A57 Link Roads
TR010034
5.4 Water Framework Directive Assessment Compliance Assessment Report

APFP Regulation 5(2)(a)

Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2021

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A57 Link Roads Scheme

Development Consent Order 202[x]

5.4 WATER FRAMEWORK DIRECTIVE

ASSESSMENT COMPLIANCE ASSESSMENT REPORT

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Planning Inspectorate Scheme Reference	TR010034
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Author:	A57 Link Roads Scheme Project Team, Highways England

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1. Introduction

1.1 Overview

1.1.1 This Water Framework Directive (WFD) compliance assessment has been prepared in respect of the proposed A57 Link Roads Scheme (hereafter referred to as “the Scheme”) made by Highways England Company Limited ("the Applicant") to the Secretary of State for Transport ("Secretary of State") for a Development Consent Order (DCO) under section 37 of the Planning Act 2008 ("the Act").

1.1.2 An Environmental Impact Assessment (EIA) has been undertaken and an Environmental Statement (ES) (TR010034/APP/6.3) prepared to support the application for the DCO. This WFD compliance assessment forms an appendix to the Road Drainage and Water Environment chapter (Chapter 13) of the ES (application document reference TR010034/APP/6.3).

1.1.3 This report is based on the current Scheme design developed to support the DCO application. Should there be any subsequent design changes to the Scheme, an update to this WFD compliance assessment would be required.

1.2 Legislative Background

1.2.1 The European Union (EU) Water Framework Directive (Council Directive 2000/60/EC) aims to protect and enhance the quality of the water environment across all EU member states. Whilst the United Kingdom is no longer a member of the EU (as of 31 January 2020), the WFD is transposed into English and Welsh law through The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 which revoke and replace The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and its amendments.

1.2.2 In England and Wales, the Environment Agency is the regulatory body responsible for the implementation of the WFD, and is also responsible for classifying the current condition of surface water and groundwater bodies, and setting a series of objectives for maintaining or improving the condition.

1.2.3 The WFD requires all natural surface water bodies to achieve both Good Ecological Status (GES) and Good Chemical Status (GCS). Artificial and Heavily Modified Water Bodies (A/HMWBs) may be prevented from reaching GES due to the modifications necessary to maintain their “use” (e.g. navigation). They are, therefore, required to achieve Good Ecological Potential (GEP) through the implementation of a series of mitigation measures.

1.2.4 The WFD requires Good status (both qualitative and quantitative) to be achieved for all groundwater bodies. The WFD also requires the prevention of the deterioration in groundwater status and the reversal of significant and sustained upward trends in pollutant concentrations in groundwater.

1.2.5 River Basin Management Plans (RBMPs) set out statutory objectives for river, canal, lake, groundwater, estuarine and coastal water bodies within a River Basin District (RBD), and document the measures required to maintain or improve status at a water body scale. The first RBMPs were published in 2009 (Cycle 1), followed by a Cycle 2 update published in 2016.

1.2.6 WFD designated watercourses are assessed under the WFD, assigned a classification and are designated as Statutory Main Rivers (i.e. the responsibility of the Environment Agency). Other watercourses within the WFD surface water body are reportable to the WFD watercourse and consideration should still be given to their impact upon the status of the wider water body. These other watercourses may either be designated as Statutory Main River or Ordinary Watercourse (i.e. the responsibility of the Lead Local Flood Authority (LLFA), internal drainage board (IDB) or district council).

1.2.7 A WFD compliance assessment is required for new developments (for which a direct impact pathway to the water environment is identified) to demonstrate that proposals will not result in the deterioration in status (or potential) of any water body (Test A), or prevent the attainment of Good status (or potential) in future WFD Cycles (Test B). The methodology used in this WFD compliance assessment is considered further in Section 2 (Methodology) of this document.

1.3 Scheme Background

1.3.1 The Scheme lies mainly within the administrative boundaries of Tameside Metropolitan Borough Council (MBC), up until to the proposed River Etherow Bridge. To the east of this, the Scheme crosses over the boundary with High Peak Borough Council and Derbyshire County Council.

1.3.2 The Scheme includes the following components:

- A new offline bypass of 1.12 miles (1.8km) of dual carriageway road connecting the M67 Junction 4 to A57(T) Mottram Moor Junction
- A new offline bypass of 0.81 miles (1.3km) of single carriageway connecting the A57(T) Mottram Moor to the A57 Woolley Bridge
- Creation of two new junctions, Mottram Moor Junction and Woolley Bridge Junction and improvement works to the existing M67 Junction 4
- Creation of five new structures (Old Hall Farm Underpass, Roe Cross Road Overbridge, Mottram Underpass, Carrhouse Lane Underpass, River Etherow Bridge and Roe Cross Road overbridge)
- One main temporary construction compound area, located on agricultural land to the east of the M67 Junction 4
- Detrunking, including safety measures from the M67 Junction 4 to Mottram Back Moor Junction, to be agreed with Tameside MBC.
- Safety measures and improvements to the A57 from Mottram Moor Junction to Gun Inn Junction and from Gun Inn Junction to Woolley Lane Junction, to be agreed with Tameside MBC

2. Methodology

2.1 Approach

2.1.1 The overall aim of this WFD compliance assessment is to identify and assess potential impacts of the Scheme upon the water environment, and to determine whether the Scheme is compliant with WFD legislation.

2.1.2 The following Environment Agency guidance documents have been considered in the undertaking of this WFD compliance assessment:

- Position Statement 488_10: Protecting and improving the water environment. Water Framework Directive compliance of physical works in rivers[1].
- Water Framework Directive risk assessment. How to assess the risk of your activity[2].
- Position Statement 1340_16: Supporting implementation of river basin management plans[3].
- Supporting Document 1340_16_SD01: Implementation of the river basin management plans position statement[4].

2.1.3 The methodology used for this WFD compliance assessment follows guidance produced by The Planning Inspectorate (PINS) in Advice Note 18 on the Water Framework Directive (PINS, 2017[5]). This approach includes three phases of work:

- Stage 1 – WFD Screening
- Stage 2 – WFD Scoping
- Stage 3 – WFD Impact Assessment

2.2 Stage 1 – WFD Screening

2.2.1 The Stage 1 (WFD Screening) process included determining the Scheme's Zone of Influence (ZoI) and identifying receptors which have the potential to be affected by the Scheme.

2.2.2 A desk study was undertaken to identify WFD water bodies which fall (or partly fall) within the defined ZoI for the Scheme. WFD water bodies where there is a high confidence of Scheme works having no direct impact were screened out from further assessment at this stage. All other identified water bodies were marked as requiring further detailed assessment under the WFD and were carried forward to Stage 2 – WFD Scoping.

[1] Environment Agency, 2016. Position Statement 488_10: Protecting and improving the water environment. Water Framework Directive compliance of physical works in rivers.
[2] Environment Agency, 2016. Water Framework Directive risk assessment. How to assess the risk of your activity. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/522426/LIT_10445.pdf
[3] Environment Agency, 2017. Position Statement 1340_16: Supporting implementation of river basin management plans.
[4] Environment Agency, 2018. Supporting Document: 1340_16_SD01: Implementation of the river basin management plans position statement.
[5] The Planning Inspectorate, 2017. Advice Note 18: The Water Framework Directive. Available from: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/06/advice_note_18.pdf

2.2.3 The following sources of open data and information were used for this desk study:

- Environment Agency Catchment Data Explorer[6]
- Ordnance Survey (OS) Open Data[7]
- North West River Basin Management Plan[8]

2.2.4 The works associated with the Scheme were reviewed at Stage 1 (WFD Screening) to identify the potential impacts of the proposed works on surface watercourses and groundwater. Additionally, an exercise was undertaken to identify any activities associated with the Scheme which do not require further consideration, for example, activities which have been ongoing since before the current RBMP cycle and have thus formed part of the baseline.

