this parent material, which comprises sand and gravel, is seasonally waterlogged by a fluctuating groundwater table, it produces soils in the Blackwood association. On river terraces, and in older glaciofluvial deposits, sands and gravels give rise to deep and well drained soils in the Wick 1 association.
- 2.4.4 Where there is alluvium comprising silt and clay affected by high ground-water levels, there are soils in the Conway association. This type of parent material occurs in the floodplains of the Agden Brook, Birkin Brook, Mobberley Brook, and the River Bollin.

2.5 Topography and drainage

- 2.5.1 Topography in the area has gentle to moderate gradients (angle of slope between two and seven degrees). The land at the southern boundary of the study area, at Hulseheath, is at an elevation of 59m above Ordnance Datum (AOD). The land falls away down a moderate slope (angle of slope between four and seven degrees) to Agden Brook at 49m AOD. To the north of the brook, the land rises to 57m AOD at Millington Lane. From Millington Lane, the land

¹⁰ British Geological Survey. *Soil Parent Material Guide*. Available online at: [Soil Parent Material Model - British Geological Survey \(bgs.ac.uk\)](https://www.bgs.ac.uk/soil-parent-material-model/).

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descends over a gentle slope (angle of slope between two and three degrees) to 38m AOD at A556 Chester Road.

- 2.5.2 Where the route of the Proposed Scheme passes to the north of Rostherne Mere, to the south of junction 8 of the M56, the land falls over a gentle gradient (2-3 degrees) from 38m AOD to 31m AOD at a confluence of Blackburn’s Brook and Birkin Brook. The land rises to 35m AOD at Ashley Road, and then continues to rise to 40m AOD at Mobberley Road. The elevation of the land continues to increase to approximately 57m AOD at Brickhill Lane, near Thorns Green. The land then falls over a moderate to strong (angle of slope between four and 11 degrees), north-east facing slope of a narrow valley, down to the floodplain of the River Bollin at 42m AOD.
- 2.5.3 Beyond the river, the land rises quite steeply northwards (angle of slope between four and 11 degrees) to the M56, at 62m AOD. From the motorway, the land falls from 67m AOD near A538 Hale Road, to 65m AOD at the northern boundary of the area. The Proposed Scheme would cross the Timperley Brook near Davenport Green.
- 2.5.4 Drainage of the land is predominantly via the Agden Brook, Blackburn’s Brook, Birkin Brook, the River Bollin and Timperley Brook.

2.6 Agro-climate

- 2.6.1 The local agro-climatic factors have been interpolated from the Meteorological Office’s standard 5km grid point dataset at three representative points within the study area shown in Table 1 There is some variation across the study area.
- 2.6.2 Average annual rainfall is 817mm to 845mm, increasing with altitude. FCDs range from 193 days to 199 days. Moisture deficits are between 85mm to 88mm for wheat and 72mm to 75mm for potatoes, with the lower values occurring on the higher ground.
- 2.6.3 Accumulated temperature is the excess of daily air temperatures above a selected threshold temperature (0°C), summed over a specified period (January to June which is the critical growth period for most crops). The accumulated temperature within the study area is between 1,379 and 1,390 day °C.

Table 1: Interpolated agro-climatic data

Agro-climatic parameter	SJ727848 Booth Bank	SJ795843 Warburton Green	SJ803856 Hale
Altitude (mAOD)	56m	53m	63m
Average annual rainfall (mm)	817mm	844mm	845mm
Accumulated temperature >0°C (day°)	1,390day°	1,390day°	1,379day°

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Agro-climatic parameter	SJ727848 Booth Bank	SJ795843 Warburton Green	SJ803856 Hale
Field capacity days (days)	193 days	199 days	199 days
Average moisture deficit, wheat (mm)	88mm	86mm	85mm
Average moisture deficit, potatoes (mm)	75mm	73mm	72mm

2.7 Description and distribution of soil types

2.7.1 The characteristics of the soils are described in the SSEW regional bulletin covering the study area and their distribution is illustrated on the National Soil Map³. The soils are grouped into soil associations of a range of soil types that are spatially related and are summarised in Table 2. Their distribution is shown on Map AG-02-306 (Volume 5, Agriculture, Forestry and Soils Map Book).

Table 2: Soil associations

Soil association: code shown on map AG-02-306	Soil association: name	Description	Wetness class
711m	Salop	Slowly permeable seasonally waterlogged reddish fine loamy over clayey, fine loamy and clayey soils associated with fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.	IV
821b	Blackwood	Deep permeable sandy and coarse loamy soils, affected by fluctuating groundwater.	III-IV
541r	Wick 1	Deep well drained coarse loamy and sandy soils locally over gravel. Some similar soils affected by groundwater. Slight risk of water erosion.	I

2.7.2 The National Soil Map shows the general distribution of the following three soil associations in the study area:

- the Salop association is extensive over the study area. This association comprises slowly permeable and seasonally waterlogged clay loams over clay soils (WC III to IV). They are developed in reddish glacial deposits, i.e. till and glaciofluvial sand and gravel deposits;
- the Blackwood association is found in the centre of the study area, near Ashley. These soils are developed in glacial river deposits, which are variable in stone content and frequently overlie clay deposited in glacial lakes, or glacial till, at depth. Where undrained, the Blackwood soils are waterlogged for long periods during the winter (WC III and IV). These soils experience fluctuating levels of groundwater. Where the water-table has been

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lowered, the soils are well drained (WC I) or only slightly seasonally waterlogged (WC II); and

- the Wick 1 association is found in small region in the west of the study area, near Little Bollington. This association consist of soils that are well drained (WV I) sandy loam over loamy sand, and in glaciofluvial and terrace drift of variable stoniness.

