In Parliament – Session 2021 - 2022

HS2

High Speed Rail (Crewe – Manchester)

Background information and data

Water resources and flood risk

BID WR-004-0MA02

MA02: Wimboldsley to Lostock Gralam

Water resources assessment baseline data

M316

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Department for Transport

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1.1.1 This document presents baseline data relating to the water resources assessment which has been undertaken for the Proposed Scheme.

1.1.2 The data has been collected in relation to the Wimboldsley to Lostock Gralam area (MA02).

1.1.3 The Environmental Statement[1] should be referred to for details of:

- the Water Framework Directive (WFD) compliance assessment (Volume 3, Route-wide effects and Volume 5: Appendix WR-001-00000);
- the water resources assessments and flood risk assessments which are reported per community area (Volume 5: Appendices WR-003-0MA02 and WR-005-0MA02); and
- a Draft water resources and flood risk operation and maintenance plan (Volume 5: Appendix WR-007-00000).

1.1.4 Additional information is also included in Background Information and Data (BID) WFD compliance assessment baseline data that is reported for the Proposed Scheme (BID WR-002-00001).

1.1.5 Maps referred to throughout this document are set out in Volume 5, Water resources and flood risk Map Book, Map Series WR-01 and WR-02[2].

[1] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[2] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement. Volume 5 Water resources and flood risk Map Book*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

2 Baseline data

2.1 Surface water

2.1.1 The surface water features within 1km of and potentially affected by the Proposed Scheme, including their location, current overall WFD status, and future overall status objectives, are shown in Table 1. Further details are set out in Water Framework Directive baseline data (BID WR-002-00001). The receptor values attributed to each individual watercourse, based on the methodologies set out in Environmental Impact Assessment Scope and Methodology Report (SMR)[3], are also provided.

2.1.2 Those surface water features potentially affected by groundwater interactions are described in Section 2.3 Groundwater – surface water interactions.

Table 1: Surface water body receptors

Water body name and location[4]	Type (at point closest to the Proposed Scheme)[5]	Q95 value (m^3/s)[6]	Receptor value	Parent WFD water body name and identification number[7]	Current WFD status/ objective[8]	2019 WFD status
Tributary of River Weaver 2 WR-01-302b – E4	Ordinary watercourse	<0.002	Moderate	Weaver (Marbury Brook to Dane) GB112068060460	Poor/Good by 2027	Poor
River Weaver WR-01-302b – E3	Main river	1.9	Very high			
The Dingle WR-01-302b – B5	Ordinary watercourse	<0.002	Low			
Tributary of River Wheelock 1 WR-01-302b – G7	Ordinary watercourse	<0.002	Moderate	Wheelock (Fowle Brook to Dane) GB104028043750	Poor/Good by 2027	Bad

[3] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report,* Volume 5, Appendix CT-001-00001. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[4] The feature locations are indicated by the grid coordinates on the relevant Volume 5, Water resources and flood risk Map Book, Map Series WR-01.

[5] The term 'minor ditch' has been used to denote a small trench or drain that has been constructed for the purpose of draining water from the land or roads and is isolated from the wider river network.

[6] This is the flow within the watercourse that is exceeded for 95% of the time. The Q95 has been provided as an indication of watercourse size but is only one of several criteria used to inform receptor value. Details are provided in the SMR.

[7] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

[8] Status and objectives are based on those set out in the 2015 river basin management plan (RBMP). See Environment Agency (2015), *River Basin Management Plan, North West River Basin District*. Available online at: https://www.gov.uk/government/publications/north-west-river-basin-district-river-basin-management-plan.

Water body name and location[4]	Type (at point closest to the Proposed Scheme)[5]	Q95 value (m^3/s)[6]	Receptor value	Parent WFD water body name and identification number[7]	Current WFD status/ objective[8]	2019 WFD status
Tributary of River Weaver 3 WR-01-302b – G4	Ordinary watercourse	<0.002	Moderate	Weaver (Marbury Brook to Dane) GB112068060460	Poor/Good by 2027	Poor
River Wheelock WR-01-302b – F8	Main river	0.090	Moderate	Wheelock (Fowle Brook to Dane) GB104028043750	Poor/Good by 2027	Bad
Tributary of River Wheelock 2 WR-01-302b – G7	Ordinary watercourse	<0.002	Moderate			
Tributary of River Wheelock 3 WR-01-302b – G7	Ordinary watercourse	<0.002	Moderate			
Tributary of River Weaver 4 WR-01-302b – H5	Ordinary watercourse	0.003	Low	Weaver (Marbury Brook to Dane) GB112068060460	Poor/Good by 2027	Poor
Tributary of River Wheelock 4 WR-01-302b – H7	Ordinary watercourse	<0.002	Moderate	Wheelock (Fowle Brook to Dane) GB104028043750	Poor/Good by 2027	Bad
Shropshire Union Canal WR-01-302b – F4	Canal	N/A	Very high	Weaver (Marbury Brook to Dane) GB112068060460	Poor/Good by 2027	Poor
Tributary of River Wheelock 5 WR-01-302b – I7	Ordinary watercourse	<0.002	Low	Wheelock (Fowle Brook to Dane) GB104028043750	Poor/Good by 2027	Bad
Middlewich Road Drains WR-01-302b – I5	Minor ditch	<0.002	Low	Weaver (Marbury Brook to Dane) GB112068060460	Poor/Good by 2027	Poor
Birch Lane Drain WR-01-303 – B7	Minor ditch	<0.002	Low	Dane (Wheelock to Weaver) GB112068060470	Bad/ Moderate by 2027	Moderate
River Dane WR-01-303 – E5	Main river	0.8	Very high			
The Willowbeds WR-01-303 – C4	Minor ditch	<0.002	Low			
A533 Drain WR-01-303 – C6	Minor ditch	<0.002	Low			
Tributary of River Dane 3 WR-01-303 – C6	Ordinary watercourse	<0.002	Low			
Tributary of River Dane 4 WR-01-303 – D6	Ordinary watercourse	<0.002	Moderate			

