

# High Speed Rail (West Midlands - Crewe)

## Environmental Statement

### Volume 5: Technical appendices

CA5: South Cheshire

Agriculture, forestry and soils data (AG-001-005)



# High Speed Rail (West Midlands - Crewe)

## Environmental Statement

Volume 5: Technical appendices

CA5: South Cheshire

Agriculture, forestry and soils data (AG-001-005)



## 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.

High Speed Two (HS2) Limited,  
Two Snowhill  
Snow Hill Queensway  
Birmingham B4 6GA

Telephone: 08081 434 434

General email enquiries: [HS2enquiries@hs2.org.uk](mailto:HS2enquiries@hs2.org.uk)

Website: [www.gov.uk/hs2](http://www.gov.uk/hs2)

A report prepared for High Speed Two (HS2) Limited:

ARUP



ERM

High Speed Two (HS2) Limited has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the HS2 website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard, please contact High Speed Two (HS2) Limited.

© High Speed Two (HS2) Limited, 2017, except where otherwise stated.

Copyright in the typographical arrangement rests with High Speed Two (HS2) Limited.

This information is licensed under the Open Government Licence v2.0. To view this licence, visit [www.nationalarchives.gov.uk/doc/open-government-licence/version/2](http://www.nationalarchives.gov.uk/doc/open-government-licence/version/2) **OGL** or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or e-mail: [psi@nationalarchives.gsi.gov.uk](mailto:psi@nationalarchives.gsi.gov.uk). Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.



Printed in Great Britain on paper containing at least 75% recycled fibre.

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Soils and agricultural land classification surveys</b>	<b>2</b>
2.1	Background	2
2.2	Soils and land resources	3
2.3	Topography and drainage	3
2.4	Geology and soil parent materials	3
2.5	Description and distribution of soil types	4
2.6	Soil and land use interactions	8
<b>3</b>	<b>Forestry</b>	<b>14</b>
<b>4</b>	<b>Assessment of effects on holdings</b>	<b>15</b>
<b>5</b>	<b>References</b>	<b>21</b>

## List of figures

Figure 1: Newport 1, Clifton and Blackwood soil associations in a landscape context	5
Figure 2: Predominant soil series profile descriptions	7
Figure 3: Methodology for calculating the severity of a droughtiness limitation to ALC grading	11

## List of tables

Table 1: Bedrock and soil forming materials	3
Table 2: Soil associations	4
Table 3: Dominant soil series	6
Table 4: Interpolated agro-climatic data	9
Table 5: ALC grade according to soil wetness – mineral soils	10
Table 6: Area of woodland within the study area and construction boundary	14
Table 7: Summary of assessment of effect on holdings	15



# 1 Introduction

1.1.1 This document is the agriculture, forestry and soils assessment Appendix for the South Cheshire community area (CA5), and comprises:

- soils and agricultural land classification surveys (Section 2);
- forestry (Section 3); and
- farm holding impact assessment summaries (Section 4).

1.1.2 Maps referred to throughout this agriculture, forestry and soils Appendix are contained in the Volume 5, Agriculture, Forestry and Soils Map Book.

## 2 Soils and agricultural land classification surveys

### 2.1 Background

- 2.1.1 The soils and agricultural baseline conditions reported have been established from desktop studies and site surveys.
- 2.1.2 Information gathered by desktop studies has related 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 Map;<sup>1</sup>
  - Soils and Their Use in Midland and Western England;<sup>2</sup>
  - solid and superficial deposits from the Geology of Britain viewer;<sup>3</sup>
  - Gridpoint meteorological data for Agricultural Land Classification of England and Wales;<sup>4</sup>
  - Provisional Agricultural Land Classification of England and Wales (1:250,000);<sup>5</sup>
  - Likelihood of Best and Most Versatile Agricultural Land (1:250,000);<sup>6</sup>
  - agri-environment schemes;<sup>7</sup>
  - aerial photography from Google Earth; and
  - on-site soil and Agricultural Land Classification surveys.
- 2.1.3 Information gathered by field survey has related to the enhancement of desk-based information on soils and agricultural land quality, and the engagement with landowners and tenants to establish the nature and extent of agricultural, forestry and related rural enterprises.
- 2.1.4 Where the collection of agricultural site information has enabled a review/refinement of published information, this was undertaken in accordance the methodology prescribed by Ministry of Agriculture, Fisheries and Food (MAFF)<sup>8</sup>.
- 2.1.5 Information obtained from farm impact assessment interview surveys has been taken as a factual representation of local agricultural and forestry interests and has not been subject to further verification.

<sup>1</sup> Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*, Cranfield University: National Soil Resources Institute

<sup>2</sup> Soil Survey of England and Wales (1984), *Soils and Their Use in Midland and Western England*. Harpenden

<sup>3</sup> British Geological Survey, <http://bgwww.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>

<sup>4</sup> Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*

<sup>5</sup> Ministry of Agriculture, Fisheries and Food (1983), *Agricultural Land Classification of England and Wales (1:250,000)*

<sup>6</sup> Department for Environment, Food and Rural Affairs (2005), *Likelihood of Best and Most Versatile Agricultural Land (1:250,000)*

<sup>7</sup> Multi-Agency Geographical Information for the Countryside (MAGIC), [www.magic.gov.uk](http://www.magic.gov.uk)

<sup>8</sup> Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*

## 2.2 Soils and land resources

- 2.2.1 This part of the technical appendix describes the findings of a desktop study and targeted soil survey and Agricultural Land Classification (ALC) survey that identified existing soil and agricultural land resources in the study area.
- 2.2.2 The location and extent of different soil types and agricultural land in the different ALC grades are influenced by topography and drainage, and by geology and soil parent materials, which are described in turn in the following sections. This section then provides a description and distribution of the main soil types encountered along the study corridor.

## 2.3 Topography and drainage

- 2.3.1 Topography of the area has been influenced by fluvial and glacial processes acting on the underlying mudstone and halite. In the south of the area between Wrinehill and west of Betley, the land forms a series of uneven ridges, into which shallow valleys are cut. The altitude is between around 90m and 80m above Ordnance Datum (AOD). Topography in the north is low-lying and forms a broad plain with a very shallow fall from around 65m AOD at Chorlton to 50m AOD south of Crewe.
- 2.3.2 Drainage is via five significant water courses: River Lea, Checkley Brook, Mere Gutter, Swill Brook and Basford Brook. River Lea is the most southerly and originates in the hills to the south east of Onneley before flowing north and then west towards the Proposed Scheme. Checkley Brook originates in the hills south-west of Keele and flows in a generally north-westerly direction to the Proposed Scheme. The source of Mere Gutter is at Wrinehill, from where it drains the land northward until it converges with Basford Brook at Weston. Swill Brook is aligned north to south and runs through Chorlton and north-west beyond Shavington.
- 2.3.3 The low-lying land associated with River Lea, Checkley Brook, Mere Gutter and Swill Brook is considered at risk of flooding.