2.7.3 Soils of the Salop, Blackwood and Wick1 associations are described further in the Soils Guide¹¹ which is available at Cranfield University's Landis website.

2.7.4 Detailed descriptions for the dominant soil series in the Salop, Blackwood and Wick 1 associations, and are given in Table 3.

Table 3: Dominant soil series

Soil series	
Salop series	
0 – 25cm	Very dark greyish brown (Munsell colour 10YR3/3) slightly stony clay loam; moist; moderately developed medium angular blocky; low packing density; moderately weak soil strength; few very fine fibrous roots; non-calcareous; sharp smooth boundary.
25 – 45cm	Brownish grey (2.5Y5/2) slightly stony clay loam very many fine strong brown (7.5YR5/8) mottles; moist; moderate medium subangular blocky or prismatic structure; medium packing density; moderately firm ped strength; few very fine fibrous roots; non-calcareous; few irregular soft ferri-manganiferous concentrations; abrupt smooth boundary.
45 – 100cm	Yellowish red (10YR4/1) slightly stony clay with many medium yellowish brown (10YR5/6) mottles; very moist. Moderate coarse prismatic structure, moderately developed coarse prismatic with dark greyish brown (10YR4/2) faces; medium packing density; moderately firm soil strength; few very fine fibrous roots; non-calcareous; few rounded ferri-manganiferous nodules; clear smooth boundary.
100 – 120cm	Reddish brown (10YR4/2) slightly stony clay with many medium reddish brown (5YR4/4) mottles; massive or coarse prismatic structure; sometimes with calcium carbonate concentrations; very moist; moderately developed medium prismatic with dark grey (10YR4/1) faces; medium packing density; moderately weak soil strength; common very fine fibrous roots; non-calcareous; common rounded soft ferruginous concentrations; abrupt wavy boundary.
Blackwood series	
0 – 20cm	Very dark greyish brown (10YR3/2), loose slightly stony or stoneless loamy sand; mainly small and medium subrounded quartzite pebbles; weak fine and medium granular; abundant fine pores; common fine fibrous roots; clear abrupt boundary.
20 – 35cm	Pale brown (10YR6/3), slightly stony loamy sand; mainly medium and large subrounded quartzite pebbles; common very pale brown (10YR7/3), light grey (10YR 7/2) and light yellowish brown (10YR 6/4) prominent mottles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
35 – 90cm	Light brownish grey (10YR6/2), slightly stony loamy sand to sand; mainly medium and large subrounded quartzite pebbles; common brown (10YR5/3), pale brown (10YR6/3) and very pale brown (10YR7/3) mottles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
90 – 100cm	Greyish brown (10YR5/2) loamy sand to sand, stoneless; common brown (10YR5/3), pale brown (10YR6/3) and very pale brown (10YR7/3) mottles; single grain structure.

¹¹ Cranfield University (2017), *The Soils Guide*. Available online at: www.landis.org.uk.

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Soil series	
Wick series	
0 – 14cm	Brown (7.5YR4/4) friable sandy loam; common faint fine strong brown (7.5YR5/6) mottles; slightly stony with small subangular and rounded igneous pebbles; moderate medium and coarse subangular blocky breaking to fine crumb; abundant fine and medium pores and common fine fissures; moderate organic matter; abundant fine fibrous roots; narrow even boundary.
14 – 69cm	Yellowish red (5YR4/6) friable sandy loam; slightly stony with small subangular and rounded igneous pebbles; moderate medium and coarse subangular and angular blocky breaking to fine crumb; abundant fine and medium pores and common fine fissures; low organic matter; common fine fibrous roots; earthworms present; sharp undulating boundary.
69 – 90cm	Brown (7.5YR5/4) and yellowish red (5YR4/6) very friable loamy sand; stony with subangular and rounded gravel and small stones; weak medium angular and subangular blocky breaking to fine crumb and single grain; very abundant fine and medium pores and common fine fissures; low organic matter; few fine fibrous roots.

2.8 Soil and land use interactions

- 2.8.1 As described earlier, the assessment of the quality of agricultural land is derived from the consideration of the extent to which long-term limitations are placed on agricultural productive capability by the key physical factors, either individually or interactively. The publicly available information and general familiarisation with the study area established the following limitations and interactions.

Agricultural land quality

- 2.8.2 The principal physical factors influencing agricultural production and land quality in this study area are climate, site and soil and the interactions between them. Soil wetness and workability and gradient of slope are particularly relevant limitations in this area.