2.3 Stage 2 – WFD Scoping

2.3.1 For Stage 2 (WFD Scoping), a desk study was completed to present the baseline characteristics of each WFD surface water and groundwater body using the Environment Agency's Catchment Data Explorer, Environment Agency WFD Water Body Extended Summaries[9], and the North West RBMP. This includes the current classification status for all WFD elements (most recently updated in 2019 (Cycle 2)), Reasons for Not Achieving Good (RNAG) affecting the water body, its sensitivity to change and identification of watercourses within each water body. This information is presented in Section 4 (Stage 2 – WFD Scoping). The following sources of information were used for this desk study in addition to those detailed in Section 2.2:

- Defra MAGIC map[10]
- Online historic mapping resources, e.g. National Library of Scotland[11]
- High-resolution aerial photography, e.g. Google Earth[12]
- Highways England Ground Investigation Report (2018)[13]
- British Geological Survey (BGS) Geology of Britain viewer map[14]

2.3.2 Individual watercourses to be assessed within each of the WFD surface water bodies were identified using the following openly available geospatial data sources:

- WFD River, Canal and Surface Water Transfer Waterbodies (Cycle 2)[15]
- Environment Agency Statutory Main River Map[16]

[6] Environment Agency, 2020. Catchment Data Explorer. Available from: http://environment.data.gov.uk/catchment-planning/
[7] Ordnance Survey, 2020. OS Open Data. Available from: https://www.ordnancesurvey.co.uk/opendatadownload/products.html
[8] Environment Agency, 2020. North West river basin district river basin management plan. Available from: https://www.gov.uk/government/publications/north-west-river-basin-district-river-basin-management-plan
[9] WFD Water Body Extended Summaries provided by the Environment Agency on 24/12/2020 by data request. Request number: GMMC196351AB.
[10] Defra, 2020. MAGIC Map Application. Available from: https://magic.defra.gov.uk/
[11] National Library of Scotland, 2020. Map Images. Available from: https://maps.nls.uk/
[12] Google, 2020. Google Earth. Available from: https://www.google.co.uk/intl/en_uk/earth/
[13] Highways England, 2018. Ground Investigation Report. TR010034/APP/7.6
[14] BGS (2020) http://mapapps.bgs.ac.uk/geologyofbritain/home.htm
[15] Environment Agency, 2020. WFD River, Canal and Surface Water Transfer Waterbodies Cycle 2. Available from: https://data.gov.uk/dataset/c5a3e877-12c3-4e81-8603-d2d205d52d7a/wfd-river-canal-and-surface-water-transfer-waterbodies-cycle-2
[16] Environment Agency, 2020. Statutory Main River Map. Available from: https://data.gov.uk/dataset/4ae8ba46-f9a4-47d0-8d93-0f93eb494540/statutory-main-river-map

- OS Open Rivers[17]

2.3.3 Those watercourses identified were categorised into WFD designated watercourses, statutory Main Rivers and Ordinary Watercourses. WFD designated watercourses are those which are assigned a WFD ID in the relevant RBMP and are plotted on the Environment Agency's Catchment Data Explorer. Main Rivers are generally those which are larger arterial watercourses, and fall under the legal powers and responsibility of the Environment Agency. Ordinary Watercourses are defined as "every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) which conveys a flow and which does not form part of a Main River", and are the responsibility of the Lead Local Flood Authority (LLFA) or, if appropriate, the Internal Drainage Board (IDB).

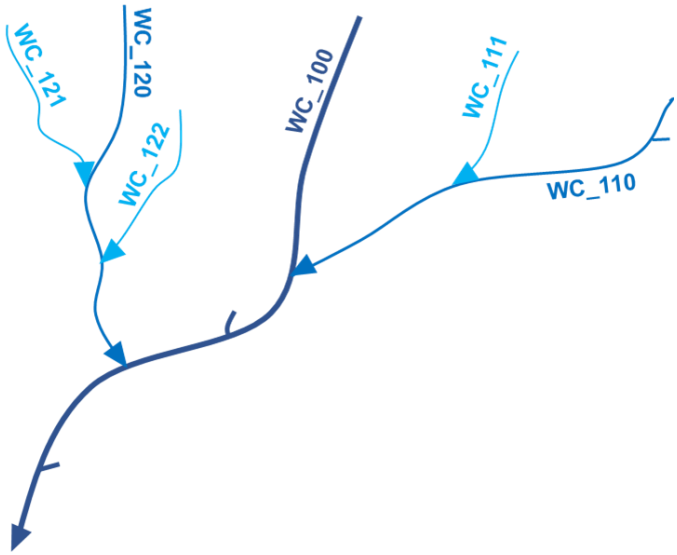
2.3.4 All WFD designated watercourses within the ZoI were scoped in for assessment under the relevant WFD surface water body. For Main Rivers and Ordinary Watercourses, only those watercourses which are located within the ZoI *and* directly impacted by the Scheme are scoped in for assessment on the relevant WFD surface water body. The remaining watercourses, along with those scoped in here, are assessed within the Road Drainage and Water Environment chapter (Chapter 13) of the ES (TR010034/APP/6.3) but are not considered in this WFD compliance assessment.

2.3.5 Many of the identified surface watercourses to be assessed are unnamed on OS mapping because they are minor watercourses. Therefore, all identified watercourses within a 1 km radius buffer of the Scheme have been assigned a unique 3-digit identifier code for ease of reference and consistency across chapters and assessments. Those watercourses which are named on OS mapping have also been assigned an identifier code. The numbering system uses the format "WC_xxx", where "WC" stands for "watercourse" and "xxx" is a unique three-digit number which is also used to indicate stream order.

2.3.6 Using the example shown in Inset 2-1 below, WC_100 is a major named watercourse (i.e. first order), WC_110 and WC_120 are tributaries of that river (i.e. second order), and WC_111, WC_121 and WC_122 are tributaries of the second order streams (i.e. third order). The numbering system also accommodates ordering of incoming tributaries from upstream to downstream (e.g. WC_110 joins WC_100 upstream of WC_120). To avoid longer codes, where there are very short (< 100 m in length) tributaries of a watercourse, these are incorporated into the assessment for the watercourse they are joining. Watercourses which are located within the Zone of Influence (ZoI), but flow into a major named watercourse outside of the ZoI, are given the first digit 0 (i.e. "WC_0xx").

[17] Ordnance Survey, 2020. OS Open Rivers. Available from: https://www.ordnancesurvey.co.uk/business-government/products/open-map-rivers

Insert 2-1 - Example watercourse numbering system



2.3.7 As part of Stage 2 (WFD Scoping), an assessment was undertaken to identify the potential risks from the Scheme to the surface water and groundwater receptors within the ZoI, based on the relevant WFD water bodies as identified during Stage 1 (WFD Screening).

2.4 Stage 3 – WFD Impact Assessment

2.4.1 Once the risks associated with the Scheme on the screened WFD water bodies have been identified, a WFD impact assessment was undertaken.

2.4.2 Field surveys of each of the WFD surface water bodies which have the potential to be affected by the Scheme (as identified in Stages 1 and 2) were performed by experienced fluvial geomorphologists and aquatic ecologists in September 2020. The aim of these surveys was to collect primary data to assess the geomorphological character of the watercourses within each of the identified WFD surface water bodies, including assessment of bed and bank characteristics (materials, forms and features), flow conditions and fluvial processes. The Modular Physical River Habitat (MoRPh[18]) methodology was also used to characterise aquatic habitat modification and potential in relation to aquatic species, aquatic macrophyte distribution, and riparian habitat structure and complexity on key watercourses. The MoRPh methodology and survey data is presented in the Biodiversity chapter (Chapter 8) of the ES (TR010034/APP/6.3) and Aquatic Ecology Appendix 8.3 (TR010034/APP/6.5).

2.4.3 Field observations were used to assign a geomorphological Conservation Score[19] to each watercourse, as summarised in Table 2.1. This metric is commonly used in catchment-scale geomorphological assessments to quantify the sensitivity and susceptibility to disturbance of each watercourse.

[18] The MoRPh survey is adopted by Defra within the Biodiveristy 2.0 Metric to assess river condition. MoRPh method is outlined in Gurnell, A. *et al.* 2020. The MoRPh Survey: Technical Reference Manual 2020 version. Available from: https://modularriversurvey.org/professional-help/
[19] Skinner, K. & Thorne, C. R., 2005. Review of impact assessment tools and post project monitoring guidance. Available from: https://www.sepa.org.uk/media/152207/wat_sg_30.pdf
[19] Sear, D.A., Newson, M.D. and Thorne, C.R., 2010. *Guidebook of applied fluvial geomorphology.* Thomas Telford Ltd.

Table 2.1: Geomorphological Conservation Status score descriptions

Susceptibility to Disturbance	Score	Description
High	8-10	Conforms most closely to natural, unaltered state and will often exhibit signs of free meandering and possess well-developed bedforms (point bars and pool-riffle sequences) and abundant bank side vegetation.
Moderate	5-7	Shows signs of previous alteration but still retains many natural features or may be recovering towards conditions indicative of the higher category.
Low	2-4	Substantially modified by previous engineering works and likely to possess an artificial cross-section (e.g. trapezoidal) and will probably be deficient in bedforms and bankside vegetation.
Channelised	1	Awarded to reaches whose bed and banks have hard protection (e.g. concrete walls or sheet piling).
Culverted	0	Totally enclosed by hard protection.

2.4.4 Where it was not possible to undertake field surveys due to access restrictions, watercourses were characterised using the information available from the desk study completed in Stages 1 and 2.