Water body name and location[4]	Type (at point closest to the Proposed Scheme)[5]	Q95 value (m^3/s)[6]	Receptor value	Parent WFD water body name and identification number[7]	Current WFD status/ objective[8]	2019 WFD status
Trent and Mersey Canal – First Crossing WR-01-303 – C7	Canal	N/A	Very high	Trent and Mersey Canal, summit to Preston Brook Tunnel GB71210247	Moderate/ Moderate by 2015	Moderate
River Croco – First Crossing WR-01-303 – C9	Main river	0.049	Moderate	Dane (Wheelock to Weaver) GB112068060470	Bad/ Moderate by 2027	Moderate
River Croco – Second Crossing WR-01-303 – C9	Ordinary watercourse	<0.002	Moderate			
Tributary of River Wheelock 6 WR-01-303 – B7	Ordinary watercourse	0.2	Moderate	Wheelock (Fowle Brook to Dane) GB104028043750	Poor/Good by 2027	Bad
Hill Wood Drain WR-01-303 – D5	Minor ditch	<0.002	Low	Dane (Wheelock to Weaver) GB112068060470	Bad/ Moderate by 2027	Moderate
Tributary of Trent and Mersey Canal WR-01- 303 – E5	Ordinary watercourse	<0.002	Low	Trent and Mersey Canal, summit to Preston Brook Tunnel GB71210247	Moderate/ Moderate by 2015	Moderate
Trent and Mersey Canal – Second Crossing WR-01-303 – F4	Canal	N/A	Very high			
Puddinglake Brook WR-01-303 – F5	Main river	0.008	High	Puddinglake Brook GB112068060220	Poor/Good by 2027	Poor
Byley Road Drain WR-01-303 – G10	Minor ditch	<0.002	Low	Wade Brook GB112068060370	Poor/Good by 2027	Poor
Tributary of Gad Brook 1 WR-01-303 – G9	Ordinary watercourse	<0.002	Moderate			
Tributary of Gad Brook 2 WR-01-303 – G9	Ordinary watercourse	0.004	High			
Trent and Mersey Canal – Third Crossing WR-01-303 – I4	Canal	N/A	Very high	Trent and Mersey Canal, summit to Preston Brook Tunnel GB71210247	Moderate/ Moderate by 2015	Moderate
Gad Brook WR-01-303 – G5	Ordinary watercourse	0.004	Moderate	Wade Brook GB112068060370	Poor/Good by 2027	Poor
Tributary of Gad Brook 3	Ordinary watercourse	<0.002	Moderate			

Water body name and location[4]	Type (at point closest to the Proposed Scheme)[5]	Q95 value (m^3/s)[6]	Receptor value	Parent WFD water body name and identification number[7]	Current WFD status/ objective[8]	2019 WFD status
WR-01-303 – H7						
Tributary of Gad Brook 4 WR-01-303 – H5	Ordinary watercourse	<0.002	Moderate			
Broken Cross Drains WR-01-303 – I5	Minor ditch	<0.002	Low			
Tributary of Wade Brook 1 WR-01-303 – I8	Ordinary watercourse	<0.002	Moderate			
Tributary of Wade Brook 2 WR-01-303 – I8	Ordinary watercourse	<0.002	Moderate			
Wade Brook WR-01-304a – B7	Main river	0.08	High			
Square Wood Drains WR-01-304a – B7	Minor ditch	<0.002	Low	Peover Eye GB112068060390	Poor/Good by 2027	Bad
A556 Drainage WR-01-304a – B6	Minor ditch	<0.002	Low			
Wincham Brook WR-01-304a – B4	Main river	0.3	High			
Tributary of Peover Eye WR-01-304a – C7	Ordinary watercourse	<0.002	Moderate			
Peover Eye WR-01-304a – C8	Main river	0.2	High			
Tributary of Wincham Brook 2 WR-01-304a – C5	Ordinary watercourse	<0.002	Moderate			
Tributary of Wincham Brook 3 WR-01-304a – C6	Ordinary watercourse	<0.002	Moderate			
Smoker Brook WR-01-304a – D7	Main river	0.07	High	Smoker Brook (Gale Brook to Wincham Brook) GB112068060410	Bad/Good by 2027	Bad