## 2.4 Geology and soil parent materials

- 2.4.1 In the south and north of the area the Proposed Scheme passes through bedrock geology of Triassic mudstone and siltstone of the Sidmouth Mudstone Formation. The two areas of mudstone are separated by the late-Triassic Wilkesley Halite Member.
- 2.4.2 A list of geological strata occurring within the study area is provided in age order in Table 1 and shown on Map WR-02-205 (Volume 5, Water Resources and Flood Risk Map Book).

Table 1: Bedrock and soil forming materials

Formation	Composition/soil parent material
Sidmouth Mudstone	Mudstone and siltstone
Wilkesley Halite	Halite (rock salt) with partings of mudstone

- 2.4.3 The Proposed Scheme passes through the following superficial deposits:
- alluvium, associated with the five water courses and comprising predominantly silty clay, but also with clay, silt, sand, peat and gravel;

- peat deposits associated with Mere Gutter and also Basford Brook at Weston;
- glaciofluvial deposits covering the ridges and slopes at Whitmore and extending northward to Basford and Weston. These deposits include sands and gravels; and
- glacial till, extending from west of Wrinehill to Chorlton, to the north of West Heath and from Basford to Crewe. These deposits may include a range of unsorted material ranging in size from clay to boulders.

## 2.5 Description and distribution of soil types

2.5.1 The characteristics of the soils are described by the Soil Survey of England and Wales bulletin that accompanies the National Soil Map. The soils are grouped into soil associations of a range of soil types (soil series) and are summarised in Table 2 and their distribution is shown on Map AG-02-105 (Volume 5, Agriculture, forestry and soils Map Book).

Table 2: Soil associations

Soil association <sup>9</sup> : code shown on map AG-02-105	Soil association: name	Description	Wetness class <sup>10</sup>
541r	Wick 1	Deep well drained sandy loam and sandy soils, locally over gravel; some similar soils affected by groundwater	I-II
551d	Newport 1	Deep well drained sandy and coarse loamy soils, some affected by groundwater.	I
711n	Clifton	Slowly permeable, seasonally waterlogged clay loam and sandy clay loam.	III-IV
712f	Crewe	Slowly permeable seasonally waterlogged reddish clayey and fine loamy over clayey soils, often stoneless.	IV
821b	Blackwood	Deep permeable sandy and coarse loamy soils, affected by fluctuating groundwater.	III-IV

2.5.2 The National Soil Map shows the following five soil associations in the study area:

- the Wick 1 association extends across the slopes from Wrinehill to Chorlton and comprises well drained sandy loams and sands, locally developed over gravel;
- Clifton soils extending across shallow slopes and level land from the south-east of Blakenhall to south-east of Hough. Clifton soils are mostly of clay loam or sandy clay loam and are seasonally waterlogged;
- the Blackwood association occupies largely level, low-lying land between Hough and Shavington and comprise loamy sand overlying sand at depth;

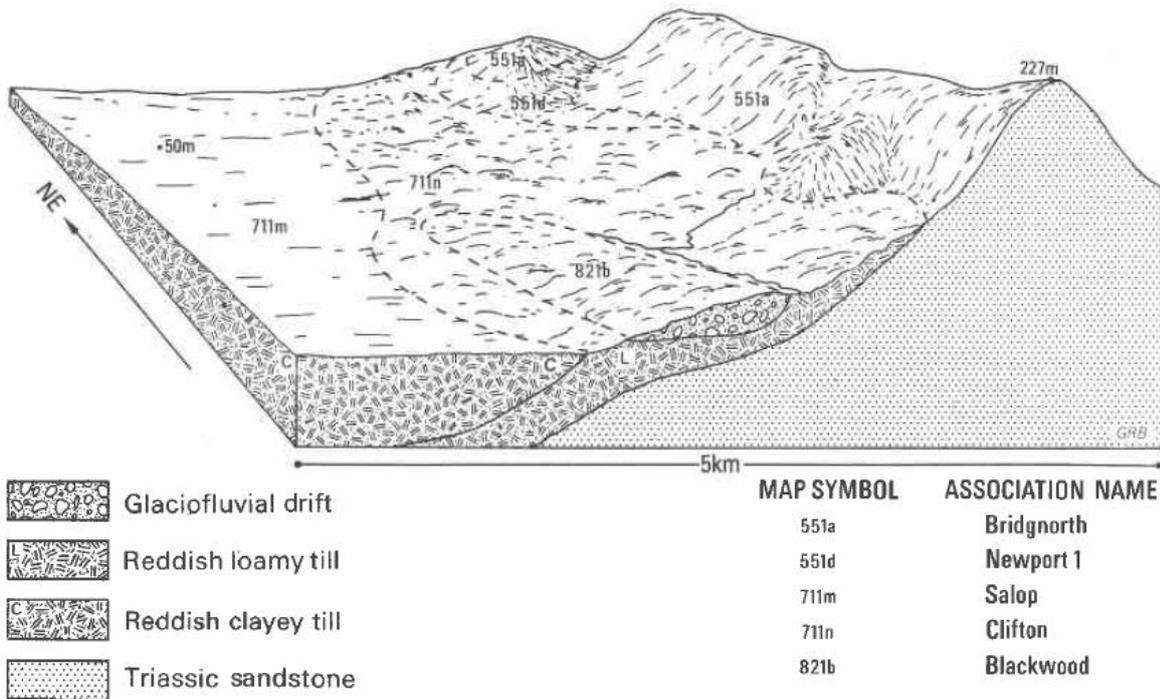
<sup>9</sup> Cranfield University (2017), <http://www.landis.org.uk/data/nsi.cfm>

<sup>10</sup> The Wetness Class (WC) of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained

- Newport 1 soils are present across the north of Shavington and east of Hough and typically include sandy loam topsoils over sand; and
- the Crewe association is present to the south of Crewe across low-lying land and includes clay loam or clay topsoils over clay.