2.4.5 Ecological desk study data for fish, invertebrates and macrophytes were reviewed using the Environment Agency's Ecology and Fish Data Explorer[20]. A desk study area of 2 km was used to identify potentially relevant background records for the watercourses identified during WFD screening. Only data 10 years old or less have been reviewed. Data older than 10 years may no longer be representative of the current conditions, whilst a more recent cut off in date resulted in limited availability of data. Full details on the method and results of the aquatic ecology desk study are provided in Aquatic Ecology Appendix 8.3 of the ES (TR010034/APP/6.5).

2.4.6 Water quality has also been considered using the Highways England Water Risk Assessment Tool (HEWRAT), as presented in Appendix 13.3 of the ES (TR010034/APP/6.5).

2.4.7 A further detailed desk study has been undertaken to fully understand the functioning of the affected WFD groundwater bodies. In addition to the sources used at the scoping stage the following sources were used for this assessment:

- Factual report on ground investigation (Socotec, 2018)[21]
- Arcadis groundwater modelling report (2017)[22];
- Hyder Consulting Report (2007)[23];
- Carillion and Hyder Consulting Report (2006)[24];

[20] Environment Agency, 2020. Ecology and Fish Data Explorer. Available from: https://environment.data.gov.uk/ecology-fish/
[21] Socotec, 2018. A57/A628 Trans Pennine Upgrade Programme, Factual Report on Ground Invetsigation, Report No A8001-18, August 2018
[22] Arcadis, 2017. Detailed groundwater flow modelling for Mottram tunnel. Cdf lot 1 pc 1004 – As14 Phase2 – Options Selection – North West.
[23] Hyder Consulting, 2007. A57/A628 Mottram Tintwistle Bypass and A628/A616 Route Restraint Measures. A Geotechnical Report on the Assessment of Potential Settlement due to Tunnel Construction.
[24] Carillion and Hyder Consulting, 2006. Private Groundwater Sources: Assessment of Mitigation Options A57/A628 Mottram – Tintwistle Bypass & A628/A616 Route Restraint Measures.

- Mott MacDonald Report (2005)[25]; and
- Ground investigation by Soil Mechanics Limited (1995)[26].

2.4.8 The information gathered through desk study and site walkover have been used to understand and record the baseline character of each of the WFD water bodies screened into the assessment. This, along with information on works associated with the Scheme which have the potential to affect the water environment (i.e. culverts, watercourse realignments, bridges, earthworks), has been used to undertake a WFD impact assessment for each of the water bodies.

2.4.9 A matrix-based approach to the WFD impact assessment has been used. This allows the effect of each individual Scheme component on each of the individual WFD quality elements for a water body to be assessed and recorded using professional judgement informed by the desk study and field surveys undertaken. These individual assessments are then aggregated in accordance with the WFD principle of "one out, all out"[27] to eventually determine the overall effect of the Scheme at the water body scale.

2.4.10 A "Red Amber Green" (RAG) colour-coding system was used to indicate the level of risk of objective non-compliance within each water body, accounting for a) mitigation either already embedded into the design or considered to be best practice guidance (i.e. avoidance or prevention) and b) additional specific mitigation for the Scheme component (i.e. reduction or remediation). This approach captures the core outcomes of a compliance assessment, whilst being transparent and simple to interpret. The definitions for each colour are as presented in Table 2.2

Table 2.2: Definitions of colour-coding system used in WFD impact assessment

Colour	Description
Dark Blue	Beneficial effect of a scale sufficient to increase status class for the water body (certain).
Light Blue	Beneficial effect resulting in a localised improvement, but insufficient to increase status class at a water body scale (certain).
Green	No measurable change to (or effect on) water body (certain).
Yellow	Minor localised and/or temporary effect when balanced against mitigation – insufficient to affect an element at the water body scale (certain).
Amber	An adverse effect is possible when balanced against mitigation – the extent of effect is uncertain, and there remains a potential to affect water body status.
Red	Adverse effect of sufficient scale to impact on a quality element at a water body scale (certain).

[25] Mott MacDonald, 2005. A57/A628 Mottram Tintwistle Bypass and A628/A616 Route Restraint Measures. Volume 4: Annex A - Assessment of potential settlement due to dewatering during tunnel construction
[26] Soil Mechanics, 1995. A57/A628 Mottram to Tintwistle Bypass Ground Investigation Survey No 1, Report No 7925/1
[27] "One out, all out" refers to a key principle that reflects the WFD's integrated approach for the protection of water resources and associated aquatic ecosystems. The WFD Overall status can only be "Good" if each of the elements (which make up the Overall assessment) are assessed as "Good" themselves. If one of these elements has a status of less than "Good", then the Overall status cannot be "Good".

2.4.11 The Scheme is assessed considering both Test A (potential to cause deterioration of current WFD Ecological Status/Potential) and Test B (potential to prevent future attainment of Good Ecological Status/Good Ecological Potential), conservatively accounting for uncertainty of potential impacts (governed by the level of information available).

2.4.12 Best practice guidance for both design (Section 5.4) and construction (Section 5.5) are assumed to be incorporated as embedded mitigation in the Scheme design. Further site-specific mitigation measures required as a result of the Scheme are presented in Section 5.9.

2.4.13 Where practicable, opportunities for enhancement of the water environment will be considered during subsequent design stages.

2.5 Consultation

2.5.1 Consultation with the Environment Agency has been undertaken throughout the production of this WFD compliance assessment.

2.5.2 Formal consultation with the Environment Agency was undertaken on 3rd December 2020. The details of this meeting are provided in the Road Drainage and Water Environment chapter (Chapter 13) of the ES (TR001034/APP/6.3). The Environment Agency provided agreement with the scope of this WFD compliance assessment at this meeting.

2.5.3 Further consultation that has been undertaken since this initial meeting with the Environment Agency is also detailed within the Introduction chapter (Chapter 1) and the Road Drainage and Water Environment chapter (Chapter 13) of the ES (TR001034/APP/6.3). This will continue as the Scheme progresses through the Detailed Design stage.

3. Stage 1 – WFD Screening

3.1 Zone of Influence

3.1.1 The Zone of Influence (ZoI) of the Scheme was considered to be a 0.5 km radius buffer around the DCO boundary for surface water (Figure 13-1 from the ES (TR010034/APP/6.4)) and a 1 km radius buffer for groundwater (Figure 13-2 from the ES (TR010034/APP/6.4)). These distances are considered to be an appropriate distance for any potential impacts to be dampened (for example, the dilution of pollutants). The chosen ZoI also allows potentially affected watercourses to be characterised at the catchment scale to fully understand the baseline and to enable appropriate siting of potential mitigation measures, where required.

3.1.2 WFD water bodies which fall (or partly fall) within the ZoI are considered to be potential receptors which required screening to determine if they are at risk of impact by the Scheme.

3.2 WFD Water Body Screening

3.2.1 A summary of the WFD water bodies which fall within the ZoI are presented in Table 3.1, and identifies those waterbodies which have been screened out of further assessment. Figure 13-1 and Figure 13-2 from the ES (TR010034/APP/6.4) provide summary maps of the affected surface water bodies and groundwater bodies respectively.

Table 3.1: Summary screening of WFD water bodies within ZoI

Water Body Name	Water Body ID	Water Body Type	Screening (In/Out)
Etherow (Woodhead Res. To Glossop Bk.)	GB112069060780	Surface Water (River)	In
Etherow (Glossop Brook to Goyt)	GB112069061050	Surface Water (River)	In
Glossop Brook (Long Clough Brook to Etherow)	GB112069060720	Surface Water (River)	In
Tame (Chew Brook to Swineshaw Brook)	GB112069061111	Surface Water (River)	Out
Wilson Brook	GB112069061280	Surface Water (River)	In
Manchester and East Cheshire Carboniferous Aquifers	GB41202G102900	Groundwater	In

3.2.2 Only a small proportion of the Tame (Chew Brook to Swineshaw Brook) WFD river water body is located within the north west edges of the ZoI and not within the Scheme Boundary itself. No works associated with the Scheme are to be undertaken within the water body, and the water body is not hydraulically connected to the Scheme such that there is high confidence the Scheme will have no direct or indirect impact on the water body. Therefore, the Tame (Chew Brook to Swineshaw Brook) WFD water body has been **screened out** of any further assessment. All other water bodies have been screened in.

3.2.3 There are **no WFD lake, surface water transfer, coastal or transitional water bodies** within the ZoI and, therefore, these have been **screened out** of any further assessment.

