In Parliament – Session 2021 - 2022

HS2

High Speed Rail (Crewe – Manchester)

Background information and data

Water resources and flood risk

BID WR-004-0MA04

MA04: Broomedge to Glazebrook

Water resources assessment baseline data

M318

HS2

High Speed Rail (Crewe – Manchester)

Background information and data

Water resources and flood risk

BID WR-004-0MA04

MA04: Broomedge to Glazebrook

Water resources assessment baseline data

M318

Department for Transport

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

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

Telephone: 08081 434 434

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

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

ARUP+ ERM | FOSTER + PARTNERS | JACOBS
RAMBOLL | TYPSA | COSTAIN

MWJV
Mott MacDonald | WSP

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

recycle

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

Contents

Tables

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 has been collected in relation to the Broomedge to Glazebrook community area (MA04).

1.1.3 The HS2 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-003-0MA04 and WR-005-0MA04);
- the hydraulic modelling report which support the flood risk assessment (Volume 5: Appendix WR-006-00002); 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-02[2].

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 Broomedge to Glazebrook area, the study area has been extended to include the Rixton Clay Pits Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI), Local Nature Reserve (LNR), and Local Wildlife Site (LWS).

[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 in Section 2.3.

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
Agden Lane Road Drain 1 WR-01-305b – D7	Minor ditch	<0.002	Low	Bollin (Ashley Mill to Manchester Ship Canal) GB112069061382	Moderate/ Moderate by 2015	Moderate
Tributary of Agden Brook 1 WR-01-305b – D7	Ordinary watercourse	<0.002	Low			
Agden Lane Road Drain 2 WR-01-305b – E8	Minor ditch	<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.

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
Bridgewater Canal WR-01-305b – E7	Canal	Not defined	Very high	Bridgewater Canal GB71210001	Moderate/ Good by 2027	Moderate
Helsdale Brook WR-01-305b – F6	Ordinary watercourse	0.006	Moderate	Bollin (Ashley Mill to Manchester Ship Canal) GB112069061382	Moderate/ Moderate by 2015	Moderate
River Bollin WR-01-305b – F7	Main river	1.2	Very high			
Wet Gate Lane Drain WR-01-305b – F7	Minor ditch	<0.002	Low			
Old Bollin WR-01-305b – F7	Main river	0.003	Low			
Tributary of Old Bollin WR-01-305b – G7	Ordinary watercourse	<0.002	Low			
Carrgreen Lane Drain WR-01-305b – G8	Minor ditch	<0.002	Low			
Tributary of Manchester Ship Canal 2 (Warburton Park Brook) WR-01-305b – H7	Main river	0.003	Low	Mersey/ Manchester Ship Canal (Irwell/Manchester Ship Canal to Bollin) GB112069061011	Moderate/ Moderate by 2015	Moderate
Field Drains A6144 WR-01-305b – H8	Minor ditch	<0.002	Low			
Manchester Ship Canal[9] WR-01-305b – I7	Canal	Not defined	Very high			
Red Brook WR-01-305b – I7	Main river	0.1	High	Sinderland Brook GB112069060980	Moderate/ Moderate by 2015	Poor
Tributary of Manchester Ship Canal 1 WR-01-305b – I6	Ordinary watercourse	<0.002	Moderate	Mersey/ Manchester Ship Canal (Irwell/Manchester Ship Canal to Bollin) GB112069061011	Moderate/ Moderate by 2015	Moderate
Marsh Brook WR-01-306a – B6	Ordinary watercourse	<0.002	Moderate			
Glaze Brook WR-01- 306a – B7	Main river	0.8	High	Glaze GB112069061420	Poor/Poor by 2015	Bad

[9] The Manchester Ship Canal is a canalised section of the River Mersey in the study area. It is referred to as the Manchester Ship Canal throughout this report.