2.5.3 Soils of the Newport 1, Clifton and Blackwood associations<sup>9</sup> are shown in a landscape context in Figure 1.

Figure 1: Newport 1, Clifton and Blackwood soil associations in a landscape context<sup>9</sup>



2.5.4 A detailed description is available for the predominant soil series of the Clifton association, and is given in Table 3.

## Appendix AG-001-005

Table 3: Dominant soil series

---

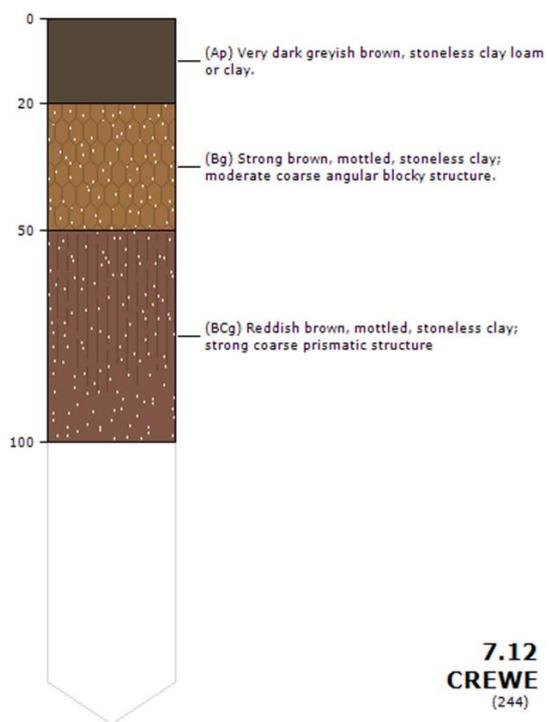
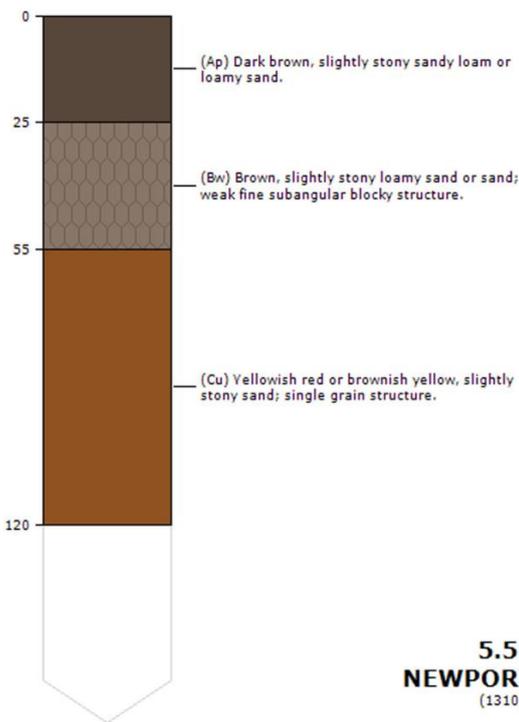
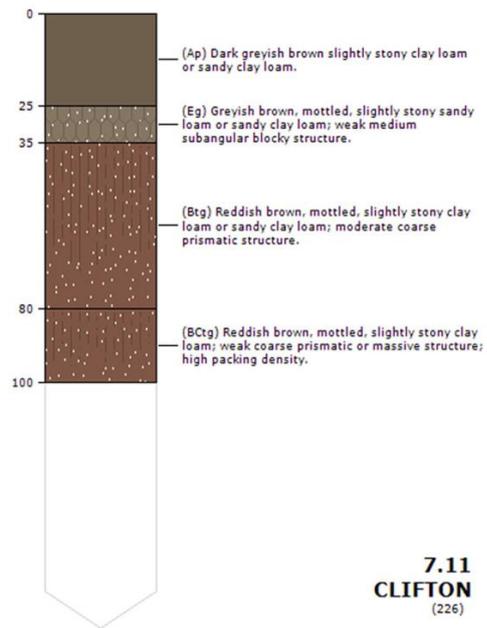
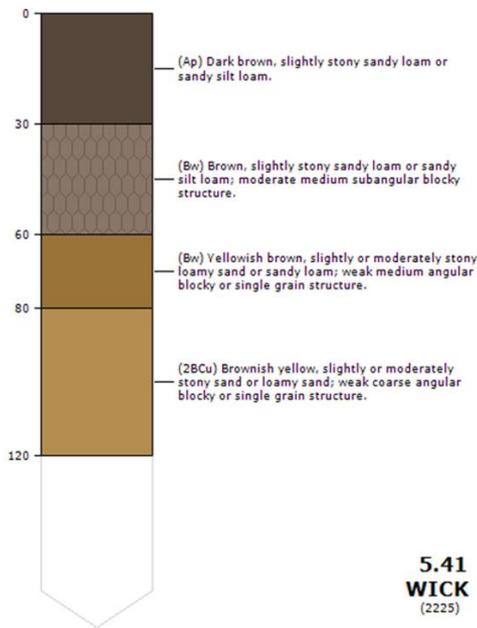
<b>Clifton series</b>
0 – 23cm, Dark greyish brown (10YR4/2 <sup>11</sup> ) slightly stony sandy clay loam; large rounded, quartzite; moist; strongly developed coarse subangular blocky; high packing density; moderately firm soil and ped strength; many fine fibrous roots; non-calcareous; sharp wavy boundary.
23 - 37cm, Light grey to grey (10YR6/1) slightly stony sandy loam with many fine yellowish brown (10YR5/6) mottles; large rounded, quartzite; moist; weakly developed, adherent medium subangular blocky; high packing density; moderately firm soil and ped strength; common very fine fibrous roots; non-calcareous; few irregular ferri-manganiferous nodules; abrupt wavy boundary.
37 - 86cm, Reddish brown (5YR4/4) slightly stony clay loam with common fine light grey to grey (10YR6/1) and strong brown (7.5YR5/6) mottles; large rounded quartzite; moist; strongly developed very coarse prismatic with greyish brown (10YR5/2) faces; high packing density; very firm soil strength; few very fine fibrous roots; non-calcareous; many clay coats; gradual smooth boundary.
86 - 107cm, Reddish brown (2.5YR4/4) slightly stony clay loam with common medium grey (N5/0) mottles; medium rounded, quartzite; moist; massive; high packing density; moderately strong ped strength; common clay coats