3.3 Stage 1 Summary

3.3.1 Stage 1 (WFD Screening) has identified that the Scheme may have an impact on the following four WFD surface water bodies (rivers):

- Etherow (Woodhead Res. to Glossop Bk.)
- Etherow (Glossop Brook to Goyt)
- Glossop Brook (Long Clough Brook to Etherow)
- Wilson Brook.

3.3.2 Stage 1 (WFD Screening has also identified that the Scheme may have an impact on the following one WFD groundwater body:

- Manchester and East Cheshire Carboniferous Aquifers.

3.3.3 No other WFD water bodies have been identified as having the potential to be impacted by the Scheme.

3.3.4 Therefore, Stage 2 (WFD Scoping) is required for this Scheme to understand the scope of assessment required for the WFD water bodies screened in.

4. Stage 2 – WFD Scoping

4.1 Scheme Activities

4.1.1 Activities associated with the Scheme may cause risk to the WFD surface water and groundwater bodies identified in Stage 1 (WFD Screening); these include:

- New crossings (culvert) structures
- Loss of existing open watercourse under the Scheme footprint
- Realignment of watercourses and connected interceptor channels[28] associated with new crossings and the Scheme footprint (as above)
- A new single-span bridge structure across the River Etherow, including alterations to existing flood defence arrangements and provision of compensatory flood storage
- New sustainable drainage solution (SuDS) ponds
- New discharge locations for Scheme drainage and surface water run-off
- Earthworks (including cutting at Mottram).

4.1.2 Activities associated with the construction of the Scheme may also cause temporary risk to the surface water and groundwater receptors identified in Stage 1 (WFD Screening). These include:

- Working near, over and in watercourses
- Construction activities and site compounds with connectivity to (or in close proximity to) watercourses
- Movement of plant, and potential pollution resulting thereof
- Working with concrete and other materials (i.e. chemicals) which may lead to pollution
- Exposed earthworks and increased surface water run-off leading to the potential increase in fine sediment entering local watercourses.

4.1.3 Temporary construction activities are not expected to have an adverse effect at the WFD water body scale, assuming that appropriate mitigation can be developed and implemented.

4.2 Surface Water Summary

4.2.1 The following four WFD surface water bodies (as identified in Table 3.1 and Figure 13-1 from the Environmental Statement (TR010034/APP/6.3)) are included in this scoping:

- Etherow (Woodhead Res. to Glossop Bk.)
- Etherow (Glossop Brook to Goyt)
- Glossop Brook (Long Clough Brook to Etherow)

[28] Interceptor channels are designed to capture flows from catchment contributions and are interconnected with the natural watercourse system. Interceptor channels are separate to the road drainage network and related treatment train.

- Wilson Brook.

4.2.2 These four WFD water bodies are categorised as surface (river) water bodies. No other WFD surface water bodies (i.e. lake, surface water transfer, coastal or transitional water bodies) have been included in this assessment. Therefore, the WFD surface water assessment will refer only to WFD river water bodies.

4.2.3 All four WFD river water bodies are situated within the North West River Basin District (RBD) and the Goyt Etherow Tame Operational Catchment.

4.2.4 A summary of the key information (as found on the Environment Agency's Catchment Data Explorer[29]) for each WFD river water body is provided in Table 4.1. This includes the hydromorphological designation, Overall Status (2019, Cycle 2), Reasons for Not Achieving Good (RNAGs) and Objectives for each water body. The complete current WFD classification (2019, Cycle 2) for each river water body is presented in 0.

[29] https://environment.data.gov.uk/catchment-planning/

Table 4.1: Summary of Overall status (2019, Cycle 2), Reasons for Not Achieving Good (RNAGs) and Objectives for each of the surface water bodies located within the ZoI.

WFD Water Body Name (WFD Water Body ID)	Hydromorphological Designation	Overall Status	Reason for Not Achieving Good (RNAG)	Objectives
Etherow (Woodhead Res. to Glossop Bk.)[30] (GB112069060780)	Heavily modified	Moderate	• Mitigation Measures Assessment • Fish	Good by 2027: • Disproportionate burdens • No known technical solution is available • Cause of adverse impact unknown
Etherow (Glossop Brook to Goyt)[31] (GB112069061050)	Not designated heavily modified or artificial	Poor	• Macrophytes and Phytobenthos • Fish • Hydrological Regime • Ammonia (Phys-Chem) • Phosphate	Moderate by 2027: • Disproportionate burdens • No known technical solution is available
Glossop Brook (Long Clough Brook to Etherow)[32] (GB112069060720)	Heavily modified	Moderate	• Mitigation Measures Assessment	Moderate by 2015: • Unfavourable balance of costs and benefits
Wilson Brook[33] (GB112069061280)	Heavily modified	Moderate	• Mitigation Measures Assessment • Macrophytes and Phytobenthos • Fish • Invertebrates • Phosphate	Good by 2027: • Disproportionate burdens

[30] https://environment.data.gov.uk/catchment-planning/WaterBody/GB112069060780
[31] https://environment.data.gov.uk/catchment-planning/WaterBody/GB112069061050
[32] https://environment.data.gov.uk/catchment-planning/WaterBody/GB112069060720
[33] https://environment.data.gov.uk/catchment-planning/WaterBody/GB112069061280

4.2.5 Further details summarising the WFD classification for each of the four WFD river water bodies is set out below:

Etherow (Woodhead Res. to Glossop Bk.)

4.2.6 The current Overall status is Moderate and has been since 2015. The Ecological potential is Moderate, which is governed by Biological Quality Elements (Fish in particular) attaining Poor and the Mitigation Measures Assessment attaining Moderate. The Chemical status is Fail solely as a result of Priority Hazardous Substances (Polybrominated diphenyl ethers (PBDE), Benzo(g-h-i)perylene, and Mercury and Its Compounds).

4.2.7 Reasons for Not Achieving Good (RNAGs) for the water body are related to invasive non-native species (INNS) and physical modifications as a result of the water industry, local and central government, and other industry within the catchment.

4.2.8 There are no linked protected areas for the Etherow (Woodhead Res. to Glossop Bk.) WFD river water body.

4.2.9 The following watercourses within the water body are identified as having the potential to be affected by activities associated with the Scheme:

- River Etherow (WC_100)
- Tara Brook (WC_200)
- Unnamed watercourse (WC_210)
- Unnamed watercourse (WC_211)
- Unnamed watercourse (WC_212)
- Unnamed watercourse (WC_213)
- Unnamed watercourse (WC_214)

4.2.10 There are groundwater-surface water interactions within this WFD surface water body, such that the above watercourses may receive baseflow contributions from the underlying groundwater.

Etherow (Glossop Brook to Goyt)

4.2.11 The current Overall status is Poor and has been since 2009. The Ecological status is Poor, which is governed by Biological Quality Elements (Fish in particular) attaining Poor. Physico-Chemical Quality Elements attain Moderate as a result of Ammonia attaining Moderate and also Phosphate attaining Poor. Chemical status is Fail as a result of Priority Substances (Cypermethrin) and Priority Hazardous Substances (Polybrominated diphenyl ethers (PBDE), and Mercury and Its Compounds).

4.2.12 RNAGs for the water body are linked to agriculture and rural land management (including poor soil, nutrient and livestock management, and also riparian and in-river activities), sewage discharges from the water industry, physical modifications from industry, and INNS.

4.2.13 There are no linked protected areas for the Etherow (Glossop Brook to Goyt) WFD river water body.

4.2.14 The following watercourses within the water body are identified as having the potential to be affected by activities associated with the Scheme:

- River Etherow (WC_100)
- Hurstclough Brook (WC_300)
- Unnamed watercourse (WC_330)
- Unnamed watercourse (WC_340)

4.2.15 There are groundwater-surface water interactions within this WFD surface water body, such that the above watercourses may receive baseflow contributions from the underlying groundwater.

Glossop Brook (Long Clough Brook to Etherow)

4.2.16 The current Overall status is Moderate, and has been since 2009. The Ecological potential is Moderate, which is solely governed by the Mitigation Measures Assessment attaining Moderate or less. Biological and Physico-Chemical Quality Elements both attain Good, and Hydromorphological Supporting Elements Supports Good. The Chemical status is Fail as a result of Priority Hazardous Substances (Polybrominated diphenyl ethers (PBDE), and Mercury and Its Compounds).

4.2.17 RNAGs for the water body are a result of physical modifications from flood protections, urban developments and transport.

4.2.18 There are no linked protected areas for the Glossop Brook (Long Clough Brook to Etherow) WFD river water body.

4.2.19 No watercourses within the water body are identified as being directly affected by activities associated with the Scheme. Only indirect effects will be assessed for the Glossop Brook (Long Clough Brook to Etherow) WFD river water body.