2.1.3 There are no licensed surface water abstractions potentially affected by the Proposed Scheme. Records of private unlicensed surface water abstractions, which comprise those for quantities less than $20m^3$ per day, have been obtained from the local authorities. This data indicates that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered

private surface water supplies may be present. Private water supplies will be assessed as high value receptors unless details obtained from the owner indicate otherwise.

2.1.4 There are 21 permitted discharges to surface water within 1km of the route of the Proposed Scheme, as shown in Table 2, three of which are within the land required for the construction of the Proposed Scheme. These have been assessed as low value receptors.

Table 2: Permitted discharges to surface water

Permit identifier (and map grid square)	Distance and direction from route	Discharge type	Receiving water body
0169/1060 WR-01-302b – E5	340m west of the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Sewage discharges – storm overflow/storm tank (not water company)	Tributary of River Weaver 2
016892135 WR-01-302 – F6	440m east of the route of the Proposed Scheme (located adjacent to the land required for construction of the Proposed Scheme)	Sewage and Trade Combined – unspecified	Unknown surface water drain
016892352 WR-01-302b – H5	500m west of the route of the Proposed Scheme (located adjacent to the land required for construction of the Proposed Scheme)	Sewage discharge – final/treated effluent (not water company)	Tributary of River Weaver 4
NPSWQD003247 WR-01-303 – B7	520m east of the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Sewage discharge – final/treated effluent (not water company)	Tributary of River Wheelock 6
016890361 WR-01-303 – C6	240m east of the route of the Proposed Scheme (located adjacent to the land required for construction of the Proposed Scheme)	Sewage discharge – final/treated effluent (not water company)	Tributary of River Wheelock 6
016880974 WR-01-303 – C6	440m east of the route of the Proposed Scheme (located adjacent to the land required for construction of the Proposed Scheme)	Sewage discharge – final/treated effluent (water company)	Tributary of River Wheelock 6
NPSWQD009429 WR-01-303-R1 – F5	109m south-west of the land required for construction of the Proposed Scheme	Sewage discharge – final/treated effluent (not water company)	Puddinglake Brook
016890854 WR-01-303-R1 – F4	317m south-west of the land required for construction of the Proposed Scheme	Sewage discharge (not water company)	Puddinglake Brook
016810058 WR-01-303-R1 – F4	483m south-west of the land required for construction of the Proposed Scheme	Sewage discharge – final/treated effluent (water company)	Puddinglake Brook

Permit identifier (and map grid square)	Distance and direction from route	Discharge type	Receiving water body
016892112 WR-01-303-R1 – F4	148m west of the land required for construction of the Proposed Scheme	Sewage discharge – final/treated effluent (not water company)	Puddinglake Brook
NPSWQD009396 WR-01-303-R1 – F6	306m north-west of the land required for construction of the Proposed Scheme	Sewage discharge – final/treated effluent (not water company) and Trade discharge – process water	Tributary of Gad Brook 1
016892042 WR-01-303-R1 – F6	356m north-west of the land required for construction of the Proposed Scheme	Trade discharge – process water	Tributary of Gad Brook 1
016890943 WR-01-303 – F5	70m west of the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Sewage discharge – final/treated effluent (not water company)	Puddinglake Brook
01CON0060 WR-01-303-R1 – F5	381m north of the land required for construction of the Proposed Scheme	Sewage discharge – final/treated effluent (water company)	Tributary of Gad Brook 2
016891589 WR-01-303 – H5	420m west of the route of the Proposed Scheme (320m south-west of the land required for construction of the Proposed Scheme)	Wastewater Treatment Works (WwTW) (not water company)	Gad Brook
016892034 WR-01-303 – H4	640m west of the route of the Proposed Scheme (410m south-west of the land required for construction of the Proposed Scheme)	Pumping station on sewerage network (water company)	Tributary of Gad Brook 4
016892558 WR-01-303 – H5	600m west of the route of the Proposed Scheme (170m north-west of the land required for construction of the Proposed Scheme)	Sewage discharge – final/treated effluent (not water company)	Tributary of Gad Brook 4
Canals and Rivers Trust Discharge 1 WR-01-303 – I4	930m west of the route of the Proposed Scheme (120m west of the land required for construction of the Proposed Scheme)	Developer contract for residential estate	Trent and Mersey Canal – 3rd Crossing
Canals and Rivers Trust Discharge 2 WR-01-303 – I4	880m west of the route of the Proposed Scheme (85m west of the land required for construction of the Proposed Scheme)	Developer contract for residential estate	Trent and Mersey Canal – 3rd Crossing
016890401 WR-01-304a – B6	260m south-east of the route of the Proposed Scheme (50m north of the land required for construction of the Proposed Scheme)	Trade discharge effluent (not water company)	Wade Brook
016891642 WR-01-304a – C7	300m east of the route of the Proposed Scheme (180m north-east of the land required for	Domestic property (multiple) (including farmhouses)	Peover Eye