Agro-climatic limitations

- 2.8.3 The local agro-climatic factors have been interpolated from the Meteorological Office's standard 5km grid point dataset at three points within the study area, as set out Table 1. Average annual rainfall is from 817mm to 845mm, increasing with altitude. FCDs range from 193 days to 199 days. Moisture deficits are 85mm to 88mm for wheat and 72mm to 75mm for potatoes, with the lower values occurring on the higher ground.
- 2.8.4 Average annual rainfall and accumulated temperature do not place any limitation upon the land in this study area, but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the soil.

Site limitations

- 2.8.5 The assessment of site limitations is primarily concerned with the way in which topography influences the use of agricultural machinery and hence the cropping potential of land. In addition, gradient influences the risk of soil erosion on cultivated land, particularly where the soil is weakly structured. Topography in this study area is characterised by undulating land with mainly gentle to moderate gradients (angle of slope between two and seven degrees). There are some moderate to strong gradients (up to 11 degrees) on valley sides flanking the River Bollin, which is sufficient to limit the quality of the agricultural land to Subgrade 3b.
- 2.8.6 Flood risk is potentially limiting to agricultural land quality in the study area alongside the Agden Brook, Blackburn's Brook, Birkin Brook, the River Bollin and Timperley Brook, although there is no site-specific data on duration and frequency of flooding in terms of Table 2 'Grade according to flood risk in summer' and Table 3 'Grade according to flood risk in winter' in the ALC Guidelines² to confirm this. No land was flooded during the time the detailed soil surveys were carried out. The land in these floodplains is classed as predominantly flood zone 3, in which there is a 1 in 100 or greater annual probability of flooding. Further details are provided in Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06), Section 15, Water resources and flood risk.

Soil limitations

- 2.8.7 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, drainage, workability and trafficability. The main soil characteristics within the study area are:
- slowly permeable and seasonally waterlogged clay loams over clay soils in reddish drift;
 - deep well drained coarse loamy and sandy soils locally over gravel, variably affected by fluctuating groundwater; and
 - deep permeable sandy and coarse loamy soils developed in glacial river deposits, which are variable in stone content and frequently overlie clay deposited in glacial lakes, or glacial till, at depth.
- 2.8.8 Soil depth and chemical limitations are not encountered in this study area.

Interactive limitations

- 2.8.9 The physical limitations which result from interactions between climate, the site and soil are soil wetness, droughtiness and erosion. Each soil can be allocated a WC based on soil structure, evidence of waterlogging and the number of FCDs; the topsoil texture then determines its ALC Grade in accordance with the MAFF ALC guidelines. The conclusions reached on the quality of agricultural land in the study area from the initial desk based consideration are as follows.

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- 2.8.10 Where soils in the Salop association are slowly permeable and seasonally waterlogged (WC III to IV) clay loams over clay soils in reddish drift, agricultural land quality is limited mainly by soil wetness to mainly Subgrade 3a or Subgrade 3b, with Grade 4 where the topsoil is heavy clay loam over clay subsoil. The profiles are waterlogged for long periods over the winter (WC IV).
- 2.8.11 The quality of agricultural land with soils in the Blackwood association is limited by soil wetness to Subgrade 3a where the subsoil is seasonally waterlogged (WC III) or Subgrade 3b where the subsoil is waterlogged for long periods over the winter (WC IV). Where the agricultural land is drained (WC I and WC II), soil in the Blackwood association are limited by soil droughtiness to Grade 2 or Subgrade 3a.
- 2.8.12 Deep light loamy and sandy soils of the Wick 1 association are most affected by soil droughtiness. The severity of limitation is determined by factors such as topsoil and subsoil textures, stone content and depth to the sandstone bedrock. As crop moisture deficits are moderate to moderately large, droughtiness limitations are mostly slight to Grade 2, but may be as severe as Subgrade 3b.

2.9 Soils and agricultural land classification surveys - detailed soil/ALC field surveys

- 2.9.1 The collection of site-specific information on soil resources and physical conditions has enabled a refinement and extension of published information on agricultural land quality. The analysis of the additional baseline information (topography and soils) identifies individual soil types and definitive agricultural land quality in accordance with the methodology prescribed by MAFF.
- 2.9.2 Site specific soils data have been collected through the observation of individual soil profiles at density of one observation per hectare across the study area; this being the degree of detail required for a definitive agricultural land classification. The characteristics of soil profiles were recorded to a maximum depth of 120cm where possible, or to any impenetrable layer, in relation to the following attributes:
- soil texture;
 - significant stoniness;
 - colour (including local gley and mottle colours);
 - consistency;
 - structural condition;
 - free carbonate; and
 - depth.
- 2.9.3 Soil WC was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick. Soil

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available water capacity, relevant to the assessment of drought risk, was estimated from texture, structure, organic matter content, stone content and profile depth.

