

High Speed Rail (Crewe – Manchester)

Background information and data

Water resources and flood risk

BID WR-004-0MA03

MA03: Pickmere to Agden and Hulseheath

Water resources assessment baseline data

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Department for Transport

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

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1 Introduction

- 1.1.1 This document presents baseline data relating to the water resources assessment which has been undertaken for the Proposed Scheme.
- 1.1.2 The data have been collected in relation to the Pickmere to Agden and Hulseheath area (MA03).
- 1.1.3 The Environmental Statement¹ 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-003-0MA03 and WR-005-0MA03);
 - the hydraulic modelling reports which support the flood risk assessments (Volume 5: Appendix WR-006-00001); and
 - a Draft water resources 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 which 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-02².
- 1.1.6 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the route of the Proposed Scheme. In the Pickmere to Agden and Hulseheath area, the study area has been extended to include The Mere, Mere Site of Special Scientific Interest (SSSI), which is also a part of the Midland Meres and Mosses Phase 1 Ramsar site. Rostherne Mere Ramsar site, SSSI and National Nature Reserve (NNR), is located within the Hulseheath to Manchester Airport area (MA06) and is therefore considered in the Volume 2, Community Area report MA06, Hulseheath to Manchester Airport¹.

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 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 the Water Framework Directive compliance assessment 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 separately in Section 2.3.
- 2.1.3 Millington Clough is located in the Hulseheath to Manchester Airport (MA06) area. The baseline data for this watercourse is presented in BID WR-004-0MA06.

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	WFD 2019 status
Tributary of Smoker Brook 1 WR-01-304b – D6	Ordinary watercourse	0.007	Moderate	Smoker Brook (Gale Brook to Wincham Brook) GB112068060410	Bad/Good by 2027	Bad
Leonards Wood Drain WR-01-304b – D6	Minor ditch	<0.002	Low			
Tributary of Smoker Brook 2	Ordinary watercourse	<0.002	Low			

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 is provided as an indication of watercourse size but is only one of several criteria used to inform receptor value. Other criteria include the WFD watercourse classification which takes into account the value of any habitat which the watercourse supports. 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>.

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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	WFD 2019 status
WR-01-304b – D8						
Tributary of Waterless Brook/Arley Brook 1 WR-01-304b – F7	Ordinary watercourse	<0.002	Moderate			
Tributary of Waterless Brook/Arley Brook 2 WR-01-304b – F7	Ordinary watercourse	<0.002	Moderate			
Pickmere Lane Drain WR-01-304b – F6	Minor ditch	<0.002	Low			
School Lane Drain WR-01-304b - F5	Minor ditch	<0.002	Low			
Waterless/Arley Brook WR-01-304b – D8	Main river	0.04	High			
Tabley Brook WR-01-304b – G7	Ordinary watercourse	<0.002	Moderate			
Tributary of Waterless Brook/Arley Brook 3 WR-01-304b – F6	Ordinary watercourse	<0.002	Moderate			
Tributary of Waterless Brook/Arley Brook 4 WR-01-304b - F5	Ordinary watercourse	<0.002	Moderate			
Tributary of Tabley Brook 1 WR-01-304b – G6	Ordinary watercourse	<0.002	Low			
Tributary of Waterless Brook/Arley Brook 5 WR-01-304b – G5	Ordinary watercourse	<0.002	Moderate			
Tributary of Tabley Brook 2 WR-01-304b – G7	Ordinary watercourse	<0.002	Moderate			
Tributary of Tabley Brook 3 WR-01-304b – H6	Ordinary watercourse	<0.002	Moderate			
Tributary of Tabley Brook 4 WR-01-304b – H6	Ordinary watercourse	<0.002	Low			