Permit identifier (and map grid square)	Distance and direction from route	Discharge type	Receiving water body
	construction of the Proposed Scheme)		

2.2 Groundwater

2.2.1 The groundwater features crossed by the Proposed Scheme within the study area, including their location, current overall WFD status and future overall status objectives, are shown in Table 3. Further details are set out in Water Framework Directive compliance baseline data (BID WR-002-00001). The receptor values attributed to each individual feature are based on the methodologies set out in the SMR[3].

2.2.2 Volume 5, Water resources assessment and flood risk Map Book: map WR-02-302[2] shows the superficial and bedrock formations within MA02.

Table 3: Summary of geology and hydrogeology in the study area

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[9] /2019 status	WFD objective[10]	Receptor value
Superficial deposits[11]						
Alluvium	Along the valleys of most rivers and tributaries	Clay, silt, sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
River terrace deposits	Along part of the valley of the River Dane and Wade Brook	Clay, sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Glaciofluvial deposits	Not crossed by the route of the Proposed	Sand and gravel	Secondary A	Weaver and Dane Quaternary	Good by 2027	Moderate

[9] Based on the 2015 RBMP. Note that where the Environment Agency have not assigned an individual water body ID to a unit, it has been assumed that it is connected to the underlying/overlying water body.

[10] Status and objectives are based on those set out in the 2015 RBMP.

[11] Superficial deposits are not necessarily listed in the order of superposition. Other superficial deposits may be present between the deposits shown in the table and bedrock, including deposits which do not appear in the table.

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[9] /2019 status	WFD objective[10]	Receptor value
	Scheme. Minor isolated outcrop areas across the study area			Sand and Gravel Aquifer (GB41202G991700) Poor/Poor		
Glaciofluvial sheet deposits	Minor outcrop around valley of River Dane and Wade Brook, and around MA02 borrow pit D	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Glacial till	Located across the majority of the study area	Sandy silty clay	Secondary (Undifferent-iated)	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Bedrock						
Mercia Mudstone Group – Sidmouth Mudstone Formation	In the south around Wimboldsley and around Rudheath and Lostock Gralam	Mudstone and siltstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Sidmouth Mudstone Formation – Northwich Halite Member	Across most of the study area between Wimboldsley and Rudheath and Lostock Gralam and Higher Wincham	Halite-stone and mudstone	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

2.2.3 The alluvium, river terrace deposits, glaciofluvial and glaciofluvial sheet deposits in the study area are classified as Secondary A aquifers by the Environment Agency. The glacial till in the study area is designated as a Secondary (Undifferentiated) aquifer.

2.2.4 There is one bedrock aquifer in the study area. The Sidmouth Mudstone Formation (part of the Mercia Mudstone Group) is classified as a Secondary B aquifer. This formation comprises structureless mudstone and siltstone. The Northwich Halite Member, comprising halite-rich strata within the Sidmouth Mudstone Formation, is present across the central and northern

boundary of the study area. The Northwich Halite Member is classified as an Unproductive aquifer. These units are generally overlain by glacial till.

2.2.5 The structural geology of the study area is complex, with many major faults traversing the study area, some of which have vertical displacements of over 200m in places.

2.2.6 There are no Environment Agency observation boreholes which monitor groundwater level within the study area. Water strikes recorded on borehole logs available via BGS have been referred to for the purpose of the assessment.

2.2.7 Groundwater in the superficial aquifers in the study area is expected to be shallow within the river valleys and at slightly greater depth on the valley sides. The direction of groundwater flow is likely to follow the general topography, with the surface watercourses acting as discharge points for converging groundwater flow. Where groundwater levels are not known, they have been assumed to be at or close to ground level for the purpose of a precautionary assessment.

2.2.8 In the superficial Secondary A and Secondary (Undifferentiated) aquifers (alluvium, river terrace deposits, glaciofluvial sheet deposits and glacial till) most groundwater flow is expected to be through the intergranular matrix of these unconsolidated deposits.

2.2.9 Some groundwater flow is expected in the Mercia Mudstone Group. However, permeable horizons within the Mercia Mudstone Group are expected to be laterally discontinuous and associated with thin siltstone and sandstone lenses called skerries. There may also be a small element of fracture flow within the Mercia Mudstone Group.

2.2.10 Table 4 summarises groundwater abstractions and their locations are shown on Volume 5, Water resources assessment and flood risk Map Book: map WR-02-302.