- 2.9.4 Soil data associated with post-1988 detailed ALC surveys are available from Natural England. A full archive of the soil data collected from field surveys undertaken on behalf of HS2 Ltd is presented as a series of soil survey proformas in a separate background information document (BID AG-002-0MA06)¹.
- 2.9.5 The detailed soil data confirm the presence in the study area of the soil series relating to the soil associations shown on the National Soil Map. Representative soil profiles from the Salop, Blackwood and Wick series are described in Table 4.

Table 4: Dominant soil series within study area taken from site survey data

Soil series	
Salop series (379350, 384300)	
0 – 40cm	Dark brown (7.5YR3/4) medium clay loam; moist; moderately developed medium angular blocky; low packing density; moderately weak soil strength; few very fine fibrous roots; non-calcareous; sharp smooth boundary.
40 – 75cm	Reddish brown (5YR4/4) slightly stony medium clay loam; moist; moderate medium subangular blocky or prismatic structure; medium packing density; moderately firm ped strength; few very fine fibrous roots; non-calcareous; abrupt smooth boundary.
75 – 80cm	Reddish brown (5YR4/4) slightly stony medium clay loam with many mottles; very moist. Moderate coarse prismatic structure, medium packing density; moderately firm soil strength; few very fine fibrous roots; non-calcareous; few rounded ferri-manganiferous nodules; clear smooth boundary.
80 – 120cm	Reddish brown (5YR5/4) slightly stony clay with many mottles; massive or coarse prismatic structure; sometimes with calcium carbonate concentrations; very moist; medium packing density; moderately weak soil strength; common very fine fibrous roots; non-calcareous; common rounded soft ferruginous concentrations; abrupt wavy boundary.
Blackwood series (371700, 386600)	
0 – 40cm	Black (10YR2/1), medium sandy loam; mainly small and medium subrounded quartzite pebbles; weak fine and medium granular; abundant fine pores; common fine fibrous roots; clear abrupt boundary.
40 – 60cm	Very dark brown (10YR2/2), sandy loam; mainly medium and large subrounded quartzite pebbles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
60 – 70cm	Very dark brown (10YR2/2), loamy medium sand; mainly medium and large subrounded quartzite pebbles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
70 – 75cm	Brown (7.5YR5/2) medium sand, stoneless; common mottles; single grain structure.
Wick series (372700, 384800)	
0 – 25cm	Very dark greyish brown (10YR3/2) medium sandy loam; slightly stony with small subangular and rounded igneous pebbles; moderate medium and coarse subangular blocky structure; moderate organic matter; abundant fine fibrous roots; narrow even boundary.
25 – 80cm	Brown (7.5YR5/4) medium sandy loam; slightly stony; moderate medium and coarse subangular and angular blocky breaking to fine crumb; abundant fine and medium pores and common fine fissures; low organic matter; common fine fibrous roots; earthworms present; sharp undulating boundary.
80cm+	Reddish brown (5YR5/4) loamy sand; slightly stony with subangular and rounded gravel and small stones; weak angular blocky structure.

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- 2.9.6 Where there is no available published information and it has not been possible to undertake a detailed survey of agricultural land affected by the route of the Proposed Scheme, professional judgement has been used to extrapolate from known data to provide a comprehensive ALC coverage.
- 2.9.7 The assessment of the quality of agricultural land in the study area based on publicly available data and additional detailed survey data have been reviewed, and the final conclusions on the distribution of agricultural land in the various grades of the ALC in the study area are shown on Maps AG-04-319 to AG-04-322 (Volume 5, Agriculture, Forestry and Soils Map Book).
- 2.9.8 The distribution of agricultural land in the different grades is shown in Table 5.

Table 5: Distribution of grades of agricultural land in the study area

Grade	Area (ha)	% of study area	% of Agricultural land area
1	0	0	0
2	24.6	5.4	7.3
3a	31.2	6.8	9.2
BMV subtotal	55.8	12.2	16.5
3b	280.6	61.1	82.8
4	2.5	0.5	0.7
5	0	0	0
Non agricultural	120.6	26.2	-
Total area	459.5	100	100

3 Assessment of effects on holdings

- 3.1.1 The effects on land holdings have been assessed according to the methodology set out in the in the Environmental Impact Assessment Scope and Methodology Report (SMR), (see Volume 5, Appendix CT-001-00001).
- 3.1.2 The land holdings assessed in this section are also presented in Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06), Section 4 Agriculture, forestry and soils and shown on the Volume 5, Agriculture, forestry and soils Map Book (AG-01-319 to AG-01-322).
- 3.1.3 A summary of the assessment is provided in Table 6. The nature of the impacts considered includes:
- temporary and permanent land required from the holding;
 - the temporary and permanent severance of land;
 - the permanent loss of key farm infrastructure; and
 - disruption (particularly noise and dust) on land uses and the holding's operations.
- 3.1.4 These impacts occur primarily during the construction phase of the Proposed Scheme.