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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	WFD 2019 status
Tributary of Tabley Brook 5 WR-01-304b - H7	Ordinary watercourse	<0.002	Low			
Tributary of Tabley Brook 6 WR-01-304b - H6	Ordinary watercourse	<0.002	Low			
Tributary of Tabley Brook 8 WR-01-304b - I6	Ordinary watercourse	<0.002	Low			
Belt Wood Drains WR-01-304b - I6	Minor ditch	<0.002	Low			
Tributary of Tabley Brook 7 WR-01-304b - I5	Ordinary watercourse	0.002	Moderate			
Tributary of Tabley Brook 9 WR-01-304b - I7	Ordinary watercourse	0.004	Moderate			
Winterbottom Lane Drains WR-01-304b - J5	Minor ditch	Not defined	Low			
Hoogreen Lane Drains WR-01-304b - J5	Minor ditch	<0.002	Low	Gale Brook GB112068060430	Moderate/Good by 2027	Moderate
Hulsheath Lane Drains WR-01-305a - A7	Minor ditch	<0.002	Low	Bollin (Ashley Mill to Manchester Ship Canal) GB112069061382	Moderate/Moderate by 2015	Moderate
Chapel Lane Drain WR-01-305a - A7	Minor ditch	<0.002	Low			
Tributary of Millington Clough 1 WR-01-305a - A7	Ordinary watercourse	<0.002	Low			
Tributary of Millington Clough 2 WR-01-305a - B6	Ordinary watercourse	<0.002	Low			
Kaylane Brook WR-01-305a - C4	Ordinary watercourse	<0.002	Moderate			
Tributary of Millington Clough 3 WR-01-305a - B6	Ordinary watercourse	<0.002	Low			
Tributary of Millington Clough 4 WR-01-305a - B7	Ordinary watercourse	<0.002	Low			

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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	WFD 2019 status
Froghall Lane Drains WR-01-305a – C6	Minor ditch	<0.002	Low			
Agden Brook WR-01-305a – E8	Main river	0.01	Moderate			
Tributary of Agden Brook 2 WR-01-305a – D8	Ordinary watercourse	<0.002	Low			
Tributary of Agden Brook 3 WR-01-305a – E8	Ordinary watercourse	<0.002	Low			
Tributary of Agden Brook 4 WR-01-305a – E8	Main river	<0.002	Moderate			

2.1.4 Table 2 summarises the surface water abstractions potentially affected by the Proposed Scheme. Their locations are shown on the Volume 5, Water resources and flood risk Map Book: map WR-01-304b, WR-01-305a and WR-01-308a². There are two licensed surface water abstractions, which have been assessed to be high value receptors. None of these abstractions are for public water supply (PWS). None of these are located within the land required for the construction of the Proposed Scheme.

2.1.5 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m³ 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.

Table 2: Surface water abstractions

Name, licence number (and map grid square) ²	Distance and direction from route	Abstraction source	Maximum annual abstraction quantity (m ³)	Maximum daily abstraction quantity (m ³)	Purpose
Private licensed water supplies					
Frog Lane Farm, Pickmere 2568003116 WR-01-304b – E6	500m west of the Proposed Scheme (340m west of the land required for construction of the Proposed Scheme)	Unnamed pond and two locations on Tributary of Smoker Brook 1 at Frog Lane Farm, Pickmere	6,819	436	Spray irrigation-direct

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Name, licence number (and map grid square) ²	Distance and direction from route	Abstraction source	Maximum annual abstraction quantity (m ³)	Maximum daily abstraction quantity (m ³)	Purpose
Agden Brook Farm, Altrincham 2569020016 WR-01-305a – D8	410m east of the Proposed Scheme (20m south-west of the land required for construction of the Proposed Scheme)	Agden Brook	7,092	354	Spray irrigation-direct

2.1.6 There are 14 permitted discharges to surface water within the study area, as shown in Table 3, three of which are within the land required for the construction of the Proposed Scheme. These have been assessed as low value receptors.

Table 3: Permitted discharges to surface water

Permit identifier (and map grid square) ²	Distance and direction from route	Discharge type	Receiving water body
NPSWQD009773 WR-01-304b – D5	880m west of the Proposed Scheme (670m west of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Tributary of Smoker Brook 1
01C/31 WR-01-304b – E8	820m east of the Proposed Scheme (400m north-east of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Tributary of Smoker Brook 2
016891618 WR-01-304b – F5	590m west of the route of the Proposed Scheme (250m south-west of the land required for construction of the Proposed Scheme)	Wastewater treatment works (not water company)	Tributary of Smoker Brook 1
NPSWQD005447 WR-01-304b – G6	100m east of the route of the Proposed Scheme (located adjacent to the land required for construction of the Proposed Scheme)	Domestic property (single) (including farmhouse)	Tabley Brook
01C/79 WR-01-304b – G7	440m east of the route of the Proposed Scheme (190m south-east of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Tributary of Tabley Brook 2
016891597 WR-01-304b – G5	540m west of the route of the Proposed Scheme (80m east of the land required for construction of the Proposed Scheme)	Wastewater treatment works (not water company)	Waterless/Arley Brook
016892421 WR-01-304b – H7	910m east of the route of the Proposed Scheme (120m north of the land required for construction of the Proposed Scheme)	Domestic property (multiple) (including farmhouse)	Tabley Brook