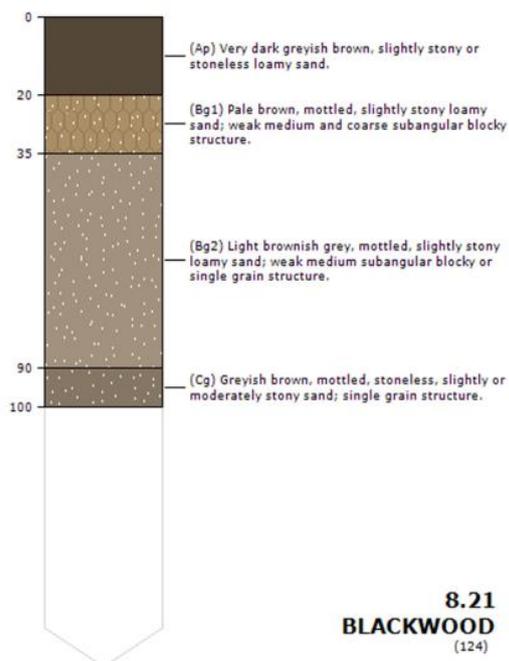
---

<sup>11</sup> Notations according to the Munsell Soil Color Book (2009). In this example, 10YR is the hue; 4/2 is the value/chroma

2.5.5 Typical soil profiles of the main series of each association<sup>9</sup> are depicted and described in Figure 2.

Figure 2: Predominant soil series profile descriptions





## 2.6 Soil and land use interactions

### Agricultural land quality

- 2.6.1 A review of available ALC information has been undertaken to ascertain the land quality within the study area. The review sought to identify the extent of any existing, detailed post-1988 ALC information to ensure that surveys are not repeated unnecessarily. Detailed ALC survey data is available for land to the east of Chorlton, to the north of Shavington and south of Crewe<sup>12,13,14,15</sup>. The assessment has been supplemented using archived Soil Survey records obtained from the National Soil Resources Institute (NSRI) at Cranfield University and with detailed soil surveys undertaken in 2016 specifically for the purpose of this assessment.

### Detailed agricultural land classification

- 2.6.2 Archived auger bores from the NSRI were obtained and used for reference in this ALC assessment. Additional field surveys were undertaken to the west of Wrinehill.
- 2.6.3 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.
- 2.6.4 During the detailed soil survey, soil profiles were examined using an Edelman (Dutch) auger and a spade. At each observation point the following characteristics were

<sup>12</sup> MAFF (1988), *Report of the MAFF Agricultural Land Classification Survey (1988) - Weston Hall*

<sup>13</sup> MAFF (1989), *Soil Notes for Nantwich and Crewe Local Plan, Area 1*

<sup>14</sup> MAFF (1990), *Soil Notes for Nantwich and Crewe Local Plan, Area 2*

<sup>15</sup> MAFF (1999), *Crewe and Nantwich Local Plan First Replacement: Land at Weston. 044/98&25/RPT/0864*

assessed for each soil horizon up to a maximum of 120cm where possible, or to any impenetrable layer:

- soil texture;
- significant stoniness;
- colour (including local gley and mottle colours);
- consistency;
- structural condition;
- free carbonate; and
- depth.

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

### Agro-climatic limitations

2.6.6 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 in Table 4. There is little variation across the study area. Average annual rainfall is from 747 to 768mm, increasing with altitude. Median Field Capacity Days (FCDs) are from 172 to 180 days. Moisture deficits are 90-94mm for wheat and 70-83mm for potatoes, with the highest value occurring on the lowest ground.

Table 4: Interpolated agro-climatic data

Agro-climatic parameter	SJ738478 Wrinehill	SJ731489 Chorlton	SJ715530 Crewe
Altitude (AOD)	75 m	75m	55m
Average annual rainfall	768mm	763mm	747mm
Accumulated temperature >0°C <sup>16</sup>	1,383 day°	1,383 day°	1,405 day°
Field capacity days (FCD)	180 days	178 days	172 days
Average moisture deficit, wheat	90mm	91mm	94mm
Average moisture deficit, potatoes	70mm	78mm	83mm

<sup>16</sup> 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)

## Appendix AG-001-005

- 2.6.7 Climate itself does 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.
- 2.6.8 The influence of climate on soil wetness is assessed by reference to median FCDs (when the soil moisture deficit is zero), soil WC and topsoil texture. The ALC grade according to soil wetness is then determined by following the methodology set out in the ALC Guidelines<sup>8</sup> and the information in Table 5.

Table 5: ALC grade according to soil wetness – mineral soils

Wetness class	Texture of the top 25cm	Field Capacity Days				
		<126	126-150	151-175	176-225	>225
I	Sand (S) Loamy Sand (LS) Sandy Loam (SL) Sandy Silt Loam (SZL)	1	1	1	1	2
	Silty Loam (ZL) Medium Silty Clay Loam (MZCL) Medium Clay Loam (MCL) Sandy Clay Loam (SCL)	1	1	1	2	3a
	Heavy Silty Clay Loam (HZCL) Heavy Clay Loam (HCL)	2	2	2	3a	3b
	Sandy Clay (SC) Silty Clay (ZC) Clay (C)	3a (2)	3a (2)	3a	3b	3b
II	S LS SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a (2)	3a (2)	3a	3a	3b
	SC ZC C	3a (2)	3b (3a)	3b	3b	3b
III	S LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a (2)	3a (2)	3a	3a	3b
	HZCL HCL	3b (3a)	3b (3a)	3b	3b	4
	SC ZC C	3b (3a)	3b (3a)	3b	4	4
IV	S LS SL SZL	3a	3a	3a	3b	3b
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5

Notes. From Table 6 of ALC Guidelines<sup>8</sup>

For naturally calcareous soils with more than 1% calcium carbonate (CaCO<sub>3</sub>) and between 18% and 50% clay in the top 25cm, the grade, where different from that of other soils, is shown in brackets.

Sand (S) topsoil is not eligible for Grades 1,2 or 3a.

Loamy sand (LS) topsoil is not eligible for Grade 1.

- 2.6.9 Soil droughtiness is determined by comparing crop-adjusted available water (AP), with the moisture deficit (MD) for the locality for wheat and potatoes (MAFF

Appendix 4)<sup>8</sup>. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs. The calculation used in the ALC Guidelines to determine the severity of this limitation is given below in Figure 3.