Table 6: Summary of assessment of impacts and effects on holdings

Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
MA06/1 Land at Chapel Lane, Bucklow Hill (2)* 0.5ha residential with grassland paddock. Low sensitivity to change	Land required: Medium 0.1ha; 20% of holding required for diversion of utility supplies. Severance: Negligible Disruption: Negligible Overall temporary assessment: Minor adverse	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/2 Moss House Farm 47ha (36ha owned; 10ha rented from Tatton Estate; 1ha rented locally). Beef cattle and sheep Contract shepherding services also undertaken Medium sensitivity to change	Land required: High 29.7ha; 63% of holding required for the construction of the Hulseheath south and north embankments, Peacock Lane realignment and viaduct, Millington Clough underbridge, Agden Brook viaduct and soil stores. Severance: Medium Access to severed farmland will be possible along public highways although access may be compromised during construction. Disruption: Negligible	Land required: High 12.2ha; 26% of holding required for the Hulseheath south and north embankments, Peacock Lane realignment and viaduct, Millington Clough underbridge, Agden Brook viaduct and ecological and landscape mitigation. Severance: Medium Access to severed farmland will be possible along public highways. Infrastructure effects: Negligible Overall permanent assessment: Major/moderate adverse due to the proportion of land required

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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
	Overall temporary assessment: Major/moderate adverse due to the proportion of land required	
MA06/3 Land at Boothbank Lane, Millington* 0.4ha grassland paddock. Low sensitivity to change	Land required: High 0.4ha; 100% of holding required for utility diversion. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/4 Millington House Nursery Owner occupied 2.6ha specialist horticultural unit with glasshouses – specialising in bedding plants for hanging basket production; grassland paddock used for hay making. Glasshouses high sensitivity to change Grassland paddock low sensitivity to change	Land required: High 1.5ha; 58% of holding required for the construction of the Hulseheath north embankment, Millington Clough underbridge and soil stores. Severance: Medium Access to severed land will be possible along public highways and private accesses but may be compromised during construction. Disruption: Low Glasshouse shading due to construction dust may require additional cleaning processes. Overall temporary assessment: Moderate adverse due to the proportion of the land required	Land required: High 0.9ha; 35% of holding required for the Hulseheath north embankment, Millington Clough underbridge and ecological and landscape mitigation. Severance: Medium Access to severed land will be possible along public highways and private access tracks. Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA06/5 Ivy House Farm 11ha owner occupied Grassland holding with 27 stables used for commercial livery; woodland rides also available on owned property Medium sensitivity to change	Land required: High 7.4ha; 67% of holding used for riding out required for the construction of the Hulseheath north embankment, Millington Clough underbridge, Ivy Farm accommodation access, utility diversion, construction access to balancing ponds and soil stores. Severance: Medium Access to severed farmland will be possible along public highways but may be compromised during construction. Disruption: Low Riding of horses close to construction activities may need to be limited.	Land required: Medium 2ha; 18% of holding required for the Hulseheath north embankment, Millington Clough underbridge, Ivy Farm accommodation access, HS2 access to balancing ponds and ecological and landscape mitigation. Severance: Medium Severed land will be accessible via the public highway and the Ivy House access diversion. Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required and severance

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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
	Overall temporary assessment: Major/moderate adverse due to the proportion of land required	
<p>MA06/6</p> <p>Millington Hall Farm – managed in hand by Tatton Estate (Arden Enterprises).</p> <p>Total area farmed 300ha.</p> <p>Arable and sheep.</p> <p>Buildings underused for agriculture, proposed commercial/residential development; house let on an Assured shorthold tenancy</p> <p>Medium sensitivity to change</p>	<p>Land required: Medium</p> <p>54ha; 18% of holding required for the construction of the Hulseheath north embankment, Millington cutting, Agden Brook viaduct and Agden Brook viaduct satellite compound, Millington Lane realignment, Ashley west and east embankments, Ashley Road diversion, Ashley railhead, utility diversions and soil stores.</p> <p>Severance: Medium</p> <p>Access to severed farmland will be possible along public highways but access may be compromised during construction.</p> <p>Disruption: Negligible</p> <p>Overall temporary assessment: Moderate adverse due to the proportion of land required</p>	<p>Land required: Low</p> <p>19.4ha; 7% of holding required for the Hulseheath north embankment, Millington cutting, the Agden Brook viaduct, Millington Lane realignment, Ashley west and east embankments, Ashley Road diversion and ecological and landscape mitigation.</p> <p>Severance: Medium</p> <p>Access to severed farmland will be possible along public highways.</p> <p>Infrastructure effects: Negligible</p> <p>Overall permanent assessment: moderate adverse due to severance</p>
<p>MA06/7</p> <p>Newhall Farm</p> <p>Majority (65ha) owned by Tatton Estate rented on an Agricultural Holdings Act (AHA) tenancy; balance (20ha) owner occupied.</p> <p>85ha holding used for arable cropping and diary heifer rearing.</p> <p>Medium sensitivity to change</p>	<p>Land required: High</p> <p>31.1ha; 37% of holding required for the construction of the Millington cutting, Millington to Liverpool junction, Millington Lane realignment and overbridge, Millington footpath 7/14 accommodation overbridge, A556 Chester Road satellite compound and transfer node, utility diversions and soil stores.</p> <p>Severance: Low</p> <p>Access to severed farmland will be possible using the Millington footpath 7/14 accommodation overbridge.</p> <p>Disruption: Negligible</p> <p>Overall temporary assessment: major/moderate adverse due to the proportion of land required</p>	<p>Land required: High</p> <p>19.1ha; 22% of holding required for the construction of the Millington cutting, Millington to Liverpool junction, Millington Lane realignment and overbridge, Millington footpath 7/14 accommodation overbridge and ecological and landscape mitigation.</p> <p>Severance: Low</p> <p>Access to severed farmland will be available using the Millington footpath 7/14 accommodation overbridge.</p> <p>Infrastructure effects: Negligible</p> <p>Overall permanent assessment: Major/moderate adverse due to the proportion of land required</p>
<p>MA06/8</p> <p>Yarwood Heath Farm including Cherry Tree Farm</p> <p>Managed in hand by Tatton Estate (Marsh Partnership).</p>	<p>Land required: High</p> <p>74.7ha; 25% of holding required for the construction of the Rostherne cutting, Yarwood Heath Farm accommodation access realignment</p>	<p>Land required: Medium</p> <p>30.7ha; 10% of holding required for the Rostherne cutting, Yarwood Heath Farm accommodation access realignment and overbridge, Birkin</p>