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Permit identifier (and map grid square) ²	Distance and direction from route	Discharge type	Receiving water body
016890372 WR-01-304b – I5	380m west of the route of the Proposed Scheme (90m south of the land required for construction of the Proposed Scheme)	Wastewater treatment works (not water company)	Tributary of Tabley Brook 8
016810082 WR-01-308a – B8	380m south-east of the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Wastewater treatment works (water company)	Tabley Brook
016892026 WR-01-305b – A6	Located directly on the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Sewerage and Trade Combined (unspecified)	Tributary of Agden Brook 1
016990318 WR-01-305b – A7	600m east of the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Wastewater treatment works (not water company)	Tributary of Millington Clough 1
NPSWQD004779 WR-01-305a – D6	380m west of the route of the Proposed Scheme (90 south-west of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Tributary of Agden Brook 1
016992555 WR-01-305b – E8	700m north-east of the route of the Proposed Scheme (510m east of the land required for construction of the Proposed Scheme)	Wastewater treatment works (not water company)	River Bollin
016993011 WR-01-305b – E8	460m north-east of the route of the Proposed Scheme (300m east of the land required for construction of the Proposed Scheme)	Wastewater treatment works (not water company)	Agden Brook

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 4. Further details are set out in Water Framework Directive compliance assessment baseline data (BID WR-002-00001). The receptor values attributed to each individual feature are based on the methodologies set out in the SMR³.
- 2.2.2 Volume 5, Water resources assessment and flood risk Map Book: map WR-02-303² shows the superficial and bedrock formations within MA03.

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Table 4: 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 deposits¹¹						
Alluvium	Mainly along the valleys of rivers and some 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	Not crossed by the route of the Proposed Scheme. Present in the north of the study area along parts of the River Bollin valley	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Shirdley Hill Sand Formation	Along the southern side of the River Bollin valley and Agden Brook	Sand	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Glaciofluvial deposits	Isolated area in the south, and present across the north of the study area	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Glaciofluvial sheet deposits	Not crossed by the route of the Proposed Scheme. Isolated areas in and around the River Bollin valley	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	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 the bedrock, including deposits which do not appear in the table.

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Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status ⁹ /2019 status	WFD objective ¹⁰	Receptor value
Glacial till	Located across much of the study area	Sandy silty clay with gravel	Secondary (Undifferentiated)	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB41202G991700) Poor/Poor	Good by 2027	Moderate
Bedrock						
Mercia Mudstone Group – Sidmouth Mudstone Formation – Northwich Halite Member	Across the southern region of the study area, and a small area in the north	Halite with mudstone partings	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Mercia Mudstone Group – Sidmouth Mudstone Formation – Bollin Mudstone Member	Across the central region of the study area. In outcrop between High Legh and Bucklow Hill	Mudstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Tarpoley Siltstone Formation	In parts of the north of the study area	Siltstone, mudstone and sandstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Sherwood Sandstone Group – Helsby Sandstone Formation	In an 800m wide band crossing the north of the study area	Pebbly sandstone	Principal	Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers (GB41201G101700) Poor/Poor	Good by 2027	High

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

2.2.4 The Northwich Halite Member of the Sidmouth Mudstone Formation (Mercia Mudstone Group) is classified as Unproductive strata. The Bollin Mudstone Member of the Sidmouth Mudstone Formation (Mercia Mudstone Group) and the Tarpoley Siltstone Formation (Mercia Mudstone Group), are classified as Secondary B aquifers. The Sherwood Sandstone

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Group, comprising the Helsby Sandstone Formation in the study area, is classified as a Principal aquifer. The structural geology of the study area is complex, with many major faults traversing the study area.