Figure 3: Methodology for calculating the severity of a droughtiness limitation to ALC grading

$$AP \text{ wheat (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{50}) + \sum (EA_{vs} \times LT_{50-120})}{10}$$

where

TA<sub>vt</sub> is Total available water (TA<sub>v</sub>) for the topsoil texture

TA<sub>vs</sub> is Total available water (TA<sub>v</sub>) for each subsoil layer

EA<sub>vs</sub> is Easily available water (EA<sub>v</sub>) for each subsoil layer

LT<sub>t</sub> is thickness (cm) of topsoil layer

LT<sub>50</sub> is thickness (cm) of each subsoil layer to 50 cm depth

LT<sub>50-120</sub> is thickness (cm) of each subsoil layer between 50 and 120 cm depth

Σ means 'sum of'.

$$AP \text{ potatoes (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{70})}{10}$$

where

LT<sub>70</sub> is thickness (cm) of each subsoil layer to 70 cm depth

**MB (Wheat) = AP (Wheat) - MD (Wheat)**

**MB (Potatoes) = AP (Potatoes) - MD (Potatoes)**

Where

MB is the Moisture Balance

AP is the Crop-adjusted available water capacity

MD is the moisture deficit, as determined by the agro-climatic assessment.

#### Grade according to droughtiness

Grade/ Subgrade	Moisture Balance limits (mm)		
	<i>wheat</i>		<i>potatoes</i>
1	+30	<i>and</i>	+10
2	+5	<i>and</i>	-10
3a	-20	<i>and</i>	-30
3b	-50	<i>and</i>	-55
4	<-50	<i>or</i>	<-55

## Site limitations

- 2.6.10 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. Gradient and microrelief are limiting to agricultural land quality in the vicinity of Wrinehill. The valley slopes are in places very steep and limit land quality as severely as to Grade 5 where slopes exceeding 18 degrees were measured. Slopes exceeding 7 degrees were also measured in the vicinity of Chorlton and Weston, limiting land to Subgrade 3b.
- 2.6.11 Flood risk is limiting to agricultural land quality throughout the area across low-lying land associated with the River Lea, Checkley Brook, Mere Gutter and Swill Brook. Land associated with the Mere Gutter has been assessed as Subgrade 3b due to flooding and peaty profiles. Other land affected by flood risk may be of Grade 4 or Subgrade 3b. This is a potential limitation but its incidence and severity is difficult to ascertain. Flood risk is determined by the extent, duration, frequency and timing of flooding events which may not have been recorded.

## Soil limitations

- 2.6.12 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:
- light loamy and sandy textures which are well drained;
  - coarse loamy profiles affected by fluctuating groundwater; and
  - loamy over clayey textures, commonly with poor subsoil structure and slow permeability.
- 2.6.13 Soil depth and chemical limitations are not encountered in this study area.

## Interactive limitations

- 2.6.14 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 Table 6 of the MAFF ALC guidelines (as detailed in Table 5).
- 2.6.15 Light loamy and sandy soils of the Wick 1 and Newport associations are most affected by soil droughtiness. The severity of limitation is determined by factors such as topsoil texture and stone content. As crop moisture deficits are moderate to moderately small, droughtiness limitations are mostly slight to Grade 2.
- 2.6.16 The presence of this soil type is confirmed throughout the north of the study area in detailed surveys undertaken by MAFF<sup>12,13,14,15</sup> and in the north and south in NSRI profile data. The NSRI data identifies an average topsoil thickness of 35cm, and the MAFF data shows a range of 20cm to 58cm. The topsoil texture is consistently of sandy loam and overlies sandy loam or loamy sand, commonly with sand at variable

depth. Much of the land is limited to Grade 2, though where the subsoil sand component is greater the droughtiness limitation is slightly more severe, to Subgrade 3a.

- 2.6.17 Soil profiles comparable with the Blackwood association have been identified at Weston. The profiles have sandy loam or sandy clay loam topsoil, with sand upper subsoil and overlying clay, or directly over peat. Gleying and restricted drainage evidenced by topographic position results in an assessment of WC IV and the profiles are limited to Subgrade 3b.
- 2.6.18 The medium loamy over clayey soils of the Clifton and Crewe associations are also identified throughout the study area. The detailed surveys undertaken as part of this assessment at Wrinehill identify a 32cm thick topsoil layer of sandy clay loam or clay loam. Subsoil is predominantly of clay though sandy clay loam and sandy clay are also observed. The subsoils are slowly permeable and the profiles of WC IV.
- 2.6.19 Similar profiles are also identified in the MAFF survey data and in the NSRI profile data and are of WC III or IV depending upon the depths to gleying and slowly permeable layers. Soils of WC III are limited by wetness and workability to Subgrade 3a where the topsoil texture is medium or sandy clay loam, or more severely to Subgrade 3b where the topsoil texture is of heavy clay loam.
- 2.6.20 Soil profiles of WC IV with medium or sandy clay loam topsoil are of Subgrade 3b, whilst those with heavier topsoils are of Grade 4.

## 3 Forestry

- 3.1.1 Assessment of forestry resources has primarily had regard to the National Forestry Inventory<sup>17</sup> and its predecessor, the National Inventory of Woodland and Trees<sup>18</sup>, and to data collected from landowners and tenants in the farm impact assessments.
- 3.1.2 The area of woodland within a 4km wide corridor (2km either side of the route centre line of the Proposed Scheme) has been determined using GIS, and is shown in Table 6.
- 3.1.3 Woodland is found predominantly around Blakenhall, with Blakenhall Moss and Checkley Wood being the largest woodlands of note. The rest of the study area has limited woodland with only Burrow Coppice at Weston being the only other substantial area. Checkley Wood is managed as part of the pheasant shooting enterprise known as Checkley Wood Shoot.

Table 6: Area of woodland within the study area and construction boundary

	Area of woodland within 2km either side of centreline		Woodland permanently required	
	ha	%	ha	%
Ancient woodland	55.5	21	0.0	0
Broadleaved	162.9	62	6.4	100
Coniferous	22.2	9	0.0	0
Other	21.4	8	0.0	0
Total woodland	262.0	100	6.4	100
Woodland as % of total land within 2km either side of centreline		10.0		

<sup>17</sup> Forestry Commission, National Forest Inventory. <https://www.forestry.gov.uk/inventory>

<sup>18</sup> Forestry Commission, National Inventory of Woodland and Trees. <https://www.forestry.gov.uk/fr/infd-86xc6c>

## 4 Assessment of effects on holdings

4.1.1 The effects on farm holdings have been assessed according to the methodology set out in the Phase 2a Scope and Methodology Report (SMR) and the SMR Addendum which are set out in Volume 5: Appendix CT-001-001 and Appendix CT-001-002. A summary of the assessment is provided in Table 7. The nature of impacts considered comprises the temporary and permanent land required from the holding, the temporary and permanent severance of land, the permanent loss of key farm infrastructure and the imposition of disruptive effects (particularly noise and dust) on land uses and the holding's operations. These impacts occur primarily during the construction phase of the Proposed Scheme.