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 Glaze Brook 1 (Hollins Green Brook) WR-01-306a – B7	Main river	<0.002	Low			
Glazebrook Lane Drains WR-01-306a – C8	Minor ditch	<0.002	Low			
Dam Head Lane Drains WR-01-306a – C7	Minor ditch	<0.002	Low			
Tributary of Glaze Brook 2 WR-01-306a – D7	Ordinary watercourse	<0.002	Low			
Tributary of Glaze Brook 3 WR-01-306a – D8	Ordinary watercourse	<0.002	Moderate			
Boundary Drain WR-01-306a – E10	Minor ditch	<0.002	Low			
Birch Covert Drains WR-01-306a – E10	Minor ditch	<0.002	Low			
Little Woolden Moss Drain WR-01-306a – F10	Minor ditch	<0.002	Low			

2.1.3 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-01-305b and WR-01-306a[2]. There are ten licensed surface water abstractions, all of which have been assessed to be high value receptors. None of these abstractions are for public water supply (PWS). One of these is located within the land required for the construction of 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.

Table 2: Surface water abstractions

Name, licence number (and map grid square)[4]	Distance and direction from route	Abstraction source	Maximum annual abstraction quantity (m^3)	Maximum daily abstraction quantity (m^3)	Purpose
Private licensed water supplies					
Woolstencroft Farm, Agden 2569020060 WR-01-305b – E7	150m west of the route of the Proposed Scheme (located within the land required for the construction of the Proposed Scheme)	Bridgewater Canal at Agden	6,810	364	Spray irrigation-direct
Agden Brook Farm, Altrincham 2569020067 WR-01-305b – F6	960m west of the route of the Proposed Scheme (170m west of the land required for the construction of the Proposed Scheme)	Bridgewater Canal at Agden	13,650	900	Spray irrigation-direct
Woolstencroft Farm, Agden 2569020063 WR-01-305b – E8	750m east of the route of the Proposed Scheme (600m south-east of the land required for the construction of the Proposed Scheme)	River Bollin at Agden	13,000	400	Spray irrigation-direct
Agden Brook Farm, Altrincham 2569020041 WR-01-305b – F8	250m east of the route of the Proposed Scheme (50m north-east of the land required for construction of the Proposed Scheme)	River Bollin at Heatley Altrincham	16,300	900	Spray irrigation-direct
Yew Tree House Farm, Altrincham 2569020065 WR-01-305b – F6	945m west of the route of the Proposed Scheme (250m west of the land required for the construction of the Proposed Scheme)	River Bollin at Heatley Weir	13,640	900	Spray irrigation-direct
Moss Brow Farm, Warburton 2569020059 WR-01-305b – F6	475m south-west of the route of the Proposed Scheme (60m south-west of the land required for construction of the Proposed Scheme)	River Bollin at Warburton, Lymm	17,048	436	Spray irrigation-direct
Agden Brook Farm, Altrincham 2569020010 WR-01-305b – F6	520m west of the route of the Proposed Scheme (75m west of the land required for construction of the Proposed Scheme)	River Bollin at Warburton, Lymm	13,650	900	Spray irrigation-direct
Moss Brow Farm, Warburton 2569020015 WR-01-305b – G7	240m south-west of the route of the Proposed Scheme (60m north of the land required for	Tributary of Old Bollin 1 at Moss Brow Farm, Warburton	10,638	355	Spray irrigation-direct

Name, licence number (and map grid square)[4]	Distance and direction from route	Abstraction source	Maximum annual abstraction quantity (m^3)	Maximum daily abstraction quantity (m^3)	Purpose
	construction of the Proposed Scheme)				
Transfer License at Heatley Weir NW/068/0001/002 Environment Agency WR-01-305b – G6	590m south-west of the route of the Proposed Scheme (90m south-east of the land required for construction of the Proposed Scheme)	River Bollin at Heatley Weir	Unknown	Unknown	Fish pass/Canoe pass
Agden Brook Farm, Altrincham 2569017032 WR-01-305b – I7	120m west of the route of the Proposed Scheme (located adjacent to the land required for construction of the Proposed Scheme)	Red Brook at Warburton, Lymm	13,640	873	Spray irrigation-direct