- 2.2.5 There are no Environment Agency observation boreholes which monitor groundwater level within the study area.
- 2.2.6 No groundwater monitoring data are available in the study area for the Secondary A and Secondary (Undifferentiated) aquifers in superficial deposits or for the Principal and Secondary B bedrock aquifers. Water strikes recorded on borehole logs, available via the British Geological Society (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 a higher elevation but greater depth on the valley sides and in more elevated areas. However, 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. The direction of groundwater flow is likely to follow the general topography, with the surface watercourses acting as discharge locations for converging groundwater flow.
- 2.2.8 In the superficial Secondary A and Secondary (Undifferentiated) aquifers (alluvium, river terrace deposits, glaciofluvial deposits, Shirdley Hill Sand Formation, 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 known as skerries. There may also be a small element of fracture flow within the Mercia Mudstone Group.
- 2.2.10 Groundwater in the Sherwood Sandstone Group is expected to flow approximately east to west, although due to the lack of groundwater level data it is not possible to confirm the direction at this time¹². The sandstone is present in extensive fractured blocks and the hydraulic connection between the different blocks is unclear. Groundwater flow within a fractured block is likely to be directional, with greater horizontal permeability than vertical permeability, and fracture flow is expected to play a significant role in the Sherwood Sandstone.
- 2.2.11 Table 5 summarises groundwater abstractions and their locations are shown on Volume 5, Water resources assessment and flood risk Map Book: map: WR-02-303².
- 2.2.12 There are no source protection zones (SPZ) associated with licensed public water supplies within the study area. There are two potential private abstractions from groundwater (unlicensed) in the study area. These do not have mapped SPZ but, where used for potable

¹² British Geological Survey (1989), *Hydrogeological map of Clwyd and the Cheshire Basin including parts of the hydrometric areas 54, 65, 66, 67, 68 69 and 70*. Available online at: <https://webapps.bgs.ac.uk/data/maps/maps.cfc?method=viewRecord&mapId=11567>.

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supply and some other purposes, have a nominal SPZ1 of 50m¹³. These abstractions have both been assessed as high value receptors although their use and purpose are currently unknown.

- 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 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 20m³ per day and not all unlicensed abstractions are registered with the local authority. These may also need to be protected.

Table 5: Summary of groundwater abstractions

Name, licence number (and map grid square) ¹⁴	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						
Well at Frog Lane Farm, Pickmere, Knutsford, Cheshire 2568003053 WR-02-303 – C5	930m west of the route of the Proposed Scheme (170m west of the land required for the construction of the Proposed Scheme)	Glacial till	3,319	Not defined	Unknown	1
Well at Heyrose Farm, Over Tabley, Knutsford 2568003036 WR-02-303 – D6	Crossed by the route of the Proposed Scheme	Glacial till	6,637	Not defined	Unknown	1

- 2.2.15 There is one permitted discharge to groundwater within the study area and this has been assessed as a low value receptor (see Table 6). There are two other consented discharges where the receiving water body is unknown, hence they have also been included in the

¹³ 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>.

¹⁴ Volume 5, Water resources assessment and flood risk Map Book: map WR-02-303 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.

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baseline data on a precautionary basis. These discharges have been assessed as low value receptors. These are summarised in Table 6.

Table 6: Permitted discharges to groundwater

Permit identifier (and map grid square) ¹⁵	Distance and direction from route	Discharge type	Receiving water body
01C/31 WR-02-303 – B5	820m east of the route of the Proposed Scheme (440m north of land required for the construction of the Proposed Scheme)	Septic tank - sewage discharges - final/treated effluent - not water company	Underground strata
01C/79 WR-02-303 – D6	500m east of the route of the Proposed Scheme (350m east of land required for the construction of the Proposed Scheme)	Sewage discharges - final/treated effluent - not water company	Unknown
0173/2093 WR-02-303 – G8	770m east of the route of the Proposed Scheme (510m east of land required for the construction of the Proposed Scheme)	Wastewater treatment works: sewage discharges - final/treated effluent - not water company	Unknown

2.3 Groundwater – surface water interactions

2.3.1 Table 7 summarises the potential groundwater – surface water interactions identified within the study area.

2.3.2 Along with the main surface watercourses, which could have connection with groundwater, potential springs and issues 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 7, but are excluded from the groundwater – surface water interactions impact assessment in Volume 5: Water resources assessment, Appendix WR-003-0MA03 and they are not shown in the table below or on Volume 5, Water resources assessment and flood risk Map Book: map, WR-02-303², because they are implicitly included in the assessment of surface waters. Where they are inflows to minor ditches, for example, then any related impacts will be identified as part of the assessment on surface water features. In the absence of site surveys, the potential spring features have been assumed to comprise springs and to be high or very high value receptors. Where a spring does not support water dependant habitat then the corresponding value of the receiving surface watercourse is applied.