Wilson Brook

4.2.20 The current Overall status is Moderate and has been since 2013. The Ecological potential is Moderate, which is governed by the Mitigation Measures Assessment, Biological Quality Elements and Physico-Chemical Quality Elements attaining Moderate status. Hydromorphological Supporting Elements attain Supports Good. The Chemical status is Fail as a result of Priority Hazardous Substances (Polybrominated diphenyl ethers (PBDE), and Mercury and Its Compounds).

4.2.21 RNAGs for the water body are linked to agriculture and rural land management (including poor soil, nutrient and livestock management, and also riparian and in-river activities), and physical modifications and diffuse pollution related to urban developments and transport.

4.2.22 There are no linked protected areas for the Wilson Brook WFD river water body.

4.2.23 No watercourses within the water body are identified as being directly affected by activities associated with the Scheme. Only indirect effects will be assessed for the Wilson Brook WFD river water body.

4.3 Groundwater Summary

4.3.1 The following one WFD groundwater body (as identified in Table 3.1 and Figure 13-2 from the ES (TR010034/APP/6.4)) are included in this scoping:

- Manchester and East Cheshire Carboniferous Aquifers (GB 41202G102900).

4.3.2 This WFD groundwater body is situated within the North West RBD and within the Manchester and Cheshire East Carboniferous Aq. Operational Catchment.

4.3.3 A summary of the key information (as found on the Environment Agency's Catchment Data Explorer[34]) for the WFD ground water body is provided in Table 4.2. This includes the Overall Status (2019, Cycle 2), Reasons for Not Achieving Good (RNAGs) and Objectives for the water body. The complete current WFD classification (2019, Cycle 2) for the groundwater body is presented in Appendix A.2.

Table 4.2: Summary of Overall status (2019, Cycle 2), Reasons for Not Achieving Good (RNAGs) and Objectives for the groundwater body located within the ZoI

WFD Water Body Name (WFD Water Body ID)	Overall Status	RNAGs	Objectives
Manchester and Cheshire East Carboniferous Aquifers[35] (GB41202G102900)	Poor	• Chemical Drinking Water Protected Area • Trend Assessment	Good by 2027: • Disproportionate burdens

4.3.4 Further details summarising the WFD classification for each of the four WFD river water bodies is set out below:

Manchester and East Cheshire Carboniferous Aquifers

4.3.5 The current Overall status is Poor and has been since 2009. The Quantitative element classification is Good, whereas the Chemical classification element is Poor. This is solely due to the Chemical Drinking Water Protected Area element attaining Poor.

4.3.6 RNAGs for the water body are related to agriculture and rural land management (including poor nutrient and livestock management), and also private sewage treatment and septic tanks.

4.3.7 There are three linked protected areas[36] for the Manchester and East Cheshire Carboniferous Aquifers WFD groundwater body:

- North Staffordshire – G149 (Nitrates Directive)
- East Shropshire – G27 (Nitrates Directive)
- Manchester and East Cheshire Carboniferous Aquifers – UKGB41202G102900 (Drinking Water Protected Area)

[34] https://environment.data.gov.uk/catchment-planning/
[35] https://environment.data.gov.uk/catchment-planning/WaterBody/GB41202G102900
[36] Linked protected areas may not be located within the Zone of Influence.

4.3.8 There are no groundwater dependent terrestrial ecosystems (GWDTEs) within the ZoI. Whilst Hurst Clough LNR is a designated site within the ZoI, it is not groundwater dependant.

4.3.9 The bedrock which underlies the Scheme is the Millstone Grit Group. The Millstone Grit Group is comprised of interbedded siltstone, sandstone and mudstone and classified as a Secondary A aquifer. The definition of a Secondary A aquifer is “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.”[37]. Within the ZoI, the Millstone Grit Group is considered to contribute baseflow to surface watercourses, including those listed in Section 4.2.

4.3.10 In the area of the Scheme, low permeability glacial till overlies the Millstone Grit Group, which acts as a minor aquifer. The Till is classified as a Secondary Undifferentiated aquifer. The definition of a Secondary Undifferentiated aquifer is “has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.”[37].

4.4 Stage 2 Summary

4.4.1 Stage 2 (WFD Scoping) has considered each of the four WFD river water bodies and one WFD groundwater body in turn to understand the scope of assessment required. Stage 3 (WFD Impact Assessment) is required for this Scheme to identify and assess potential risks to the WFD water bodies screened in.

[37] Environment Agency (2020) http://apps.environment-agency.gov.uk/wiyby/117020.aspx [Accessed 01/12/20]

5. Stage 3 – WFD Impact Assessment

5.1 Surface Water Character

5.1.1 Summary descriptions (in terms of hydromorphology, aquatic ecology and water quality) and also the assigned Conservation Status of each identified watercourse within the Etherow (Woodhead Res. to Glossop Bk.) and Etherow (Glossop Bk. to Goyt) WFD water bodies are presented in Table 5.1. No individual watercourses are assessed for either the Glossop Brook (Long Clough Brook to Etherow) or Wilson Brook WFD water bodies.

5.1.2 Descriptions of the ecological characteristics of each watercourse are based on the aquatic ecology baseline information and survey data, which is presented in the Biodiversity chapter (Chapter 8) of the ES (TR010034/APP/6.3). Some watercourses have no available Environment Agency ecological monitoring data. For those watercourses which have been surveyed using the MoRPh methodology, the MoRPh Habitat Condition is also provided in Table 5.1.

5.1.3 Descriptions of the water quality characteristics of each of the watercourses are based on Environment Agency water quality monitoring data (both routine and ad-hoc) which has been analysed and presented in the Road Drainage and Water Environment chapter (Chapter 13) of the ES (TR010034/APP/6.3). This includes the analysis of monitoring records for WFD Physico-chemical quality elements (i.e. Orthophosphate (Reactive as P), BOD and Ammoniacal Nitrogen (as N)), and comparing them to WFD standards. Some watercourses have no available Environment Agency water quality monitoring data.

Table 5.1: Summary of baseline surface watercourse characteristics within Etherow (Woodhead Res. to Glossop Bk.) and Etherow (Glossop Bk. to Goyt) WFD water bodies. For river type; WFD = WFD-designated watercourse, SMR = Statutory Main River, and OW = Ordinary Watercourse

Watercourse	River Type	Watercourse Description (hydromorphology, aquatic ecology, water quality)
WFD Water Body: Etherow (Woodhead Res. to Glossop Bk.)		
River Etherow (WC_100)	WFD	Large channel (approximately 10 m wide) which has been modified through a residential area (i.e. straightened planform, bank protection, over-widened) and through agricultural land. The bed substrate is gravel and cobble, and the banks are earthy and vegetated with mature trees and scrub. Some artificial bank protection (comprised of stone walls) is present along the watercourse in the vicinity of structures (e.g. Whalley Bridge) and residential areas. The flow regime was predominantly smooth and rippled flow, with some slacker flow in marginal backwaters. Some active geomorphological processes were observed at the time of survey, including gravel bar deposition and erosion of earth banks, although the channel was stable and the dominant reach sediment process is as an exchange. Conservation Status: 6 Two Environment Agency water quality monitoring locations on the River Etherow within this WFD water body were analysed for water quality baseline conditions: just downstream of Woodhead Reservoir and just upstream of the confluence with Glossop Brook. All physico-chemical elements are Good (orthophosphate (OP) and pH) or High (dissolved oxygen (DO), biochemical oxygen demand (BOD), temperature and ammonia) WFD status. Where data is available for priority substances and specific pollutants, at the upstream monitoring site, these have all Passed. One Environment Agency fish monitoring site in this WFD water body is located on the River Etherow within 2 km of the DCO boundary (Site 6934; NGR 400923 395697). A further Environment Agency fish monitoring site is located on the Hollingworth Brook just upstream of its confluence with the River Etherow within the WFD water body (Site 6945; NGR 401256 396464). Environment Agency records indicate that the River Etherow supports a limited number of fish species. Specifically, brown trout, lamprey and three-spined stickleback within this WFD water body. Three Environment Agency monitoring sites (Site 65904; NGR 402054 396952, Site 67595; NGR 401396 396522 and Site 67542; NGR 400996 395297) are located on the River Etherow within 2 km of the DCO boundary within this WFD water body. Aquatic macroinvertebrate records on the River Etherow within the WFD water body are indicative of moderate to good habitat diversity, good water quality, high flow velocity conditions and low channel sedimentation. Four invasive non-native invertebrates have been recorded: signal crayfish (*Pacifastacus leniusculus)*, one amphipod shrimp (*Crangonyx pseudogracilis/floridanus)*, and two molluscs (*Physella acuta* and *Potamopyrgus antipodarum).* No Environment Agency macrophyte survey data less than 10 years old are available for the River Etherow within 2 km of the DCO boundary.