2.1.4 There are 18 permitted discharges to surface water potentially affected by Proposed Scheme, as shown in Table 3, one of which is 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)[4]	Distance and direction from route	Discharge type	Receiving water body
016892389 WR-01-305b – F8	300m east of the route of the Proposed Scheme (110m east of the land required for construction of the Proposed Scheme)	Domestic property (multiple) (including farm houses)	River Bollin
01WAR0067 WR-01-305b – G6	670m south-west of the route of the Proposed Scheme (190m south-west of the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	River Bollin
016892035 WR-01-305b – G8	270m north-east of the route of the Proposed Scheme (35m east of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Tributary of the Manchester Ship Canal 2
01TRA0050 WR-01-305b – H7	675m west of the route of the Proposed Scheme (460m north-west of the land require for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Unknown
016891884 WR-01-305b – H9	870m north-east of the route of the Proposed Scheme (220m north-east of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Red Brook

Permit identifier (and map grid square)[4]	Distance and direction from route	Discharge type	Receiving water body
016940148 WR-01-305b – I8	345m north-east of the route of the Proposed Scheme (35m east of the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Red Brook
016982608 WR-01-305b – I7	305m west of the route of the Proposed Scheme (25m south of the land required for construction of the Proposed Scheme)	Wastewater treatment works/sewage treatment works (water company)	Manchester Ship Canal
01TRA0035 WR-01-305b – J10	1km east of the route of the Proposed Scheme (405m north-east of the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Manchester Ship Canal
01TRA0046 WR-01-305b – J10	1km east of the route of the Proposed Scheme (400m north-east of the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Unknown
0174/2311 WR-01-305b – I5	1km west of the route of the Proposed Scheme (700m north-west of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Marsh Brook
01TRA0047 WR-01-305b – J10	975m east of the route of the Proposed Scheme (445m north-east of the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Unknown
01WAR0047 WR-01-305b – I7	250m north-east of the route of the Proposed Scheme (located within the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Glaze Brook
016992454 WR-01-305b – I7	265m north-east of the route of the Proposed Scheme (50m north-east of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (not water company)	Glaze Brook
016940133 WR-01-306a – B7	725m east of the route of the Proposed Scheme (285m north-east of the land required for construction of the Proposed Scheme)	Sewage discharge - final/treated effluent (water company)	Glaze Brook
01WAR0040 WR-01-306a – B8	780m east of the route of the Proposed Scheme (280m north-east of the land required for	Sewage discharges - storm overflow/storm tank (water company)	Glaze Brook

Permit identifier (and map grid square)[4]	Distance and direction from route	Discharge type	Receiving water body
	construction of the Proposed Scheme)		
01WAR0037 WR-01-306a – C8	860m north-east of the route of the Proposed Scheme (455m south-east of the land required for construction of the Proposed Scheme)	Pumping station on sewerage network (water company)	Glaze Brook
01SAL0049 WR-01-306a – C8	900m north-east of the route of the Proposed Scheme (455m south-east of the land required for construction of the Proposed Scheme)	Sewage discharges - storm overflow/storm tank (water company)	Glaze Brook
01WAR0036 WR-01-306a – C8	900m east of the route of the Proposed Scheme (310m south-east of the land required for construction of the Proposed Scheme)	Pumping station on sewerage network (water company)	Glaze 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 SMR[3].

2.2.2 Volume 5, Water resources assessment and flood risk Map Book, map: WR-02-304[2] shows the superficial and bedrock formations within MA04.