2.2.11 There are no source protection zones (SPZ) associated with licensed public water supplies within the study area.

2.2.12 There are three private unlicensed abstractions from groundwater in the study area. These do not have mapped SPZ but, where used for potable supply and some other purposes, have a nominal SPZ1 of 50m[12]. The abstraction at Bank Farm, Stanthorne, Middlewich has been assessed as a high value receptor on a precautionary basis as the purpose of the abstraction is unknown. The remaining two abstractions have been assessed as moderate value receptors.

2.2.13 The private water supply information has been provided by the local authorities. Information regarding deregulated abstractions has been provided by the Environment Agency. Where land access has been available, surveys have been undertaken to confirm unlicensed

[12] Environment Agency (2017), *Protect groundwater and prevent groundwater pollution*. Available online at: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution.

abstraction details. Where the exact details of an unlicensed abstraction are not known, a precautionary assessment has been undertaken.

2.2.14 There is the potential for further unlicensed abstractions to exist, as a licence is not required for abstraction volumes below 20m^3 per day and not all unlicensed abstractions are registered with the local authority. These may also need to be protected.

Table 4: Summary of groundwater abstractions

Name, licence number (and map grid square)[13]	Distance and direction from route	Abstraction source	Maximum annual abstraction quantity (m^3)	Maximum daily abstraction quantity (m^3)	Purpose	Number of boreholes
Private unlicensed water supplies						
Mellor Knowl Farm WR-02-302 – D5	600m east of the route of the Proposed Scheme (200m south-east of land required for construction of the Proposed Scheme)	Glacial till[14]	N/A	<20	Commercial or public activity	1
Bank Farm, Stanthorne, Middlewich 2568002026 WR-02-302 – D4	230m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glaciofluvial deposits[14]	3319	<20	Unknown	1
Lagoon at Rudheath Woods, Cranage, Knutsford 2568002189 WR-02-302 – F8	450m north of MA02 borrow pit D (450m north of land required for construction of the Proposed Scheme)	Glaciofluvial sheet deposits[14]	6819	218	General Agriculture – Spray Irrigation – Direct	1

2.2.15 There are no consented discharges to groundwater in the study area.

2.3 Groundwater – surface water interactions

2.3.1 Table 5 summarises the potential groundwater – surface water interactions identified within the study area.

[13] Map grid squares on Volume 5, Water resources assessment and flood risk Map Book: map WR-02-302 for SPZ, licence numbers (for licensed abstractions) and unique map identification (ID) numbers (for unlicensed groundwater abstractions). Abstraction features in the study area are generally listed from south to north.

[14] Licence does not state aquifer type, aquifer assumed based on geology.

2.3.2 Along with the main surface watercourses, which could have connection with groundwater, potential springs and sinks have been identified within the study area from Ordnance Survey (OS) maps and detailed river network data provided by the Environment Agency. Where land access has been available, these have been surveyed to check if they are true expressions of groundwater (and therefore could contribute to flows to surface water bodies), or if they are simply land drainage features. Where surveys have proved the latter, the features are recorded as such in Table 5, but are excluded from the groundwater – surface water interactions impact assessment in Volume 5: Water resources assessment, Appendix WR-003-0MA02 and they are not shown on Volume 5, Water resources and flood risk Map Book: map WR-02-302[2], because they are implicitly already included in the assessment of surface waters. In the absence of site surveys, the potential spring features have been assumed to comprise springs and to be high value receptors. Where a spring does not support water dependant habitat then the corresponding value of the receiving surface watercourse is applied.

Table 5: Groundwater – surface water interactions

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Watercourses				
Tributary of River Weaver 2 WR-02-302 – B5	100m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	40	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
River Weaver WR-02-302 – B4	950m west of the route of the Proposed Scheme (340m south-west of land required for construction of the Proposed Scheme)	Alluvium over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	26	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
The Dingle WR-02-302 – B4	360m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	42	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Wheelock 1 WR-02-302 – C5	740m east of the route of the Proposed Scheme (410m east of land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	47	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

[15] Volume 5, Water resources assessment and flood risk Map Book: map WR-02-302. Watercourses cross several map grid squares and are labelled. Map grid squares are provided for the springs and potential spring locations within the study area. These features are listed from south to north.