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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
<p>300ha arable and forage grassland managed by agricultural contractors. Commercial lets at Cherry Tree Farm.</p> <p>Medium sensitivity to change</p>	<p>and overbridge, Birkin Brook embankment, Ashley infrastructure maintenance base – rail (IMB-R), Rostherne cutting satellite compound and transfer node, Blackburn’s Brook north viaduct west and east satellite compounds, Ashley IMB-R satellite compound and transfer node, utility diversions and soil stores.</p> <p>Severance: Low</p> <p>Access to severed farmland will be possible using the Yarwood Heath Farm accommodation access realignment and overbridge and public highways.</p> <p>Disruption: Negligible</p> <p>Overall temporary assessment: Major/moderate adverse due to the proportion of land required</p>	<p>Brook embankment, Ashley IMB-R, and ecological and landscape mitigation.</p> <p>Severance: Low</p> <p>Access to severed farmland will be possible using the Yarwood Heath Farm accommodation access realignment and overbridge and public highways.</p> <p>Infrastructure effects: High</p> <p>Demolition of commercial properties at Cherry Tree Farm.</p> <p>Overall permanent assessment: Major/moderate adverse due to property demolition at Cherry Tree Farm</p>
<p>MA06/9</p> <p>Bowden View Farm</p> <p>7ha equestrian (commercial) owned by Tatton Estate. Full details of tenancy not disclosed but understood to be coming back into estate management.</p> <p>Commercial livery undertaken.</p> <p>Medium sensitivity to change</p>	<p>Land required: High</p> <p>6.8ha; 97% of holding required for the construction of the Rostherne cutting, Rostherne north cutting, Rostherne west embankment, Rostherne cutting satellite compound and transfer node and soil stores.</p> <p>Severance: High</p> <p>Small pocket of residual farmland inaccessible.</p> <p>Disruption: Low</p> <p>Riding of horses close to construction activities may need to be limited.</p> <p>Overall temporary assessment: Major/moderate adverse due to the proportion of land required and severance</p>	<p>Land required: High</p> <p>4.1ha; 59% of holding required for the Rostherne cutting, Rostherne north cutting, Rostherne west embankment and ecological and landscape mitigation.</p> <p>Severance: Low</p> <p>Holding severed but access to severed land available via farm accommodation track.</p> <p>Infrastructure effects: High</p> <p>Demolition of residential properties and equestrian buildings.</p> <p>Overall permanent assessment: Major/moderate adverse due to the proportion of land required and property demolition</p>
<p>MA06/10</p> <p>Briddon Weir Farm</p> <p>32ha beef and sheep holding owned by Tatton Estate and rented on a Farm Business Tenancy (FBT).</p> <p>Farm shop</p> <p>Medium sensitivity to change</p>	<p>Land required: High</p> <p>14.3ha; 45% of holding required for the construction of the Blackburn’s Brook embankment, Rostherne east box structure, Blackburn’s Brook satellite compound and soil stores.</p> <p>Severance: Negligible</p> <p>Disruption: Negligible</p>	<p>Land required: High</p> <p>12.3ha; 38% of holding required for the Blackburn’s Brook embankment, future Blackburn’s Brook south viaduct foundations, Rostherne east box structure, ecological and landscape mitigation.</p> <p>Severance: Negligible</p> <p>Infrastructure effects: Negligible</p>