Table 7: Summary of assessment of effect on holdings

Holding reference, name and description	Temporary effects	Permanent effects
<p>CA5/1</p> <p>Grange Farm</p> <p>Owner-occupied</p> <p>372ha poultry and arable farm. 621,000 laying hens in enriched cages. Poultry business a large employer with 40 associated jobs.</p> <p>Arable farming on land surrounding Grange Farm and at Ley grounds.</p> <p>Agricultural land is used by Checkley Wood Shoot.</p>	<p>Land required: Medium</p> <p>46.8ha; 13% of holding required for construction.</p> <p>Agricultural land required from a single block north and south of Checkley Lane for construction compounds, stockpile, haul road and borrow pit north of Checkley Lane.</p> <p>Severance: High</p> <p>Construction would sever a large area of land between Checkley Brook and Checkley Lane with no access available.</p> <p>Disruptive effects: Low</p> <p>Potential for noise and dust arising from construction to affect the operation of the poultry enterprise.</p>	<p>Land required: Negligible</p> <p>17.7ha; 5% of holding required.</p> <p>Agricultural land required from a single block north and south of Checkley Lane for HS2 main line, north and southbound West Coast Mainline (WCML) connection spurs, Checkley Lane realignment and landscape mitigation planting and habitat creation.</p> <p>Severance: Low</p> <p>Although access to severed land requires use of Checkley Lane, highway use is limited reducing severance impact to low: access to severed land to be provided via private way.</p> <p>Infrastructure: Negligible</p>
<p>CA5/2</p> <p>Lower Den Farm</p> <p>Owner-occupied, small area rented under a Farm Business Tenancy (FBT) agreement.</p> <p>258ha Dairy, beef and arable farm. Approximately 200-cow milking herd plus replacements. Beef herd comprises a 50-cow suckler herd and 100 finishers from the dairy herd. Approximately 115ha in arable production.</p> <p>Diversification includes a wind turbine and four telephone masts.</p> <p>Agricultural land is used by Checkley Wood Shoot.</p> <p>Land in Entry Level Stewardship (ELS) and Higher Level Stewardship (HLS) (grazing with rare breeds- off route).</p>	<p>Land required: High</p> <p>90.8ha; 35% of holding required for construction.</p> <p>Agricultural land required from two blocks: an area between Checkley Lane and Den Lane for general construction works, haul road and borrow pit north of Checkley Lane; and an area either side of the WCML for connection works to WCML, haul roads, Blakenhall Cutting satellite compounds and stockpile.</p> <p>Severance: Medium</p> <p>Access required via public highway to severed land.</p> <p>Disruptive effects: Medium</p> <p>Demolition and subsequent reconstruction construction of the Blakenhall Bridleway 8 accommodation overbridge over the WCML directly adjacent to the farm yard, and use of the main farm access for haul traffic would affect daily operations at the holding.</p>	<p>Land required: Medium</p> <p>32.0ha; 12% of holding required.</p> <p>Agricultural land required from two blocks: an area between Checkley Lane and Den Lane for HS2 main line, southbound WCML connection spur, balancing ponds, landscape mitigation planting and habitat creation, and an area north of Den Lane for HS2 main line and southbound WCML connection spur, balancing pond, landscape mitigation planting, access tracks and Blakenhall Bridleway 8 accommodation overbridge.</p> <p>Severance: Low</p> <p>Access to severed land to be provided via private way.</p> <p>Infrastructure: Negligible</p>

Appendix AG-001-005

Holding reference, name and description	Temporary effects	Permanent effects
<p>CA5/3</p> <p>Ash Tree Farm</p> <p>Owner-occupied</p> <p>201ha dairy and arable farm. Approximately 250-cow milking herd plus replacements. Approximately 25ha in arable production.</p> <p>Agricultural land is used by Checkley Wood Shoot.</p> <p>Land in ELS</p>	<p>Land required: Medium</p> <p>28.8ha; 14% of holding required for construction.</p> <p>Agricultural land required from a single block south of Mill Lane for construction works, Blakenhall Northbound spur satellite compound and stockpile, haul roads and works to raise overhead National Grid power lines.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Low</p> <p>Loss of large area of grazing block would have an effect on the operation of the holding.</p>	<p>Land required: Low</p> <p>11.4ha; 6% of holding required.</p> <p>Agricultural land required from a single block south of Mill Lane for HS2 main line and northbound WCML connection spur and landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/4*</p> <p>Land at Higher Den Farm</p> <p>1ha grassland used to graze horses (non-commercial).</p>	<p>Land required: High</p> <p>0.4ha; 41% of holding required for construction.</p> <p>Agricultural land required from a single block south of Den Lane for construction works.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: High</p> <p>0.4ha; 41% of holding required.</p> <p>Agricultural land required from a single block south of Den Lane for landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/5</p> <p>Oakhanger Hall</p> <p>Owner-occupied, and FBT agreements</p> <p>304ha dairy and arable farm. 430-cow milking herd (housed) plus replacements. Land at Gonsley Green and Sutch Farm used to graze young stock and dry cows.</p> <p>Agricultural land is used by Checkley Wood Shoot.</p> <p>Land in ELS</p>	<p>Land required: High</p> <p>108.4ha; 36% of holding required for construction.</p> <p>Agricultural land required from three blocks: an area between Wrinehill Road and the WCML for general construction works, haul roads, construction compounds and stockpile; an area between Newcastle Road and Weston Lane for haul road, Crewe south portal satellite compound, and stockpile; and an area north of Larch Avenue for Basford Cutting transfer node.</p> <p>Severance: High</p> <p>Construction would sever a large area of land west of Chorlton Lane with no access available.</p> <p>Disruptive effects: Medium. During the construction period the holding would need to make a number of changes to daily operation.</p>	<p>Land required: Medium</p> <p>58.4ha; 19% of holding required.</p> <p>Agricultural land required from two blocks: an area between Wrinehill Road and the WCML for HS2 main line, northbound and southbound WCML connection spurs, realigned WCML down slow and extended freight lines, balancing ponds, landscape mitigation planting and habitat creation; and an area between Newcastle Road and Weston Lane for balancing pond and landscape mitigation planting and habitat creation.</p> <p>Severance: Low</p> <p>Access to severed land to be provided via private way.</p> <p>Infrastructure: Negligible</p>
<p>CA5/6</p> <p>1 Gonsley Farm Barns</p> <p>1.2ha grassland used to graze horses (non-commercial).</p>	<p>Land required: Medium</p> <p>0.2ha; 17% of holding required for construction.</p> <p>Agricultural land required from a single block east of Wrinehill Road for construction works.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Medium</p> <p>Construction noise could prevent use of equestrian facilities by nervous horses.</p>	<p>Land required: Low</p> <p>0.1ha; 8% of holding required.</p> <p>Agricultural land required from a single block east of Wrinehill Road for landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>