Watercourse	River Type	Watercourse Description (hydromorphology, aquatic ecology, water quality)
		MoRPh survey identified the River Etherow within this water body as being of moderate condition for its typology which is reflective of some modifications, artificial ground cover and presence of invasive non-native Himalayan balsam.
Tara Brook (WC_200)	OW	Tara Brook (WC_200) is a minor tributary of the River Etherow. Within its upper reaches, the watercourse is heavily poached by horses. A bund has been positioned across the channel impounding water and creating a small ponded area used as a drinking point for livestock. The channel bed and banks are comprised of earth, with very little flow observed at the time of survey. Channel vegetation was dominated by the invasive non-native species Himalayan balsam. Further downstream the channel receives flow from incoming tributaries, and evolves to become an approximately 1 m wide gravel-bed channel with earth banks. The channel offers varied flow types (rippled, broken waves, and chute) and exhibits small step-pool features, gravel bar deposition and erosion of the earth banks. The lower reaches of Tara Brook (WC_200) are considered to function as a stable transfer. Possibly receives contribution from groundwater. Conservation Status: 5 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. Tara Brook (WC_200) provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
Unnamed watercourse (WC_210)	OW	Small (<1 m wide) agricultural land drain with a straightened planform, contributing to minor tributary systems of Tara Brook (WC_200). Slow flowing, heavily vegetated and ponded in various locations. Limited active fluvial morphological processes observed. Possibly receives contribution from groundwater. Conservation Status: 3 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_210 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
Unnamed watercourse (WC_211)	OW	Small (<1 m wide) watercourse through woodland behind residential area in Spout Green, contributing to minor tributary systems of Tara Brook (WC_200). Little flow observed at time of survey. Possibly receives contribution from groundwater. Conservation Status: 3 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_211 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
Unnamed watercourse (WC_212)	OW	Small (<1 m wide) agricultural land drain with a straightened planform, contributing to minor tributary systems of Tara Brook (WC_200). Little flow observed at time of survey. Possibly receives contribution from groundwater.

Watercourse	River Type	Watercourse Description (hydromorphology, aquatic ecology, water quality)
		Conservation Status: 3 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_212 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
Unnamed watercourse (WC_213)	OW	Small (<1 m wide) agricultural land drain with a straightened planform, contributing to minor tributary systems of Tara Brook (WC_200). Little flow observed at time of survey. Possibly receives contribution from groundwater. Conservation Status: 3 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_213 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
Unnamed watercourse (WC_214)	OW	Small (<1 m wide) agricultural land drain with a straightened planform, contributing to minor tributary systems of Tara Brook (WC_200). Little flow observed at time of survey. Possibly receives contribution from groundwater. Conservation Status: 3 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_214 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
WFD Water Body: Etherow (Glossop Bk. to Goyt)		
River Etherow (WC_100)	WFD	Located directly downstream of the Scheme, the River Etherow (WC_100) within the Etherow (Glossop Bk. to Goyt) WFD water body is situated in a predominantly rural catchment. Similar to the upstream water body, the River Etherow (WC_100) occupies a large channel (approximately 10 m wide) which exhibits physical modifications (i.e. straightened planform, bank protection, over-widened). Some active geomorphological processes were observed at the time of survey, including gravel bar deposition and erosion of earth banks, although the channel was stable and the dominant reach sediment process is as an exchange. Conservation Status: 5 Two Environment Agency water quality monitoring locations on the River Etherow within this WFD water body were analysed for water quality baseline conditions: below the confluence with Glossop Brook and at the railway viaduct. The DO and temperature phys-chem elements were High WFD status, and pH was Good, at both locations. BOD, OP and ammonia showed decreases in WFD status between the upstream and downstream sites: BOD High to Good; OP, Moderate to Poor; and, Ammonia High to Moderate. The downstream monitoring site is downstream of Glossop STW. Where data is available for priority substances and specific pollutants, at both of the monitoring sites, these have all Passed.

Watercourse	River Type	Watercourse Description (hydromorphology, aquatic ecology, water quality)
		One Environment Agency fish monitoring site in this WFD water body is located on the River Etherow within 2 km of the DCO boundary (Site 6945; NGR 401256 396464). Records indicate that the River Etherow within the WFD water body supports a limited number of fish species, specifically brown trout, minnow and stone loach. No Environment Agency invertebrate or macrophyte survey data less than 10 years old are available for the River Etherow within 2 km of the DCO boundary within this WFD water body.
Hurstclough Brook (WC_300)	SMR[38]	Hurstclough Brook (WC_300) is a small (approximately 1 m wide) watercourse which flows through agricultural fields at the western end of the Scheme. The watercourse is culverted beneath the existing A57 (Hyde Road) before eventually joining the River Etherow downstream of the Scheme. Hurstclough Brook is an Ordinary Watercourse upstream of the existing A57 crossing, downstream of this point, Hurstclough Brook is designated as a Statutory Main River. Within the study area Hurstclough Brook (WC_300) flows through rough pasture, with riparian vegetation comprising of terrestrial grasses, rushes and some mature trees. The channel has a small wetted width (typically < 1 m) and is comprised of predominantly fine substrates (sand-dominated). Cattle poaching was observed along the channel banks. As the watercourse approaches the existing A57 crossing, the channel narrows (approximately 0.5 m wide) and the perceptible flow reduces significantly where the channel forms part of a larger wetland-type environment. Possibly receives contribution from groundwater. Conservation Status: 5 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. Hurstclough Brook (WC_300) is an important feature for dispersal and connectivity for a limited range of aquatic species within the local agricultural setting. MoRPh survey identified the Hurstclough Brook (WC_300) as being of moderate condition for its typology which is reflective of pressures from poaching and some modifications.
Unnamed watercourse (WC_330)	OW	Small (<1 m wide) agricultural land drain. Dry at time of survey, likely ephemeral. Possibly receives contribution from groundwater. Conservation Status: 3 No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_330 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.
Unnamed watercourse (WC_340)	OW	Small (<1 m wide) agricultural land drain. Dry at time of survey, likely ephemeral. Possibly receives contribution from groundwater. Conservation Status: 3

[38] Hurstclough Brook (WC_300) is designated as a statutory Main River downstream of the existing A57 (Hyde Road). Upstream of the road, Hurstclough Brook (WC_300) is an ordinary watercourse.

Watercourse	River Type	Watercourse Description (hydromorphology, aquatic ecology, water quality)
		No available Environment Agency water quality monitoring data. No available Environment Agency ecological monitoring data. WC_340 provides limited potential for fish and other truly aquatic species, although the watercourse does provide an important aquatic linear corridor within the local agricultural landscape.

5.2 Groundwater Character

Published geology and hydrogeology

5.2.1 The mapped bedrock and superficial geology for the ZoI is presented in Figure 13-2 from the ES (TR010034/APP/6.4). Glacial Till is the predominant superficial geology, with Glacio-fluvial Deposits also present to the south west of the Scheme. Alluvium occurs to the south and east of the Scheme in a north east to south west orientation along the river valleys[14].

5.2.2 The bedrock geology of the ZoI is dominated by the Carboniferous Millstone Grit Group[14]. The series comprises a sequence of thick sandstone units interbedded with mudstone and/or siltstone units. Around Mottram in Longdendale, this includes the main units of the Kinderscout Grit and the Midgely Grit. The bedrock generally dips towards the south at between 5 and 15 degrees[22].

5.2.3 The region is characterised by a high degree of faulting in the bedrock, often offsetting sandstone and mudstone units against one another and creating a block-like sub-crop pattern. In the Mottram area the presence of geological faulting has a significant effect on the groundwater regime.

5.2.4 As described in Section 4.3, the bedrock in the ZoI is classified as a Secondary A Aquifer, with the overlying superficial deposits classified as Undifferentiated Secondary Aquifer. The groundwater vulnerability in the ZoI is Medium-Low to Medium[10].

5.2.5 There are no published groundwater Source Protection Zones within the ZoI[10].

5.2.6 Details of groundwater abstractions in the ZoI have been provided by both the Environment Agency and Tameside Metropolitan Borough Council (MBC). There are no Environment Agency groundwater abstraction licences within the ZoI. There are five private water abstractions (recorded by Tameside MBC) from spring, well and borehole abstractions within the ZoI, as well as a number of additional sources identified through the surface water features survey. The Environment Agency's approach to groundwater protection states that a default source protection zone of minimum 50 m radius should be assumed for all abstractions, including private water supplies. The closest of the identified groundwater abstractions is 75 m from the Scheme Boundary.