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	Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Overall permanent assessment: Major/moderate adverse due to the proportion of land required
MA06/11 Ryecroft Farm* 54ha arable and grassland holding Medium sensitivity to change	Land required: Medium 6ha; 11% of holding required for utility diversion. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/12 Bow Green Farm* 59ha arable and grassland holding Medium sensitivity to change	Land required: Negligible 0.3ha; 1% of holding required for diversion of utility supplies. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Minor adverse	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/13 Birkin Farm 8ha equestrian (commercial) holding owned by Tatton Estate and rented on a rolling Farm Business Tenancy (FBT). Holiday lets Medium sensitivity to change	Land required: High 5.3ha; 66% of holding required for the construction of the Blackburn's Brook north viaduct and soil stores. Severance: Negligible Disruption: Low Riding of horses close to construction activities may need to be limited. Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: High 5.1ha; 64% of holding required for the Blackburn's Brook north viaduct, ecological and landscape mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Major/moderate adverse due to the proportion of land required
MA06/14 Back Lane Farm 105ha dairy holding. Majority (49ha) owned by Tatton Estate rented on an Agricultural Holdings Act (AHA) tenancy; balance includes 16ha rented from the estate on a contract farming agreement and 40ha owner occupied at Castle Hill Farm. Equestrian livery, caravan storage and building lets	Land required: Medium 10.6ha; 10% of holding required for the construction of the Thorns Green embankment, Back Lane accommodation overbridge and soil stores. Severance: Low Access to severed farmland will be possible using the Back Lane accommodation overbridge. Disruption: Negligible	Land required: Low 5.6ha; 5% of holding required for the Thorns Green embankment, Back Lane accommodation overbridge, ecological and landscape mitigation. Severance: Low Access to severed farmland will be possible using the Back Lane accommodation overbridge. Infrastructure effects: Negligible

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High sensitivity to change	Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Overall permanent assessment: Moderate adverse due to the proportion of land required and severance
MA06/15 Birtles Farm* 50ha arable and grassland holding Medium sensitivity to change	Land required: Low 4.3ha; 9% of holding required for utility diversion. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Minor adverse	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/16 Kell House Farm 300ha arable and beef holding. 182ha rented from Tatton Estate on FBT; land also rented from Lower House Farm. Agricultural contracting undertaken Medium sensitivity to change	Land required: Negligible 7.4ha; 2% of holding required for the construction of the Ashley east embankment, Mobberley Road realignment and utility diversions. Severance: Negligible Disruption: Negligible Overall temporary assessment: Negligible	Land required: Negligible 1.7ha; 1% of holding required for the Ashley east embankment, Mobberley Road realignment and ecological and landscape mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/17 Sugar Brook Farm 50ha arable, sheep and free-range poultry holding. Owned by Tatton Estate rented on AHA (45ha) and balance on annual grazing agreement. Bed and Breakfast farm diversification Medium sensitivity to change	Land required: High 35.3ha; 71% of holding required for the construction of the Ashley west and east embankments, Ashley Road diversion, Ashley railhead, the Birkinheath Covert satellite compound, Mobberley Road realignment, Mobberley Road south and north satellite compounds, Public Right of Way (PRoW) and utility diversions, and soil stores. Severance: Negligible Disruption: Low Disruption due to dust possible and extent of works could reduce uptake by Bed and Breakfast customers. Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: High 13ha; 26% of holding required for the Ashley west embankment, Ashley Road diversion, Mobberley Road realignment, ecological and landscape mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Major/moderate adverse due to the proportion of land required
MA06/18 Lower House Farm* 14ha arable and grassland holding Low sensitivity to change	Land required: Medium 1.8ha; 13% of holding required for the construction of the Ashley east embankment and Mobberley Road realignment.	Land required: Medium 1.5ha; 11% of holding required for the Ashley east embankment, Mobberley Road realignment and ecological and landscape mitigation.

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	Severance: Negligible Disruption: Negligible Overall temporary assessment: Minor adverse	Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Minor adverse
MA06/19 Higher Thorns Green Farm 44ha owner occupied Arable and beef holding with commercial equestrian livery (x40) stables. Care farm "Fairfield Farm Project" also provided. Medium sensitivity to change	Land required: High 16.7ha; 38% of holding required for the construction of the Thorns Green embankment, River Bollin south embankment, Brickhill Lane diversion, Castle Mill Lane diversion and satellite compound, utility diversions and soil stores. Severance: Medium Access to severed farmland will be possible along public highways and HS2 access routes but may be compromised during construction. Disruption: Low Activities on the care farm may need careful management whilst construction activities are being undertaken. Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: High 13.3ha; 30% of holding required for the Thorns Green embankment, River Bollin south embankment, Brickhill Lane diversion, Castle Mill Lane diversion, ecological and landscape mitigation. Severance: Medium Land severed accessible via public highways and HS2 access routes. Infrastructure effects: High Demolition of residential properties and agricultural buildings. Overall permanent assessment: Major/moderate adverse due to the proportion of land required and property demolition
MA06/20 Barnshaw Farm* 4.3ha grassland holding Medium sensitivity to change	Land required: High 1.7ha; 40% of holding required for utility diversions. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/21 Waugh Brow Farm* 7ha grassland holding Medium sensitivity to change	Land required: High 3.7ha; 53% of holding required for diversion of utility supplies. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible

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MA06/22 Land at Small Lane, Mobberley (1)* 11ha grassland holding Medium sensitivity to change	Land required: High 3.5ha; 32% of holding required for utility diversions. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/23 Land at Small Lane, Mobberley (2)* 16ha grassland holding Medium sensitivity to change	Land required: High 3.8ha; 24% of holding required for utility diversions. Severance: Low Access to land whilst utility works are undertaken may be compromised. Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/24 Chapel House Farm Owner-occupied 24ha equestrian (non-commercial) Low sensitivity to change	Land required: Low 1.9ha; 8% of holding required for the construction of the Castle Mill Lane realignment, Castle Mill Lane satellite compound and utility diversions. Severance: Negligible Disruption: Low Riding of horses close to construction activities may need to be limited. Overall temporary assessment: Negligible	Land required: Negligible <0.1ha; <1% Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/25 Lower Thorns Green Farm Owner-occupied 3.5ha grassland paddock. Low sensitivity to change	Land required: Medium 0.6ha; 17% of holding required for the construction of the Castle Mill Lane realignment. Severance: Negligible Disruption: Negligible Overall temporary assessment: Minor adverse	Land required: Low 0.2ha; 6% of holding required for the Castle Mill Lane realignment and landscape mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Negligible
MA06/26 Hale Bank Farm * 21ha grassland holding	Land required: High 20.4ha; 97% of holding required for the construction of the River Bollin	Land required: High 17.2ha; 82% of holding required for the River Bollin north embankment,

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Medium sensitivity to change	north embankment, Halebank cutting, Sunbank Lane realignment, River Bollin east satellite compound, Sunbank Lane satellite compound and transfer node, PRoW and utility diversions and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Halebank cutting, Sunbank Lane realignment, PRoW diversions and ecological mitigation. Severance: Negligible Infrastructure effects: High Demolition of residential properties and agricultural buildings. Overall permanent assessment: Major/moderate adverse due to the proportion of land required and property demolition
MA06/27 Higher Doles Farm* 2.3ha grassland holding Low sensitivity to change	Land required: High 0.6ha; 26% of holding required for the construction of a balancing pond and turning head. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: Medium 0.3ha; 13% of holding required for a balancing pond and turning head. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Minor adverse
MA06/28 Land at Hale Barns Owner-occupied 16ha grassland holding use for hay/haylage production. Low sensitivity to change	Land required: High 14.5ha; 91% of holding required for the M56 east satellite compound and transfer node, Manchester Airport High Speed station north satellite compound, utility diversions and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: High 9ha; 56% of holding required for the Manchester Airport High Speed station cutting and ecological mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA06/29 Land at Warburton Green * 5ha grassland holding. Low sensitivity to change	Land required: High 2ha; 40% of holding required for the Manchester Airport High Speed station cutting. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: High 1.3ha; 26% of holding required for the Manchester Airport High Speed station cutting, landscape and ecological mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA06/30 Land west of A538 Hale Road, Hale * 7.4ha grassland holding. Low sensitivity to change	Land required: High 7.4ha; 100% of holding required for the Manchester Airport High Speed station cutting, M56 east satellite	Land required: High 4.9ha; 66% of holding required for the Manchester Airport High Speed station cutting and landscape and ecological mitigation.

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	compound and transfer node and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA06/31 Land east of A538 Hale Road, Hale* 8ha grassland holding. Low sensitivity to change	Land required: High 7.7ha; 96% of holding required for the Manchester Airport High Speed station, Hasty Lane diversion, Manchester Airport High Speed station satellite compound and transfer node, utility diversions and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: High 7.5ha; 94% of holding required for the Manchester Airport High Speed station cutting, landscape and ecological mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA06/32 Land at Checkley Hall* 1.6ha grassland holding. Low sensitivity to change	Land required: High 1.6ha; 100% of holding required for the Manchester Airport High Speed station, Hasty Lane diversion, Manchester Airport High Speed station satellite compound and transfer node, utility diversions and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: High 1.6ha; 100% of holding required for the Manchester Airport High Speed station. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA06/33 Land at Ash Farm* 108ha grassland holding Medium sensitivity to change	Land required: Low 10.6ha; 10% of holding required for the Manchester Airport High Speed station and retaining wall, access roads, Manchester tunnel south portal main compound and transfer node and utility diversions. Severance: Negligible Disruption: Negligible Overall temporary assessment: Minor adverse	Land required: Low 7.2ha; 7% of holding required for the Manchester Airport High Speed station and retaining wall, landscape and ecological mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Minor adverse
MA06/34 Land at Davenport Green* 26ha grassland holding	Land required: High 13.9ha; 53% of holding required for the Manchester Airport High Speed	Land required: Medium 3.2ha; 12% of holding required for the Manchester Airport High Speed

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 Agriculture, forestry and soils assessment

Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
Low sensitivity to change	station and retaining wall, access roads and the Manchester tunnel south portal main compound and transfer node. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	station and retaining wall and ecological mitigation. Severance: Negligible Infrastructure effects: Negligible Overall permanent assessment: Minor adverse

** It has not been possible to arrange farm impact assessment interviews with these holdings. Publicly available sources have been used to obtain the information presented.*

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