Appendix AG-001-005

Holding reference, name and description	Temporary effects	Permanent effects
<p>CA5/7</p> <p>2 Gonsley Farm Barns</p> <p>1.4ha grassland used to graze horses (non-commercial).</p>	<p>Land required: High</p> <p>1.4ha; 100% of holding required for construction.</p> <p>Agricultural land required from a single block of land east of Wrinehill Road for construction works.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: High</p> <p>0.6ha; 43% of holding required.</p> <p>Agricultural land required from a single block of land east of Wrinehill Road for landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/8*</p> <p>Rose Hill Farm</p> <p>52ha beef and arable farm</p>	<p>Land required: Negligible</p> <p>0.7ha; 1% of holding required for construction.</p> <p>Agricultural land required from a single block south of Chorlton for construction works.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Negligible</p> <p>0.7ha; 1% of holding required.</p> <p>Agricultural land required from a single block south of Chorlton for landscape mitigation bund and planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/9</p> <p>Ellesmere Dairy Farm</p> <p>Owner-occupied, and FBT agreements</p> <p>304ha dairy farm with 500-cow milking herd plus replacements. Small beef herd reared from dairy replacements. Land farmed at three different sites with paintball enterprise at site near Shavington.</p> <p>Land in ELS</p>	<p>Land required: Negligible</p> <p>14.6ha; 5% of holding required for construction.</p> <p>Agricultural land required from two blocks: an area west of Swill Brook for construction works and stockpile; and an area north of Chorlton Lane for construction works, stockpile and haul road.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Low. The closure of Chorlton Lane will require some changes to the operation of the holding with regards to accessing off-lying land.</p>	<p>Land required: Negligible</p> <p>11.4ha; 4% of holding required.</p> <p>Agricultural land required from two blocks: an area west of Swill Brook for balancing pond and habitat creation; and an area north of Chorlton Lane also for balancing pond and habitat creation.</p> <p>Severance: Negligible. Access available via the Chorlton Road diversion.</p> <p>Infrastructure: Negligible</p>
<p>CA5/10*</p> <p>Land west of Waybutt Lane</p> <p>7ha grassland used to graze horses (non-commercial).</p>	<p>Land required: High</p> <p>6.1ha; 87% of holding required for construction.</p> <p>Agricultural land required from a single block west of Waybutt Lane for construction works and haul road.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: High</p> <p>1.5ha; 22% of holding required (remaining land is existing earth embankment). Agricultural land required from a single block west of Waybutt Lane for landscape earthworks, landscape mitigation planting and grassland habitat creation, and ecological mitigation ponds. Grassland habitat to remain in agricultural use.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/11*</p> <p>Chorlton Dairy Farmhouse</p> <p>2ha grassland used to graze horses (non-commercial).</p>	<p>Land required: High</p> <p>1.3ha; 67% of holding required for construction. Agricultural land required from a single block west of the WCML for construction works.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Medium. Construction noise could prevent use of equestrian facilities by nervous horses.</p>	<p>Land required: High</p> <p>1.2ha; 64% of holding required.</p> <p>Agricultural land required from a single block west of WCML Lane for landscape earthworks, Chorlton Lane diversion and landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>

Appendix AG-001-005

Holding reference, name and description	Temporary effects	Permanent effects
<p>CA5/12 Jubilee Farm Owner-occupied 6ha non-commercial smallholding with sheep, pigs, chickens and horses.</p>	<p>Land required: High 4.4ha; 73% of holding required for construction. Agricultural land required from a single block west of Chorlton Lane for construction works and haul road. Severance: Negligible Disruptive effects: Negligible</p>	<p>Land required: High 3.6ha; 60% of holding required. Agricultural land required from a single block west of Chorlton Lane for landscape earthworks and landscape mitigation planting. Severance: Negligible Infrastructure: Negligible</p>
<p>CA5/13 Heath Farm Rented on Agricultural Holdings Act (AHA) and FBT agreements 100ha arable farm. Diversified enterprises include DIY livery, agricultural contracting and engineering workshop.</p>	<p>Land required: Medium 15.9ha; 16% of holding required for construction. Agricultural land required from a single block south of Newcastle Road for construction works, stockpile and haul road. Severance: Negligible Disruptive effects: Negligible</p>	<p>Land required: Low 10.0ha; 10% of holding required. Agricultural land required from a single block south of Newcastle Road for landscape earthworks and landscape mitigation planting, balancing pond, Chorlton Lane diversion, habitat creation and ecological mitigation ponds. Severance: Negligible Infrastructure: Negligible</p>
<p>CA5/14* Land west of Chorlton Lane 4ha grassland used to graze horses (non-commercial).</p>	<p>Land required: High 1.1ha; 28% of holding required for construction. Agricultural land required from a single block west of Chorlton Lane for construction works and haul road. Severance: Negligible Disruptive effects: Negligible</p>	<p>Land required: High 0.9ha; 23% of holding required. Agricultural land required from a single block west of Chorlton Lane for landscape and habitat creation. Severance: Negligible Infrastructure: Negligible</p>
<p>CA5/15* Chorlton Bank Farm 7ha grassland enterprise</p>	<p>Land required: High 3.0ha; 43% of holding required for construction. Agricultural land required from a single block north and south of Newcastle Road for stockpile and haul road. Severance: Negligible Disruptive effects: Negligible</p>	<p>Land required: Medium 1.4ha; 20% of holding required. Agricultural land required from a single block north and south of Newcastle Road for landscape mitigation planting. Severance: Negligible Infrastructure: Negligible</p>
<p>CA5/16* The Moss Rented under FBT agreements 92ha arable holding farmed remotely from Proposed Scheme</p>	<p>Land required: High 23.9ha; 26% of holding required for construction. Agricultural land required from three blocks; an area between Newcastle Road and Weston Lane for construction works, Chorlton cutting satellite compound; an area north of Newcastle Road west of the WCML for construction works; and an area north of the A500 Shavington Bypass for the Crewe south crossovers satellite compound and access road. Severance: High. Large area of agricultural land between Newcastle Road and Weston Lane with no access available. Disruptive effects: Negligible</p>	<p>Land required: Medium 13.3ha; 14% of holding required. Agricultural land required from two blocks: and area between Newcastle Road and Weston Lane for Newcastle Road diversion, Casey Lane diversion, balancing ponds, habitat creation and landscape mitigation planting; and an area north of Newcastle Road west of the WCML for HS2 main line. Severance: Medium Access required via public highway to severed land. Infrastructure: Negligible</p>