Table 4: Summary of geology and hydrogeology in the study area

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[10] /2019 status	WFD objective[11]	Receptor value
Superficial deposits[12]						
Peat	Northern end of the study area at	Peat	Unproductive	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500)	Good by 2027	Low

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

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

[12] 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[10] /2019 status	WFD objective[11]	Receptor value
	Glazebrook Moss			Poor/Poor		
Alluvium	Along the main rivers and some tributaries	Clay, silt, sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500) Poor/Poor	Good by 2027	Moderate
River terrace deposits	Not crossed by the route of the Proposed Scheme. Isolated patches on the south side of the valley of the River Bollin	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500) Poor/Poor	Good by 2027	Moderate
Shirdley Hill Sand Formation	Along the Bridgewater Canal and around Mossbrow and Partington	Sand	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500) Poor/Poor	Good by 2027	Moderate
Glaciofluvial deposits	Patches at Glazebrook and south of Mossbrow	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500) Poor/Poor	Good by 2027	Moderate
Glaciofluvial sheet deposits	Along the valleys of the River Bollin, the Glaze Brook and Manchester Ship Canal	Sand and gravel	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500) Poor/Poor	Good by 2027	Moderate
Glacial till	In the northern and southern parts of the study area to the west of the Proposed Scheme	Sandy silty clay with pebbles	Secondary (Undifferentiated)	Weaver and Dane Quaternary Sand and Gravel Aquifer (GB40401G300500) Poor/Poor	Good by 2027	Moderate

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[10] /2019 status	WFD objective[11]	Receptor value
Bedrock						
Mercia Mudstone Group – Sidmouth Mudstone Formation – Northwich Halite Member	In and along the southern side of the valley of the River Bollin	Halite stone and mudstone	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Mercia Mudstone Group – Sidmouth Mudstone Formation – Bollin Mudstone Member	North of the valley of the River Bollin and south-west of Hollins Green and Glazebrook Moss	Mudstone and siltstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Tarporley Siltstone Formation	From Glazebrook Moss to Red Brook. Minor area close to the study area southern boundary near Broomedge	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	Between Glazebrook and Partington. Minor area close to the study area southern boundary near Broomedge	Pebbly sandstone	Principal	Lower Mersey Basin and Merseyside North Permo-Triassic Sandstone Aquifers (GB41201G101700) Poor/Poor	Good by 2027	High
Sherwood Sandstone Group – Wilmslow Sandstone Formation	Not crossed by the route of the Proposed Scheme. Minor area in the south of the study area	Sandstone	Principal	Lower Mersey Basin and Merseyside North Permo-Triassic Sandstone Aquifers (GB41201G101700) Poor/Poor	Good by 2027	High

2.2.3 Alluvium, river terrace deposits, Shirdley Hill Sand Formation, glaciofluvial deposits and glaciofluvial sheet deposits in the study area are all classified as Secondary A aquifers by the Environment Agency. Glacial till is classified as a Secondary (Undifferentiated) aquifer by the Environment Agency. The peat is classified as Unproductive by the Environment Agency.

2.2.4 The following bedrock aquifer classifications apply in the study area. Within the Mercia Mudstone Group, the Sidmouth Mudstone Formation, Bollin Mudstone Member, and the Tarporley Siltstone Formation, are classified as Secondary B aquifers. The Mercia Mudstone Group, Sidmouth Mudstone Formation, Northwich Halite Member is classified as Unproductive. The Sherwood Sandstone Group, comprising the Helsby Sandstone Formation and Wilmslow Sandstone Formation, is classified as a Principal aquifer.

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

2.2.6 There are no Environment Agency observation boreholes which monitor groundwater levels within the study area. No groundwater monitoring data are available for the Principal, Secondary A and Secondary B aquifers in the study area. Water strikes recorded on borehole logs available via 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 present at a shallow depth, and the direction of groundwater flow is likely to follow the general topography. Groundwater flow may discharge to some surface watercourses.

2.2.8 Some groundwater flow may occur in the Mercia Mudstone Group, although permeable horizons are expected to be laterally discontinuous and associated with thin siltstone and sandstone layers called skerries. There may also be a small component of fracture flow in the aquifers in the Mercia Mudstone Group. The Environment Agency considers that these bedrock aquifers may be hydraulically connected to the superficial deposits (Weaver and Dane Quaternary Sand and Gravel Aquifer WFD groundwater body).