¹⁵ Volume 5, Water resources assessment and flood risk Map Book: map WR-02-303. Discharges in the study area are listed from south to north.

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Table 7: Groundwater – surface water interactions

Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Watercourses				
Tributary of Smoker Brook 1 WR-02-303 – C5	30m west of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	20	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Smoker Brook 2 WR-02-303 – C5	266m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	37	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Waterless Brook/Arley Brook 2 WR-02-303 – C5	220m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	37	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Waterless Brook/Arley Brook 1 WR-02-303 – C6	600m east of the route of the Proposed Scheme (340m east of land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	33	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Waterless Brook/Arley Brook WR-02-303 – C5	Crossed by the route of the Proposed Scheme	Alluvium, glaciofluvial deposits and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	33	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tabley Brook WR-02-303 – C5	120m east of the route of the Proposed Scheme (10m east of land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	34	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

¹⁶ Volume 5, Water resources and flood risk Map Book: map WR-02-303. 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.

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Tributary of Waterless Brook/Arley Brook 4 WR-02-303 – D5	370m west of the route of the Proposed Scheme (110m west of land required for the construction of the Proposed Scheme)	Glaciofluvial deposits and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	35	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Waterless Brook/Arley Brook 5 WR-02-303 – D5	440m west of the route of the Proposed Scheme (310m north-west of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	34	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 1 WR-02-303 – D6	10m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	45	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 2 WR-02-303 – D6	Crossed by the route of the Proposed Scheme	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	50	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 3 WR-02-303 – D6	10m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	52	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 4 WR-02-303 – D6	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	53	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 5 WR-02-303 – D6	210m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	55	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Tributary of Tabley Brook 6 WR-02-303 – D6	10m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	55	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 8 WR-02-303 – E6	Crossed by the route of the Proposed Scheme	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	54	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Tabley Brook 9 WR-02-303 – E7	100m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Bollin Mudstone Member)	61	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Millington Clough 1 WR-02-303 – F7	Crossed by the route of the Proposed Scheme	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation – Bollin Mudstone Member and Tarporley Siltstone Formation)	57	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Millington Clough 2 WR-02-303 – F7	Crossed by the route of the Proposed Scheme	Mercia Mudstone Group (Sidmouth Mudstone Formation – Bollin Mudstone Member and Tarporley Siltstone Formation)	57	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Millington Clough 3 WR-02-303 – F7	Crossed by the route of the Proposed Scheme	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation – Bollin Mudstone Member and Tarporley Siltstone Formation)	55	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Millington Clough 4 WR-02-303 – F7	Crossed by the route of the Proposed Scheme	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation – Bollin Mudstone Member)	57	Watercourses are likely to be in hydraulic connection with the underlying and adjacent

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
		and Tarporley Siltstone Formation)		permeable superficial deposits.
Agden Brook WR-02-303 – F8	Crossed by the route of the Proposed Scheme	Alluvium, river terrace deposits, glaciofluvial deposits and Shirdley Hill Sand Formation over Sherwood Sandstone Group (Helsby Sandstone Formation) and Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member and Tarporley Siltstone Formation)	22	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Agden Brook 1 WR-02-303 – G7	Crossed by route of the Proposed Scheme	Glaciofluvial deposits, Shirdley Hill Sand Formation and glacial till over Mercia Mudstone Group (Tarporley Siltstone Formation and Sidmouth Mudstone Formation - Northwich Halite Member) and Sherwood Sandstone Group (Helsby Sandstone Formation).	25	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Agden Brook 2 WR-02-303 – G8	460m east of the route of the Proposed Scheme (50m north of land required for the construction of the Proposed Scheme)	Glaciofluvial deposits, Shirdley Hill Sand Formation and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	20	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Agden Brook 3 WR-02-303 – H8	690m east of the route of the Proposed Scheme (600m east of land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Tarporley Siltstone Formation and Sidmouth Mudstone Formation - Northwich Halite Member)	14	Watercourses are likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Agden Brook 4 WR-02-303 – H8	650m east of the route of the Proposed Scheme (380m south-east of land required for the	Alluvium and river terrace deposits over Sherwood Sandstone Group (Helsby Sandstone Formation) and Mercia Mudstone	15	Watercourses are likely to be in hydraulic connection with the underlying and adjacent