5.2.7 As identified in Section 4.3, there are no groundwater dependant designated sites within the ZoI.

Site specific geology and hydrogeology

5.2.8 A number of previous ground investigations have been undertaken in the Scheme area including:

- Socotech, 2018
- Fugro Engineering Services, 2005
- Norwest Holst Soil Engineering, 2004
- Soil Mechanics, 1995.

- Full details of these investigations are provided in the Geology and soils chapter (Chapter 9) of the ES (TR010034/APP/6.3)and in the Ground Investigation Report (GIR) (TR010034/APP/7.6)[13]. Information relevant to the groundwater body WFD assessment only has been included here. Supplementary ground investigation will be undertaken (currently planned to commence February 2021) as the previous investigations were designed around an alternative Scheme design, resulting in gaps in the site specific information.

5.2.9 The Glacial Till, which forms the majority of the superficial deposits in the ZoI is typically clay rich and stony. Within the immediate vicinity of the Scheme the thickness of the Till is highly variable between 1 m and 36 m thick, reaching the greatest thickness on the western part of the Scheme (M67 Junction 4 to Old Mill Farm Underpass). It generally increases in a north-westerly direction, becoming thickest (c. 36 m) at the proposed western tunnel entrance. Cohesive Alluvium and Head Deposits are present at the eastern part of the ZoI within the vicinity of the River Etherow, overlying more granular glacio-fluvial deposits.

5.2.10 An understanding of site specific bedrock geology was attained by assessing 64 borehole logs drilled for the ground investigations identified above. The data available confirm that the geology encountered is generally consistent with the anticipated published geology in terms of strata type and lithology.

5.2.11 A potentially significant fault is indicated in the BGS mapping[14], which bisects the proposed Scheme alignment running NNW-SSE that appears to offset mudstone and sandstone units against one another. An approximately 20 m wide fault zone has been inferred based on the groundwater level information[13]. The fault, in combination with folding in the Millstone Grit, causes groundwater levels to be higher and potentially artesian east of the fault and lower west of the fault.

5.2.12 Aquifer property testing has been undertaken as part of the ground investigations. The sandstone units of the Millstone Grit Group are fracture dominated and this heterogeneity is reflected in the highly variable hydraulic conductivities measured. The Till is well defined by the tests and has a hydraulic conductivity within the range of zero (i.e. no-flow) to 0.019 m/d.

5.2.13 Groundwater level data were collected between January 1994 and August 2007 and a summary of the data is presented in Appendix 13.2 of the ES (TR010034/APP/6.5). The spatial distribution of groundwater level data is constrained by previous iterations of the Scheme design, which differs to the current design. This means there are some areas where no groundwater level data is currently available. As discussed previously, these will be addressed through supplementary ground investigation.

5.2.14 The available groundwater level data show that groundwater levels are generally consistent with the topography. With groundwater flow to the south east. The average hydraulic gradient is 0.1 m/m. A shallower hydraulic gradient is present around the River Etherow, likely to be associated with the higher permeability glacio-fluvial deposits present in this area[13].

5.2.15 Groundwater levels were monitored manually at 10 boreholes and automatically by loggers at 28 boreholes between 14 March 2018 and 25 July 2018. Pockets of pressurised artesian conditions were reported demonstrating the heterogeneity of the Millstone Grit Group aquifer[21,13]. Groundwater level monitoring from the 2018 ground investigation has shown that the Millstone Grit Group is generally confined by the Glacial Till and is also self-confining, due to its layered structure. Artesian groundwater conditions were locally encountered during the 2018 ground investigation[13] around the Mottram Underpass area and within the Eastern Cutting area. The significant faulting in this area results in the groundwater level being over 10 m lower to the west than it is to the east, where it is artesian. It is interpreted that there is a significant barrier to groundwater flow across this zone. Pumping tests showed that drawdown propagates parallel to the fault zone and did not propagate in a SW-NE direction across the fault zone.

5.2.16 Groundwater flow information was also interpreted in the GIR (application document TR010034/APP/7.6)[13]. Key points are: in the Millstone Grit Group groundwater flow is generally in a south easterly direction towards the River Etherow. Groundwater to the west of Mottram village is considered likely to discharge towards the south west towards Hurstclough Brook, due to high ground to the south associated with an outcrop of Rossendale Formation (a formation of the Millstone Grit Group). Around the River Etherow at the eastern end of the ZoI, there is a shallower hydraulic gradient, likely to be associated with the higher permeability deposits present in this area. The faulting around Mottram village has a significant effect on groundwater levels and flow direction. Large changes in groundwater elevation (up to 10 m) over a short distance have been recorded in this area.

5.2.17 A number of surface watercourses within the ZoI (including the upper reaches and tributaries of Tara Brook (WC_200), and Hurstclough Brook (WC_300)) appear to receive baseflow contribution from groundwater.

Summary of groundwater understanding

5.2.18 In the ZoI, the Millstone Grit Group (part of the Manchester and East Cheshire Carboniferous Aquifers groundwater body) forms the main bedrock aquifer. This is generally overlain by low permeability Glacial Till. The thickness and permeability of the superficial deposits vary across the ZoI, with more granular, and therefore higher permeability, deposits in the east of the ZoI around the River Etherow.

5.2.19 Groundwater flow direction in the Millstone Grit Group is generally to the south east, with some variation at the western and eastern extents of the ZoI. Groundwater contributes baseflow to surface watercourses within the ZoI.

5.2.20 Faulting in the Mottram village area is a key control on groundwater levels and flow. In addition to displacing the bedrock and superficial geology, the faulting causes artesian conditions to the east of the Mottram Underpass.

5.3 Scheme Activities

Surface Water

5.3.1 The works associated with the Scheme which directly affect the surface water environment can be categorised as follows:

- **Project footprint**: Encroachment resulting in a physical modification of a watercourse, including realignment, interceptor channels or channel crossing (including modifications to existing crossings, such as culverts or bridges).
- **Pollution from road drainage**: Including collisions, road degradation, incomplete fuel combustion, fuel, and accidental spillage.
- **Reduction in watercourse flows/volumes**: Watercourses which receive contributions from groundwater may have a reduction in baseflow as a result of subsurface Scheme works (i.e. cutting, piling). The proposed Scheme alignment may result in the alteration of existing catchments which may result in a reduction in flow volume entering selected reaches of watercourses through catchment contributions.
- **Increased run-off**: An increase in impermeable area will increase the run-off volume and rate of discharge from the road surface. Contaminants deposited on the road surface are quickly washed off during rainfall. Where traffic levels are high the level of contamination increases and therefore, the potential for unacceptable harm being caused to the receiving water also increases.

5.3.2 The works considered as part of the WFD surface water assessment are summarised in

5.3.3 Table 5.2. A detailed breakdown of each of the individual Scheme works affecting the watercourses is provided in Appendix B. The works descriptions and lengths provided are directly transposed from The Works Plan and Works Plan Schedule (application document reference TR010034/APP/2.3).

5.3.4 The current Scheme design developed to support the DCO application does not detail the specific design details proposed (such as structure type and cross-sectional dimensions) for culverts and other structures. Therefore, a conservative assumption has been made to assess all culverts as pipe culverts at this stage of assessment. For the purposes of this assessment, it is assumed that all culverts and structures will be appropriately designed taking best practice guidance (provided in Section 5.4) into account, including ensuring the structure is appropriately sized for the watercourse and its flow volumes and velocities. It is also assumed that appropriate bed and bank protection will be required at the inlet and outlet of culverts, as per best practice guidance.

Table 5.2: Summary of Scheme works directly affecting surface water. For river type; WFD = WFD-designated watercourse, SMR = Statutory Main River, and OW = Ordinary Watercourse

WFD Water Body	Watercourse	River Type	Summary of Works
Etherow (Woodhead Res. to Glossop Bk.)	River Etherow (WC_100)	WFD	• New 42 m single-span structure carrying single carriageway and bridleway across 18 m length of River Etherow (WC_100). Bridge abutments to be placed in riparian zone. • Changes to flood defence arrangements upstream of proposed crossing on left bank. • Creation of a 5,593 m^2 flood compensation area downstream of proposed crossing on right bank.
	Tara Brook (WC_200)	OW	• Infilling and permanent loss of 304 m length of existing WC_200 small channel through agricultural land underneath Scheme new road alignment. • Creation of a 322 m length of newly realigned watercourse (WC_200) alongside Glossop Spur to tie-in to existing WC_200 downstream of Scheme. • Creation of new 33 m length of culvert to carry realigned watercourse (WC_200) below proposed footway. • Creation of new 72 m length of culvert to carry realigned watercourse (WC_200) below proposed highway. • Creation of 1.6 km of new drainage ditches alongside both northern and southern sides of Glossop Spur. • Creation of 2 No. 14 m lengths of culvert to carry drainage ditches below proposed footways/access tracks. • Potential reduction in watercourse baseflow contributions.
	Unnamed watercourse (WC_210)	OW	• Culverting of 115 m length of WC_210 underneath the Scheme new road alignment. Culvert to tie-in with existing culverted reach of WC_210 downstream of Scheme. • Potential reduction in watercourse baseflow contributions.
	Unnamed watercourse (WC_211)	OW	• Infilling and permanent loss of 51 m length of existing WC_211 open agricultural drain underneath the Scheme new road alignment.
	Unnamed watercourse (WC_212)	OW	• Infilling and permanent loss of 176 m length of existing WC_212 open agricultural drain underneath the Scheme new road alignment.
	Unnamed watercourse (WC_213)	OW	• Infilling and permanent loss of 143 m length of existing WC_213 open agricultural drain underneath the Scheme new road alignment.