2.2.9 Groundwater in the Sherwood Sandstone is expected to flow approximately east to west, based on hydrogeology maps available from the BGS[13], although due to the limited groundwater level data available it is not possible to confirm the overall direction of flow. Fracture flow is likely to play a significant role in groundwater flow.

2.2.10 Table 5 summarises groundwater abstractions and their locations are shown on Volume 5, Water resources assessment and flood risk Map Book, map WR-02-304[2].

2.2.11 One groundwater abstraction licence for public water supply (PWS) is located near Lymm, approximately 3.1km to the west of the route in the southern part of the community area. A

[13] 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.

source protection zone (SPZ)3[14], associated locally with the PWS near Lymm, extends into the study area but does not cross the route of the Proposed Scheme.

2.2.12 The route also crosses the SPZ3 at the northern end of this study area, near Glazebrook. Here the SPZ3 is associated with a group of abstractions located between 5.9km and 6.6km to the north of the study area. These abstractions are located within the Risley to Bamfurlong (MA05) area. The baseline information on these abstractions is presented in BID WR-004-0MA05.

2.2.13 There are no private abstractions from groundwater (licensed and unlicensed) in the study area.

Table 5: Summary of groundwater abstractions

Name, licence number (and map grid square)[15]	Distance and direction from route	Abstraction source	Maximum annual abstraction quantity (m^3)	Maximum daily abstraction quantity (m^3)	Purpose	Number of boreholes
Public water supplies (PWS)						
United Utilities Water Ltd. Licence identifier confidential WR-02-304 – D3, SPZ3 location	3.1km west of the route of the Proposed Scheme (SPZ3 located 80m south-west of the land required for construction of the Proposed Scheme)	Sherwood Sandstone Group (assumed to be Helsby Sandstone Formation)	3,318,580	9,092	Public water supply (PWS)	2
United Utilities Water Ltd. Licence identifier confidential Group of four abstractions WR-02-304 – F5, F6, G5 and G6, SPZ3 location	5.9km to 6.3km north-west of the route of the Proposed Scheme (in MA05) (SPZ3 includes land required for the construction of the Proposed Scheme in MA04)	Sherwood Sandstone Group (assumed to be Chester Formation in MA05)	Various see BID WR-004-0MA05 for details	Various see BID WR-004-0MA05 for details	Public water supply (PWS)	Various see BID WR-004-0MA05 for details

2.2.14 There is one consented discharge to groundwater within the study area and this has been assessed as a low value receptor. This is summarised in Table 6.

[14] SPZ3 represents the total catchment area of an abstraction.

[15] Volume 5, Water resources assessment and flood risk Map Book, map WR-02-304 for SPZs, 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.

Table 6: Discharge consents to groundwater

Permit identifier (and map grid square) [16]	Distance and direction from route	Discharge type	Receiving water body
EPRCB3592AS WR-02-304 – C5	95m east of the route of the Proposed Scheme (10m north of land required for the construction of the Proposed Scheme)	Soakaway - domestic final/treated effluent (multiple properties)	Underground strata

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 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 7, but are excluded from the groundwater – surface water interactions impact assessment in Volume 5: Water resources assessment, Appendix WR-003-0MA04 and they are not shown on Volume 5, Water resources assessment and flood risk Map Book: map WR-02-304[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 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.

Table 7: Groundwater – surface water interactions

Feature (and map grid square)[17]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Watercourses				
Tributary of Agden Brook 1 WR-02-304 – C5	Crossed by the route of the Proposed Scheme	Shirdley Hill Sand Formation and glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member) and Sherwood Sandstone	25	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

[16] Volume 5, Water resources assessment and flood risk Map Book, map WR-02-304. Discharges in the study area are listed from south to north.