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
	construction of the Proposed Scheme)	Group (Sidmouth Mudstone Formation - Northwich Halite Member)		permeable superficial deposits.
Springs or potential spring features				
Potential spring at Clay House Farm, Flittogate Lane WR-02-303 – C6	790m east of the route of the Proposed Scheme (220m south-east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	32	Surveys confirmed it is a possible spring supporting a high value watercourse. This feature therefore is a high value receptor.
Potential spring at M6, 160m north of Hollowood Farm, Cheshire East WR-02-303 – D6	70m west of the route of the Proposed Scheme (within land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	54	Surveys have shown this to be a land drain which discharges to Tributary of Tabley Brook 4 and it is therefore included in the surface water assessment.
Potential spring north of Tableypipe Wood, Cheshire East WR-02-303 – D7	900m east of the route of the Proposed Scheme (300m north of land required for the construction of the Proposed Scheme)	Alluvium and glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	50	Not surveyed. Assumed to be a high value receptor until verified by surveys. If present, this feature is likely to discharge from the alluvium.
Potential spring 175m north-west of Kennel Wood, Cheshire East WR-02-303 – E7	580m east of the route of the Proposed Scheme (490m south-east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	65	Surveys have shown this to be a drainage outfall which discharges to Tributary of Tabley Brook 9 and it is therefore included in the surface water assessment.
Potential spring 170m north-west of Kennel Wood, Cheshire East WR-02-303 – E7	580m east of the route of the Proposed Scheme (490m east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	61	Surveys have shown this to be a drainage outfall which discharges to Tributary of Tabley Brook 9 and it is therefore included in the surface water assessment.

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Potential spring 310m east of Daisybank Farm, Winterbottom Lane WR-02-303 – E6	180m east of the route of the Proposed Scheme (90m east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	57	Surveys have shown this to be a land drain which discharges to Tributary of Tabley Brook 9 and it is therefore included in the surface water assessment.
Potential spring at Belt Wood east WR-02-303 – E7	500m south-east of the route of the Proposed Scheme (adjacent to land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	77	Surveys unable to identify if this is a modified spring or drainage outfall. Assumed to be a high value receptor until verified by further surveys. If confirmed as a spring, it is likely to discharge from the glacial till.
Potential spring 360m west of Goodiersgreen Farm, Hoo Green Lane WR-02-303 – E7	200m south-east 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 - Bollin Mudstone Member)	60	Surveys have shown this to be a land drain which discharges to Tributary of Tabley Brook 9 and it is therefore included in the surface water assessment.
Spring at Belt Wood north WR-02-303 – E7	450m east of the route of the Proposed Scheme (310m north-east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	59	Surveys have shown this is a spring supporting a moderate value watercourse. This is therefore a moderate value receptor.
Potential spring at Hoo Green Lane, 200m south-west of Hoo Green WR-02-303 – E7	60m east 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 - Bollin Mudstone Member)	61	Surveys have shown this to be a land drain which discharges to Tributary of Tabley Brook 9 and it is therefore included in the surface water assessment.
Potential spring 250m south-west of Yew Tree Farm, A50	540m west of the route of the Proposed Scheme (340m south-west of land required	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone	66	Surveys have shown this to be a land drain which discharges to

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
WR-02-303 – F6	for the construction of the Proposed Scheme)	Formation - Bollin Mudstone Member)		Tributary of Northwood Drain and it is therefore included in the surface water assessment.
Potential spring at Dobb Lane, Yew Tree Farm, A50 WR-02-303 – E6	330m west of the route of the Proposed Scheme (180m west of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	68	Surveys have shown this to be a land drain which discharges to Tributary of Tabley Brook 7 and supports an undesignated habitat. This is therefore a moderate value receptor.
Potential spring at Park Farm, Ditchfield Lane WR-02-303 – F6	830m east of the route of the Proposed Scheme (530m east of land required for the construction of the Proposed Scheme)	Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	66	Surveys have shown this to be a land drain which discharges to tributary of Northwood Drain and it is therefore included in the surface water assessment.
Spring at Wrenshot House, Wrenshot Lane WR-02-303 – F7	200m west of the route of the Proposed Scheme (120m west of land required for the construction of the Proposed Scheme)	Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	68	Surveys confirmed it is a spring supporting a low value stream. This feature is therefore a low value receptor.
Potential spring at ponds 360m north of Wrenshot House, Wrenshot Lane WR-02-303 – F7	200m west of the route of the Proposed Scheme (120m west of the land required for the construction of the Proposed Scheme)	Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	58	Surveys have shown this to be a land drain which discharges to Tributary of Millington Clough 2 and supports an undesignated habitat. This is therefore a moderate value receptor.
Potential spring 200m south of Middlemoss Farm, Agden Lane WR-02-303 – F7	60m west of the route of the Proposed Scheme (within the land required for	Glacial till over Mercia Mudstone Group (Tarpurley Siltstone Formation)	56	Surveys have shown this to be a land drain which discharges to Tributary of