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Tributary of River Weaver 3 WR-02-302 – C4	790m west of the route of the Proposed Scheme (40m west of land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	44	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
River Wheelock WR-02-302 – D5	830m east of the route of the Proposed Scheme (340m east of land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	22	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Wheelock 2 WR-02-302 – C5	660m east of the route of the Proposed Scheme (400m east of land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	45	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Wheelock 3 WR-02-302 – C5	620m east of the route of the Proposed Scheme (370m east of land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	45	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Weaver 4 WR-02-302 – C4	500m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	41	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Wheelock 4 WR-02-302 – C5	650m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	39	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Wheelock 5 WR-02-302 – D5	220m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	42	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Wheelock 6 WR-02-302 – D5	680m east of the route of the Proposed Scheme (140m east of land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	36	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
River Dane WR-02-302 – E4 and E5	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	18	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
The Willowbeds WR-02-302 – D4	620m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	40	These features are a network of drains, located up-gradient of the Proposed Scheme. They are unlikely to be hydraulically connected to the Proposed Scheme.
Tributary of River Dane 3 WR-02-302 – D5	80m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Alluvium, glaciofluvial deposits and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	38	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of River Dane 4 WR-02-302 – E5	640m west of the route of the Proposed Scheme (360m west of land required for construction of the Proposed Scheme)	Glaciofluvial deposits and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	18	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Puddinglake Brook WR-02-302 – F4	Crossed by the route of the Proposed Scheme	Alluvium, glaciofluvial deposits and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation and the Sidmouth Mudstone Formation – Northwich Halite Member)	22	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Gad Brook 1 WR-02-302 – F7	670m north-west of MA02 borrow pit D (400m north-east of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	44	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Gad Brook 2 WR-02-302 – F7	370m north-east of MA02 borrow pit D (370m north-east of land required for construction of the Proposed Scheme)	Glaciofluvial deposits and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	50	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Gad Brook WR-02-302 – G4 and G5	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation and the Sidmouth Mudstone Formation – Northwich Halite Member)	22	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Gad Brook 3 WR-02-302 – G5	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	22	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Gad Brook 4 WR-02-302 – G4	350m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation and the Sidmouth Mudstone Formation – Northwich Halite Member)	24	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Wade Brook 1 WR-02-302 – G6	1.3km east of the route of the Proposed Scheme (210m south-east of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	35	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Wade Brook 2 WR-02-302 – G6 and H6	1.1km east of the route of the Proposed Scheme (190m south-east of land required for construction of the Proposed Scheme)	Alluvium, river terrace deposits and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	32	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Wade Brook WR-02-302 – H5	Crossed by the route of the Proposed Scheme	Alluvium, river terrace deposits and glaciofluvial deposits over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	26	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Peover Eye WR-02-302 – I6	Crossed by the route of the Proposed Scheme	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation and the Sidmouth Mudstone Formation – Northwich Halite Member)	24	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Peover Eye WR-02-302 – I6	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	21	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Wincham Brook 2 WR-02-302 – I5	640m north-west of the route of the Proposed Scheme (330m north-west of land required for construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	19	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Wincham Brook 3 WR-02-302 – I5	410m west of the route of the Proposed Scheme (240m north of land required for construction of the Proposed Scheme)	Alluvium and glaciofluvial deposits over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	31	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Wincham Brook WR-02-302 – I5	180m west of the route of the Proposed Scheme (240m west of land required for construction of the Proposed Scheme)	Alluvium over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	18	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Smoker Brook WR-02-302 – I5	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	20	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Springs or potential spring features				
Spring 100m south of Wimboldsley Hall WR-02-302 – B5	450m west of the route of the Proposed Scheme (less than 10m west of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	44	Surveys identified a spring (without water dependent habitat) supporting a moderate value watercourse. This feature has therefore been assessed as a moderate value receptor.
Potential saliferous spring in Wimboldsley Wood Site of Special Scientific Interest (SSSI) WR-02-302 – C4	740m west of the route of the Proposed Scheme (20m west of the land required for construction of the Proposed Scheme). The location is not	Alluvium below and glacial till above the outcrop over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	Approximately 20	The SSSI citation indicates a saliferous spring is present in the southern part of the SSSI. The spring was not identified during surveys as

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
	known precisely			access was not available to the southern end of the site. Assumed to be a high value receptor until verified by surveys.
Potential spring 180m north of Norcroft Farm WR-02-302 – C5	650m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	39	Surveys have shown this to be a land drain which discharges into Tributary of River Wheelock 4 and it is therefore included in the surface water assessment.
Spring south-west of Clive WR-02-302 – D4	800m west of the route of the Proposed Scheme (620m west of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	38	Surveys confirmed it is a spring (without water dependent habitat) supporting a moderate value stream. This feature has therefore been assessed as a moderate value receptor.
Potential spring at pond 40m west of Coalpit Lane WR-02-302 – D5	310m east of the route of the Proposed Scheme (30m east of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	42	Not surveyed. Assumed to be a high value receptor until verified by surveys. If present, it is likely to discharge from the glacial till.
Potential spring 140m north of Yew-Tree Farm, Coalpit Lane WR-02-302 – D5	220m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	42	Not surveyed. Assumed to be a high value receptor until verified by surveys. If present, it is likely to discharge from the glacial till.
Potential spring at Mill Farm, Coalpit Lane WR-02-302 – D5	680m east of the route of the Proposed Scheme (140m north-east of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	36	Not surveyed. Assumed to be a high value receptor until verified by surveys. If present, it is likely to discharge from the glacial till.
Potential sink at Bostock House, A54 WR-02-302 – D5	600m east of the route of the Proposed Scheme (130m south of land required for	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation –	40	Not surveyed. Assumed to be a high value receptor until verified by surveys. If