[17] Volume 5, Water resources assessment and flood risk Map Book, map WR-02-304. 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)[17]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
		Group (Helsby Sandstone Formation)		
Helsdale Brook WR-02-304 – D5	190m west of the route of the Proposed Scheme (within the footprint of land required for the Proposed Scheme)	Shirdley Hill Sand Formation and glaciofluvial sheet deposits over 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.
River Bollin WR-02-304 – D5	Crossed by the route of the Proposed Scheme	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	15	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Old Bollin WR-02-304 – D5	Crossed by the route of the Proposed Scheme	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member and Bollin Mudstone Member)	15	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Old Bollin WR-02-304 – D6	Crossed by the route of the Proposed Scheme	Alluvium and glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	15	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of the Manchester Ship Canal 2 WR-02-304 – E6	Crossed by the route of the Proposed Scheme	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	20	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Manchester Ship Canal WR-02-304 – E6	Crossed by the route of the Proposed Scheme	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member and Tarporley Siltstone Formation) and Sherwood Sandstone (Helsby Sandstone Formation)	11	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Red Brook WR-02-304 – E6	Crossed by the route of the Proposed Scheme	Alluvium over Mercia Mudstone Group (Tarporley Siltstone Formation)	15	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.

Feature (and map grid square)[17]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Tributary of the Manchester Ship Canal 1 WR-02-304 – E6	450m south-west of the route of the Proposed Scheme (110m north-west of land required for construction of the Proposed Scheme)	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	17	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Marsh Brook WR-02-304 – E5	350m east of the route of the Proposed Scheme (140m west of land required for construction of the Proposed Scheme)	Glacial till, alluvium and glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	18	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Glaze Brook WR-02-304 – E6	220m east of the route of the Proposed Scheme (adjacent to land required for construction of the Proposed Scheme)	Alluvium and glaciofluvial sheet deposits over Mercia Mudstone (Sidmouth Mudstone Formation, Bollin Mudstone Member) and Sherwood Sandstone (Helsby Sandstone Formation)	17	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Glaze Brook 1 WR-02-304 – F6	Crossed by route of the Proposed Scheme	Glaciofluvial sheet deposits over Mercia Mudstone Group (Tarporley Siltstone Formation)	18	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Glaze Brook 2 WR-02-304 – G6	Crossed by route of the Proposed Scheme	Peat, alluvium, glaciofluvial deposits and glacial till over Mercia Mudstone Group (Tarporley Siltstone Formation) and Sherwood Sandstone Group (Helsby Sandstone Formation)	18	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Tributary of Glaze Brook 3 WR-02-304 – G7	830m north-east of the route of the Proposed Scheme (170m north-east of land required for construction of the Proposed Scheme)	Alluvium and glacial till over Sherwood Sandstone Group (Helsby Sandstone Formation and Wilmslow Sandstone Formation)	10	Watercourse is likely to be in hydraulic connection with the underlying and adjacent permeable superficial deposits.
Springs or potential spring features				
Spring at Agden Lane Farm west, Agden Lane WR-02-304 – C5	220m west of the route of the Proposed Scheme (130m north of the land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Sherwood Sandstone Group (Helsby Sandstone Formation)	27	Surveys confirmed a spring (without water dependent habitat) supporting a low value stream. This feature is therefore a low value receptor.