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
	construction of the Proposed Scheme)			Millington Clough 4 and it is therefore included in the surface water assessment.
Potential spring at Bowdon roundabout WR-02-303 – G9	880m north of the route of the Proposed Scheme (250m north of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Tarpoley Siltstone Formation)	26	Not surveyed. Assumed to be a high value receptor until verified by further surveys. If present, it is likely to discharge from the glacial till.
Potential spring 25m north-east of The Meadows, Spodegreen Lane WR-02-303 – G9	980m north-west of the route of the Proposed Scheme (800m north-west of land required for the construction of the Proposed Scheme)	Glaciofluvial deposits over Mercia Mudstone Group (Tarpoley Siltstone Formation)	22	Not surveyed. Assumed to be a high value receptor until verified by surveys. If present, it is likely to discharge from the glaciofluvial deposits.
Potential sink 510m west of Tableypipe Wood WR-02-303 – D6	220m east of the route of the Proposed Scheme (within land required for the construction of the Proposed Scheme)	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	50	Surveys have shown this to be a culvert which discharges to Tributary of Tabley Brook 4 and it is therefore included in the surface water assessment.
Potential spring 290m west of Tableypipe Wood, Cheshire East WR-02-303 – D6	480m east of the route of the Proposed Scheme (160m east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Northwich Halite Member)	52	Surveys have shown this to be a culvert which discharges to Tributary of Tabley Brook 5 and it is therefore included in the surface water assessment.
Potential sink east of Daisybank Farm, Winterbottom Lane WR-02-303 – E6	60m north-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 - Bollin Mudstone Member)	60	Surveys have shown this to be a culvert which discharges to Winterbottom Lane Drains and it is therefore included in the surface water assessment.
Potential sink 175m south of Hoo Green WR-02-303 – E7	260m east of the route of the Proposed Scheme (160m east of land required for the construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation - Bollin Mudstone Member)	60	Surveys have shown this to be a culvert which discharges to Tributary of Tabley Brook 9 and it is therefore included

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Feature (and map grid square) ¹⁶	Distance and direction from route	Formation	Elevation (mAOD)	Comments
				in the surface water assessment.
Potential spring at Bridgewater Canal, north of Agden Brook Farm WR-02-303 – G8	450m east of the route of the Proposed Scheme (180m north-east of land required for the construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	22	Surveys have shown this to be a culvert which discharges to Tributary of Agden Brook 2 and it is therefore included in the surface water assessment.
Potential spring at Spring Lane, north of Agden Bridge Farm WR-02-303 – G7	300m east of the route of the Proposed Scheme (210m east of land required for the construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	22	Surveys have shown this to be a culvert which discharges to Tributary of Agden Brook 1 and it is therefore included in the surface water assessment.
One potential spring and one potential sink north of Woolstencroft Farm WR-02-303 – G8 and H8	560m east of the route of the Proposed Scheme (490m east of land required for the construction of the Proposed Scheme)	Glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	21	Surveys have shown these features to be culverts which discharge to Tributary of Agden Brook 2 and they are therefore included in the surface water assessment.
Potential sink 440m north of Woolstencroft Farm WR-02-303 – H8	750m east of the route of the Proposed Scheme (630m east of land required for the construction of the Proposed Scheme)	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation – Northwich Halite Member)	13	Surveys have shown this to be a culvert which discharges to Tributary of Agden Brook 3 and it is therefore included in the surface water assessment.
Two potential springs along Agden Lane and Agden Brow WR-02-303 – G7	280m west of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	Glacial till over Sherwood Sandstone Group (Helsby Sandstone Formation)	41	Surveys have shown these features to be culverts which discharge to Tributary of Agden Brook 1 and they are therefore included in the surface water assessment.