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
	construction of the Proposed Scheme)	Northwich Halite Member)		present, it is likely to discharge from the glacial till.
Spring 215m west of Bostock House, A54 WR-02-302 – D5	440m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	41	Surveys confirmed it is a spring (without water dependant habitat) supporting a low value stream. This feature has therefore been assessed as a low value receptor.
Potential spring at Winnington Belt, 100m east of Nursery on Ascol Drive WR-02-302 – I6	160m south-west of the route of the Proposed Scheme (within the land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	27	Surveys confirmed it is a land drainage outfall which discharges into Tributary of Peover Eye and it is therefore included in the surface water assessment.
Potential spring 230m west of Winnington Wood, at Lostock Gralam WR-02-302 – I5	660m north-west of the route of the Proposed Scheme (310m north-west of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	31	Surveys unable to confirm the nature of this feature. Shown as issues on OS maps. This feature has been assessed as a high value receptor, until verification possible by further surveys.
Potential spring at Winnington Wood, north-east of Lostock Gralam WR-02-302 – I5	440m west of the route of the Proposed Scheme (240m north-west of land required for construction of the Proposed Scheme)	Glaciofluvial deposits and glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member	26	Surveys have shown this to be a land drain which discharges into Tributary of Wincham Brook 3 and it is therefore included in the surface water assessment.
Potential spring 215m south-east of Home Farm, Higher Wincham WR-02-302 – I5	560m west of the route of the Proposed Scheme (370m west of land required for the construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	30	Surveys unable to confirm the nature of this feature. Shown as issues on OS maps. This feature has been assessed as a high value receptor, until verification possible by further surveys.
Potential spring south-west of caravan park, Allostock	970m north-east of MA02 borrow pit D (970m north-east of land required for	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	49	Not surveyed. Assumed to be a high value receptor until verified by surveys. If

Feature (and map grid square)[15]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
WR-02-302 – F9	construction of the Proposed Scheme)			present, it is likely to discharge from the glaciofluvial sheet deposits.
Potential sink east of Woodside Farm, Allostock WR-02-302 – G9	990m north-east of MA02 borrow pit D (990m south-east of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation)	47	Not surveyed. OS maps show this to be a sink. Assumed to be a high value receptor until verified by surveys. If present, it is likely to discharge to the glaciofluvial sheet deposits.
Potential sink at The Dingle and Shropshire Union Canal, 235m south of Wimboldsley Grange WR-02-302 – B4	530m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation)	44	Surveys have shown this to be a culvert which collects water from The Dingle, and it is therefore included in the surface water assessment.
Potential spring 100m east of Yew-Tree Farm, Coalpit Lane WR-02-302 – D5	450m east of the route of the Proposed Scheme (50m north of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	38	Surveys have shown this to be a culvert which discharges to Tributary of River Wheelock 5 and it is therefore included in the surface water assessment.
Potential spring 100m east of Yew-Tree Farm, Coalpit Lane WR-02-302 – D5	450m east of the route of the Proposed Scheme (50m north of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	38	Surveys have shown this to be a culvert which discharges to Tributary of River Wheelock 5 and it is therefore included in the surface water assessment.
Potential spring 220m west of Leonard's Wood WR-02-302 – I5	720m west of the route of the Proposed Scheme (540m west of land required for construction of the Proposed Scheme)	Glacial till over the Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	31	Surveys have shown this to be a culvert which discharges to Tributary of Smoker Brook 1 and it is therefore included in the surface water assessment.

2.4 Water dependent habitats

2.4.1 Table 6 summarises the surface water and groundwater dependent habitats within the study area.

Table 6: Water dependent habitats

Name (and map grid square)[16]	Distance and direction from route	Designation	Comments
Surface water habitats			
Shropshire Union Canal (Middlewich branch) EC-01-505 – F5 and F6	Crossed by the route of the Proposed Scheme	Local Wildlife Site (LWS)	Site comprises the Shropshire Union Canal with a number of wetland plant species listed in the citation. The site has been included as a surface water dependent habitat.
Trent and Mersey Canal EC-01-506 – I5 and I6	Crossed by the route of the Proposed Scheme	LWS	Site comprises the Trent and Mersey Canal with reedbeds along the eastern bank south of Whatcroft. The site has been included as a surface water dependent habitat.
Surface water and groundwater dependent habitats			
River Dane, Bostock EC-01-506 – G5 and I5	Crossed by the route of the Proposed Scheme	LWS	The site is a surface watercourse which is likely to be supported at least in part by groundwater flow. There may be groundwater flow in the underlying by alluvium, river terrace deposits and glaciofluvial deposits. As a result, the site has been included as a surface water and groundwater dependent habitat on a precautionary basis.
Whatcroft Lane Wetlands EC-01-507 – F6	Crossed by the route of the Proposed Scheme	LWS	The site is underlain by glacial till, a Secondary (Undifferentiated) aquifer. It is unclear if the pond is fed by groundwater or by leakage from the Trent and Mersey Canal. As a result, it has been included as a surface water and groundwater dependent habitat on a precautionary basis.
Wincham Brook Valley & Mill Wood EC-01-509a – C3	490m west of the route of the Proposed Scheme (300m north-west of land required for construction of the Proposed Scheme)	LWS	This habitat has been partially surveyed and is considered unlikely to be groundwater supported. However, further surveys are required as there may be groundwater flow in the underlying alluvium (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer).