Feature (and map grid square)[17]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
Potential spring east of Agden Lane WR-02-304 – C5	20m west of the route of the Proposed Scheme (within the land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	26	Surveys have shown this to be a land drain which discharges to Agden Lane Road Drain 1 and it is therefore included in the surface water assessment.
Potential sink east of Agden Lane WR-02-304 – C5	20m east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	26	Surveys have shown this to be a land drain which discharges to Agden Lane Road Drain 1 and it is therefore included in the surface water assessment.
Potential sink at Agden Lane Farm west, Agden Lane WR-02-304 – C5	90m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	27	Surveys have shown this to be a land drain which discharges to Agden Lane Road Drain 2 and it is therefore included in the surface water assessment.
Potential spring at Oak Villa Farm WR-02-304 – D5	760m west of the route of the Proposed Scheme (10m east of land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	20	Surveys have shown this to be a land drain which discharges to Helsdale Brook and it is therefore included in the surface water assessment.
Potential spring north-east of Fox Covert, Heatley WR-02-304 – D6	Crossed by the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	17	Surveys have shown this to be a land drain which discharges to Tributary of River Bollin and it is therefore included in the surface water assessment.
Potential spring at Warburton Bridge WR-02-304 – D5	640m west of the route of the Proposed Scheme (10m west of land required for construction of the Proposed Scheme)	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	14	The surveys have shown this to be a drainage outfall which discharges to the River Bollin and it is therefore included in the surface water assessment.
Potential spring at Moss Cottage, Mossbrow WR-02-304 – D6	650m east of the route of the Proposed Scheme (310m east of land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	20	Site surveyed but unable to locate a feature at the site of the potential spring. This is not a groundwater feature and will not be carried

Feature (and map grid square)[17]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
				forward to the assessment.
Potential spring 170m south of Church Farm, Glazebrook Moss WR-02-304 – F6	40m south-west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Peat over Mercia Mudstone Group (Tarporley Siltstone Formation)	19	Surveys have shown this to be a land drainage ditch within agricultural fields which discharge to Tributary of Glaze Brook 1 and is therefore included in the surface water assessment.
Potential spring at Glazebrook Trail and railway intercept WR-02-304 – F7	920m north-east of the route of the Proposed Scheme (480m east of land required for construction of the Proposed Scheme)	Glacial till over Sherwood Sandstone Group (Helsby Sandstone)	14	Surveys have shown this is a collect18 which slowly discharges into Glaze Brook. The collect is supporting a moderate value habitat and is therefore a moderate value receptor.
Potential spring south of Church Farm, Glazebrook Moss WR-02-304 – F6	50m south-west of the route of the Proposed Scheme (20m south-west of land required for construction of the Proposed Scheme)	Peat over Mercia Mudstone Group (Tarporley Siltstone Formation)	19	Surveys have shown this to be a land drainage ditch within agricultural fields which discharge to Tributary of Glaze Brook 1 and is therefore included in the surface water assessment.
Potential sink north-west of Church Farm WR-02-304 – G6	30m north-east of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glacial till over Sherwood Sandstone Group (Helsby Sandstone)	20	Surveys have confirmed this is a constructed drain fed by land drainage, not a groundwater sink. It will not be carried forward to the assessment.
Potential spring at Agden Brow Caravan Park/Broomedge Farm WR-02-304 – C5	730m west of the route of the Proposed Scheme (430m west of land required for construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Tarporley Siltstone Formation)	55	Surveys have shown this is a culvert which discharge to Tributary of Agden Brook 1 and is therefore included in the surface water assessment.
Two potential springs along Agden Lane/Agden Bridge	70m east to 70m west of the route of the Proposed Scheme (within the land required	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone	25 to 27	Surveys have shown these are culverts which discharge to Tributary of Agden Brook 1 and

[18] A collect is where groundwater comes to ground level over an area of ground, before draining into a channel.