2.4 Water dependent habitats

2.4.1 Table 8 summarises the groundwater dependent habitats and surface water dependent habitats within the study area.

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Table 8: Water dependent habitats

Name (and map grid square) ¹⁷	Distance and direction from route	Designation	Comments
Groundwater dependent habitats			
Rinks Wood and Round Wood EC-01-509b – I7	480m east of the route of the Proposed Scheme (adjacent to land required for the construction of the Proposed Scheme)	Local Wildlife Sites (LWS) and ancient woodland	Rinks Wood and Round Wood may be supported by groundwater flow from the alluvium, glaciofluvial deposits (Secondary A aquifers) and glacial till (Secondary (Undifferentiated) aquifer). Waterless Brook/Arley Brook, and Tributary of Waterless Brook/Arley Brook 1, flow through this habitat. This site has been included on a precautionary basis.
Bongs Wood and Rough EC-01-510 – E3	580m west of the Proposed Scheme (partly within the land required for construction of the Proposed Scheme)	LWS and ancient woodland	Bongs Wood and Rough is potentially supported by groundwater in the underlying alluvium (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer), hence the site has been included on a precautionary basis.
Tabley Pipe Wood EC-01-510 – H8	760m east of the route of the Proposed Scheme (adjacent to land required for the construction of the Proposed Scheme)	LWS	There may be some groundwater flow supporting the habitat through alluvium (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer). This site has, therefore, been included on a precautionary basis.
Belt Wood EC-01-511 – C6	160m east of the route of the Proposed Scheme (within the land required for construction of the Proposed Scheme)	LWS and ancient woodland	Belt Wood is underlain by glacial till (Secondary (Undifferentiated) aquifer). It is currently unclear if this site is supported by groundwater, hence it has been included on a precautionary basis.
Park Covert EC-01-511 – H4	410m west of the route of the Proposed Scheme (30m west of the land required for construction of the Proposed Scheme)	Ancient woodland	Park Covert may be supported by groundwater flow from the glaciofluvial deposits (Secondary A aquifers) and glacial till (Secondary (Undifferentiated) aquifer) underlying the site. It is currently unclear if this site is supported by groundwater, hence it has been included on a precautionary basis.
Fields behind 'Ye Olde No. 3' (public house) EC-01-512a – G7	450m east of the route of the Proposed Scheme (within the land required for the construction of the Proposed Scheme)	LWS	The habitat consists of wet grassland and wetland woodland and is likely groundwater dependent. The groundwater flow supporting the habitat is likely to occur through alluvium, glaciofluvial till and the Shirdley Hill Sand Formation (Secondary A aquifers).
Woolstencroft Farm Meadow EC-01-512a – J8	640m east of the route of the Proposed Scheme (540m east of land)	LWS	The site is likely to be partially groundwater dependant due to the damp habitat communities present. Groundwater in alluvium,

¹⁷ 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 shows water dependent habitats with statutory designations.

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Name (and map grid square) ¹⁷	Distance and direction from route	Designation	Comments
	required for the construction of the Proposed Scheme)		glaciofluvial deposits (Secondary A aquifer) and glacial till (Secondary (Undifferentiated) aquifer) is likely to support this habitat. There is also the possibility of some surface water dependence on Agden Brook and Tributary of Agden Brook 3 located in the valley.
Surface water and groundwater dependent habitats			
The Mere, Mere (part of Midland Meres and Mosses (Phase 1) Ramsar site) EC-01-510 – R2	Approximately 1.8km east of the route of the Proposed Scheme (260m east of the land required for the construction of the Proposed Scheme)	SSSI and a part of the Midland Meres and Mosses Phase 1 Ramsar site.	The Mere, Mere consists of two lakes, and may be supported by both groundwater and surface water.
Arley and Waterless Brook Corridor EC-01-510 – C5	Crossed by the route of the Proposed Scheme	LWS	The habitat is located along the Waterless Brook/Arley Brook. The habitat is supported by the surface watercourse, which is in turn likely to be groundwater fed, hence the habitat may be supported by both groundwater and surface water.
Surface water dependent habitats			
Leonard's and Smoker Wood (including Smoker Brook) EC-01-509b – D6	Crossed by the route of the Proposed Scheme	LWS and ancient woodland	Leonards and Smoker Wood is not wet woodland, and there is no evidence that the habitat is dependent on groundwater. Smoker Brook flows through Smoker Wood and may be supporting the surface water habitat, and the site has been included on a precautionary basis.

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3 References

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