[16] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Volume 5, Ecology Map Book, Map Series EC-01.* Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement. This Map Series show water dependent habitats with statutory designations.

Name (and map grid square)[16]	Distance and direction from route	Designation	Comments
			As a result, the site has been included on a precautionary basis.
Wade Brook EC-01-508 – G3 and G4	420m west of the route of the Proposed Scheme (partially within land required for the construction of the Proposed Scheme)	LWS	Site is a surface watercourse which is likely to be supported at least in part by groundwater flow from the underlying alluvium, glaciofluvial deposits (Secondary A aquifers) and glacial till (Secondary (Undifferentiated) aquifer).
Groundwater dependent habitats			
Wimboldsley Wood EC-01-505 – C1 and C2	760m west of the route of the Proposed Scheme (25m west of land required for construction of the Proposed Scheme)	SSSI and ancient woodland	Site includes a brackish marsh which is fed by a saliferous spring. The saliferous spring is likely to be issuing from the Northwich Halite Member of the Sidmouth Mudstone Formation (Mercia Mudstone Group) which outcrops between areas of glacial till and alluvial cover. The site is therefore partially groundwater dependent. It is also possible that baseflow in Tributary of River Weaver 3, which flows through the site, and some habitats in the upper part of the SSSI, are supported by groundwater discharge from the glacial till.
Boundary Wood/Weaver Bank Wood EC-01-504b – F2 and G2	850m west of the route of the Proposed Scheme (20m west of land required for construction of the Proposed Scheme)	LWS and ancient woodland	The site is underlain by alluvium (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer). It is currently unclear if the woodland habitat is supported by groundwater, and it has, therefore, been included on a precautionary basis.
Stanthorne Hall Farm EC-01-506 – C5	40m west of the route of the Proposed Scheme (within land required for the construction of the Proposed Scheme)	Ancient woodland	The site is underlain by glaciofluvial deposits (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer). It is currently unclear if the habitat is supported by groundwater. It has, therefore, been included on a precautionary basis.
Greenhays Farm Pasture EC-01-506 – D7 and E7	400m east of the route of the Proposed Scheme (adjacent to land required for the construction of the Proposed Scheme)	LWS	The site is underlain by alluvium (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer). It is currently unclear if the habitat is supported by groundwater, and it has, therefore, been included on a precautionary basis.
Oak Clump EC-01-506 – G4	300m west of the route of the Proposed Scheme (adjacent to land required for the	Ancient woodland	The site is underlain by glacial till (Secondary (Undifferentiated) aquifer). It is currently unclear if the habitat is supported by groundwater, and it has,

Name (and map grid square)[16]	Distance and direction from route	Designation	Comments
	construction of the Proposed Scheme)		therefore, been included on a precautionary basis.
Bull's Wood and Meadow EC-01-506 – G5 and H5	Crossed by the route of the Proposed Scheme	LWS and ancient woodland	Site is underlain by glacial till and is unlikely to be supported by groundwater. However, has been included here on a precautionary basis.
Long Wood EC-01-509a – A5	Crossed by the route of the Proposed Scheme	LWS	This site is unlikely to be groundwater dependent, but the citation includes mention of a ditch system and ponds and thus has been included on a precautionary basis.
Shakerley Mere Country Park EC-01-507-R1 – H5 and H6	510m north of MA02 borrow pit D (510m west of land required for construction of the Proposed Scheme)	LWS	The site consists of a lake. Groundwater flow through the glaciofluvial sheet deposits (Secondary A aquifer), underlying the site, may support the habitat.
Rudheath EC-01-507-R1 – G9 and G10	690m north of MA02 borrow pit D (690m west of land required for construction of the Proposed Scheme)	LWS	Rudheath contains both dry and wet woodland and the designation states that springs emerge around the reserve and provide wetland areas. Groundwater flow through the glaciofluvial sheet deposits (Secondary A aquifer) underlying the site is likely to support this habitat.

3 References

Environment Agency (2015), *River Basin Management Plan, North West River Basin District.* Available online at: https://www.gov.uk/government/publications/north-west-river-basin-district-river-basin-management-plan.

Environment Agency (2017), *Protect groundwater and prevent groundwater pollution.* Available online at: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution.

High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement.* Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

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