Appendix AG-001-005

Holding reference, name and description	Temporary effects	Permanent effects
<p>CA5/17*</p> <p>Rope Green Farm</p> <p>28ha dairy unit. Land affected by scheme is not part of main holding.</p>	<p>Land required: Low</p> <p>2.0ha; 7% of holding required for construction.</p> <p>Agricultural land required from a single block north of Newcastle Road for construction.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Low</p> <p>2.0ha; 7% of holding required.</p> <p>Agricultural land required from a single block north of Newcastle Road for Newcastle Road re-alignment and landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/18</p> <p>Casey Lane Stables</p> <p>Owner-occupied</p> <p>6ha equestrian livery. 25 stable and office block. Stables currently not commercially used, land used to graze own horses.</p>	<p>Land required: High</p> <p>1.7ha; 28% of holding required for construction.</p> <p>Agricultural land required from a single block east of WCML and south of Casey Lane for construction works.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: High</p> <p>1.6ha; 27% of holding required.</p> <p>Agricultural land required from a single block east of WCML and south of Casey Lane for landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/19</p> <p>Brookhouse Farm</p> <p>Owner-occupied</p> <p>3ha grassland used for small equestrian DIY livery enterprise.</p>	<p>Land required: High</p> <p>0.8ha; 27% of holding required for construction.</p> <p>Agricultural land required from a single block south of Weston Lane for construction.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: High</p> <p>0.8ha; 27% of holding required.</p> <p>Agricultural land required from a single block south of Weston Lane for landscape mitigation planting.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/20*</p> <p>Crotia Mill Farm</p> <p>26ha beef and arable enterprise</p> <p>Land in ELS</p>	<p>Land required: Negligible</p> <p>0.4ha; 1% of holding required for construction. Agricultural land required from a single block north of A500 Shavington Bypass for construction access road.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Negligible</p> <p>0.0ha; 0% of holding required.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/21*</p> <p>Basford Hall</p> <p>2ha grassland in equestrian use.</p>	<p>Land required: High</p> <p>0.7ha; 35% of holding required for construction.</p> <p>Agricultural land required from a single block north of Weston Lane for construction.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Negligible</p> <p>0.0ha; 0% of holding required.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/22</p> <p>Larch Farm</p> <p>Rented under FBT agreement</p> <p>57ha arable and grassland enterprise based away from proposed scheme. Dwelling let to third party.</p>	<p>Land required: Negligible</p> <p>3.0ha; 5% of holding required for construction. Agricultural land required from a single block between Weston Lane and A500 Shavington Bypass for Basford cutting transfer node.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Negligible</p> <p>0.5ha; 1% of holding required.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>

Appendix AG-001-005

Holding reference, name and description	Temporary effects	Permanent effects
<p>CA5/23*</p> <p>New Farm</p> <p>10ha grassland</p>	<p>Land required: High</p> <p>5.9ha; 59% of holding required for construction.</p> <p>Agricultural land required from a single block between Weston Lane and A500 Shavington Bypass for Basford cutting main compound and temporary workers accommodation.</p> <p>Severance: Negligible</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Negligible</p> <p>0.4ha; 4% of holding required.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>
<p>CA5/24*</p> <p>Land south of A500 Shavington Bypass</p> <p>4ha arable</p>	<p>Land required: Medium</p> <p>0.6ha; 14% of holding required for construction.</p> <p>Agricultural land required from a single block between Weston Lane and A500 Shavington Bypass for construction works.</p> <p>Severance: High</p> <p>Disruptive effects: Negligible</p>	<p>Land required: Negligible</p> <p>0.0ha; 0% of holding required.</p> <p>Severance: Negligible</p> <p>Infrastructure: Negligible</p>

\* No Farm Impact Assessment interview conducted; data estimated.

## 5 References

British Geological Survey, Geology of Britain Viewer. Available online at:

[www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html](http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html).

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

Cranfield University (2017), *The Soils Guide*, UK. Available online at: [www.landis.org.uk](http://www.landis.org.uk).

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

Forestry Commission, National Forest Inventory. Available online at:

<https://www.forestry.gov.uk/inventory>.

Forestry Commission, National Inventory of Woodland and Trees. Available online at:

<https://www.forestry.gov.uk/fr/infd-86xc6c>.

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

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

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

Ministry of Agriculture, Fisheries and Food (MAFF) (1988), *Report of the MAFF Agricultural Land Classification Survey (1988) - Weston Hall*.

Ministry of Agriculture, Fisheries and Food (MAFF) (1989), *Soil Notes for Nantwich and Crewe Local Plan, Area 1*.

Ministry of Agriculture, Fisheries and Food (MAFF) (1990), *Soil Notes for Nantwich and Crewe Local Plan, Area 2*.

Ministry of Agriculture, Fisheries and Food (MAFF) (1999), *Crewe and Nantwich Local Plan First Replacement: Land at Weston, 044/98&25/RPT/0864*.

Multi-Agency Geographical Information for the Countryside (MAGIC). Available online at:

[www.magic.gov.uk](http://www.magic.gov.uk).

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







High Speed Two (HS2) Limited  
Two Snowhill  
Snow Hill Queensway  
Birmingham B4 6GA

08081 434 434  
[HS2Enquiries@hs2.org.uk](mailto:HS2Enquiries@hs2.org.uk)