Feature (and map grid square)[17]	Distance and direction from route	Formation	Elevation (mAOD)	Comments
WR-02-304 – C5	for the construction of the Proposed Scheme)	Formation, Northwich Halite Member)		are therefore included in the surface water assessment.
Potential spring at Bradshaw Lane, 230m east of Gailey Wood WR-02-304 – D5	240m west of the route of the Proposed Scheme (within land required for construction of the Proposed Scheme)	Glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	18	Surveys have shown this is a culvert and not a groundwater feature and is therefore included in the surface water assessment.
Potential spring at Milverton Farm, Dam Lane WR-02-304 – F5	550m south-west of the route of the Proposed Scheme (320m north-east of land required for construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Tarporley Siltstone Formation)	22	Surveys have shown this is a culvert which discharges to Tributary of Glaze Brook 1 and is therefore included in the surface water assessment.
Potential spring at Burford Lane, east Spud Wood WR-02-304 – D5	780m west of the route of the Proposed Scheme (100m south of land required for construction of the Proposed Scheme)	Glacial till over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	25	Surveys have shown this is a culvert which discharges to Helsdale Brook and is therefore included in the surface water assessment.
Potential sink at Burford Lane, east Spud Wood WR-02-304 – D5	870m west of the route of the Proposed Scheme (110m south of land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Northwich Halite Member)	24	Surveys have shown this is a culvert which discharges to Helsdale Brook and is therefore included in the surface water assessment.
Potential sink at Lower Carr Green Farm, south of cycle track WR-02-304 – D6	210m west of the route of the Proposed Scheme (130m west of land required for construction of the Proposed Scheme)	Alluvium over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	14	Surveys have shown this is a culvert which discharges to Tributary of Manchester Ship Canal 2 and is therefore included in the surface water assessment.
Potential sink at Villa Farm, Mossbrow WR-02-304 – D6	320m east of the route of the Proposed Scheme (110m north-east of land required for construction of the Proposed Scheme)	Shirdley Hill Sand Formation over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	17	Surveys have shown this is a culvert which forms part of Tributary of Manchester Ship Canal 2 and is therefore included in the surface water assessment.
Potential spring at West Cottage, Park Road, Warburton WR-02-304 – E6	380m west of the route of the Proposed Scheme (240m west of land required for construction of the Proposed Scheme)	Glaciofluvial sheet deposits over Mercia Mudstone Group (Sidmouth Mudstone Formation, Bollin Mudstone Member)	15	Surveys have shown this is a culvert which discharges to Tributary of Manchester Ship Canal 2 and is therefore included in the surface water assessment.

2.4 Water dependent habitats

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

Table 8: Water dependent habitats

Name (and map grid square)[19]	Distance and direction from route	Designation	Comments
Surface water dependent habitats			
Fox Covert and Meadows EC-01-513 – E6	10m west of the route of the Proposed Scheme (partially within land required for the construction of the Proposed Scheme	Site of Biological Importance (SBI)	It is currently unclear whether this habitat is dependent on surface water or rainfall. Tributary of Old Bollin flows through the habitat. The site has been included as a surface water dependent habitat on a precautionary basis.
Coroners Wood EC-01-514a – C6	Crossed by the route of the Proposed Scheme	SBI and ancient woodland	It is currently unclear whether this habitat is dependent on surface water or rainfall. The site has been included as a surface water dependent habitat on a precautionary basis.
Groundwater dependent habitats			
Rixton Clay Pits EC-01-514a – E1	1.1km south-west of the route of the Proposed Scheme (961m west of land required for construction of the Proposed Scheme)	Special Area of Conservation (SAC), Site of Specific Scientific Interest (SSSI), Local Nature Reserve (LNR) and LWS.	The water-filled hollows and calcareous grassland habitat may be dependent on groundwater from the glacial till (Secondary (Undifferentiated) aquifer) which underlies this site. The site has been included as a groundwater dependent habitat on a precautionary basis.
Heatley Lake (Heatley Flash) EC-01-513 – D2	800m west of the route of the Proposed Scheme (120m west of land required for construction of the Proposed Scheme)	LWS	Glaciofluvial sheet deposits (Secondary A aquifer) underlie this site. It is believed that the lake, surrounding swamp and wet woodland may be dependent on groundwater.

[19] 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.

3 References

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.

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.

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.

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.

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.

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.

High Speed Two (HS2) Limited
Two Snowhill
Snow Hill Queensway
Birmingham B4 6GA
Freephone: 08081 434 434
Minicom: 08081 456 472
Email: HS2enquiries@hs2.org.uk