WFD Water Body	Watercourse	River Type	Summary of Works
	Unnamed watercourse (WC_214)	OW	• Infilling and permanent loss of 71 m length of existing WC_214 open agricultural drain underneath the Scheme new road alignment. • Creation of a 307 m length of newly realigned watercourse to northern side of Scheme road cutting to capture water in catchment draining to existing WC_212, WC_213 and WC_214. Realigned watercourse to tie-in to existing WC_214 open agricultural drain downstream of Scheme. • Potential reduction in watercourse baseflow contributions.
Etherow (Glossop Bk. to Goyt)	Hurstclough Brook (WC_300)	SMR[39]	• Infilling and permanent loss of 221 m of existing WC_300 open channel underneath the new road alignment. • Creation of a 56 m length of culvert to carry realigned watercourse below proposed highway. • Creation of a 220 m length of newly realigned watercourse to southern side of A57 link. Realigned watercourse to tie-in to existing WC_300 downstream of the Scheme. • Retention of 67 m of existing WC_300 open channel as a backwater environment. • Creation of a 264 m length of drainage ditch to south of A57 link. To drain into proposed Pond 1. • Creation of a 31 m length of drainage ditch and 9 m length of culvert to south of A57 link to connect proposed Pond 1 to existing Hurstclough Brook (WC_300) channel. • Creation of a 546 m length of interceptor channel to the north of A57 link, to feed into Hurstclough Brook (WC_300) downstream of the Scheme. • Creation of a 239 m length of drainage ditch to north of A57 link. • Potential reduction in watercourse baseflow contributions. • Scheme alignment may result in reduction in catchment contributions to approximately 600 m length of Hurstclough Brook (WC_300) on southern side of A57 link.
	Unnamed watercourse (WC_330)	OW	• Culverting of 83 m length of existing WC_330 open agricultural drain underneath the Scheme new road alignment. • Potential reduction in watercourse baseflow contributions.

[39] Hurstclough Brook (WC_300) is designated as a statutory Main River downstream of the existing A57 (Hyde Road). Upstream of the road, Hurstclough Brook (WC_300) is an ordinary watercourse.

WFD Water Body	Watercourse	River Type	Summary of Works
	Unnamed watercourse (WC_340)	OW	• Culverting of 79 m length of existing WC_340 open agricultural drain underneath the Scheme new road alignment. • Potential reduction in watercourse baseflow contributions.

5.3.1 The potential effects of the works presented in Table 5.2 on the surface water environment are considered in Section 5.6.

5.3.2 Glossop Brook (Long Clough Brook to Etherow) and Wilson Brook WFD surface water bodies are not directly affected by any works associated with the Scheme and, as such, only indirect effects of the Scheme works presented in Table 5.2 will be assessed (for example, water quality).

5.3.3 There are also six new drainage outfalls associated with the Scheme, as summarised in Table 5.3. These drainage outfalls are assessed using HEWRAT, as presented in Appendix 13.3 of the ES (TR010034/APP/6.5), and the results of this analysis are incorporated into the WFD impact assessment. The current Scheme design developed to support the DCO application does not detail the specific design details proposed for the outfalls, such that it is assumed appropriate outfall structures and scour control measures will be required, as per best practice guidance.

Table 5.3: Summary of Scheme drainage outfall locations

WFD Waterbody	Watercourse Name	Watercourse Type	Grid Reference
Etherow (Woodhead Res. to Glossop Bk.)	Tara Brook (WC_200)	Ordinary Watercourse	399900, 395694
	River Etherow (WC_100)	WFD Watercourse	400914, 395553
	River Etherow (WC_100)	WFD Watercourse	401036, 395482
Etherow (Glossop Brook to Goyt)	Unnamed watercourse (WC_130)	Ordinary Watercourse	400818, 395466
	Unnamed watercourse (WC_140)	Ordinary Watercourse	400194, 395563
	Hurstclough Brook (WC_300)	Main River	398622, 395422

5.3.4 There are also three SuDS ponds to be created as part of the Scheme works. The ponds themselves are not assessed as activities under the WFD (although the outfalls are, as detailed above), but are considered in the Biodiversity chapter (Chapter 8) of the ES (TR010034/APP/6.3).

Groundwater

5.3.5 A summary of the works associated with the Scheme which directly affect groundwater are:

- Mottram Underpass (works 32 and 33) – New two-cell reinforced concrete underpass carrying the carriageway mainline beneath Roe Cross Road, Old Road and the community of Mottram. The top of the underpass would be 2 m below ground level.
- Mottram cutting (works 5 and 6) – Earthworks associated with the cutting to the east of Mottram underpass.
- Old Mill Farm Underpass (work 31) – Beneath the carriageway between the M67 Intersection and Roe Cross Road. The underpass will take a farm access track and public right of way beneath the new carriageway.
- Carrhouse Farm Underpass (work 34) – A new farm accommodation underpass is required beneath the carriageway between the Mottram Moor Junction and the A57 Junction.
- River Etherow Crossing (work 35) – A new river crossing of the River Etherow near the connection at Brookfield will be required (towards the eastern end of the Scheme).
- M67 Junction 4 improvements (works 1, 2 and 3) – Additional approach and potential junction widening.

5.3.6 The work numbers listed above refer to The Works Plan and Works Plan Schedule (application document reference TR010034/APP/2.3).

5.4 Best Practice Guidance – Design

5.4.1 Best practice guidance (as detailed below) will be incorporated into the design of any Scheme components with the potential to impact upon a watercourse and/or its riparian zone, or a groundwater body. Such mitigation is considered to be embedded into the Scheme and aims to minimise the impact of the works associated with the Scheme on WFD quality elements, with a view to securing WFD compliance for the Scheme.

5.4.2 The WFD impact assessment assumes that this best practice guidance for design is embedded into the Scheme.

Bridges

5.4.3 Single span (or clear span) structures are the preferred type of watercourse crossing because they minimise the impact on the water environment, if designed appropriately (Environment Agency, 2013[40]). Single span structures will be designed in such a way as to minimise (as far as reasonably practicable) disruption to the river and riparian zone, as detailed in the Design Manual for Roads and Bridges (DMRB) CD 356: Design of Highways Structures for Hydraulic Action (DMRB, 2020[41]).

[40] Environment Agency, 2013. Water Framework Directive Mitigation Measures Manual. Available from: http://evidence.environment-agency.gov.uk/FCERM/en/SC060065.aspx
[41] Design Manual for Roads and Bridges (DMRB), 2020. CD 356: Design of Highways Structures for Hydraulic Action. Available from: https://www.standardsforhighways.co.uk/prod/attachments/559b43dc-82db-46c9-be1a-f2b718e8db62?inline=true

This includes setting abutments well back from the bank edge to allow the river to function naturally and to maintain a wildlife corridor along the banks, and designing the bridge deck to lie perpendicular to the watercourse (where practicable) to reduce shading. Bed and bank protection will only be used where a real risk to life or critical infrastructure is apparent. The single span structure will be designed so as not to create a barrier to fish and other wildlife, or disrupt navigation or recreation.

5.4.4 The bridge abutments will be situated with a suitable clearance from the bank top. Bridges with abutments will be designed to reduce the width of channel lost, to maintain in-stream and bankside habitats as far as is practicable, and to maintain a sufficient light level to the channel. Careful consideration is required regarding the effect the supports may have on the bed (e.g. scour) and may require bed protection.

Culverts

5.4.5 Where a clear span structure is not technically feasible nor economically viable, a closed culvert is likely to be required. Culverts are common along many of the UK's road and rail networks, in addition to forming large parts of the river networks underneath urban environments. Culverts broadly prevent the occurrence of natural hydraulic and fluvial processes (including sediment transport), may create a barrier for the movement of fish and other wildlife, and limit the growth of vegetation. Culverts may also cause debris build-up and increase flood risk if not properly designed. Therefore, culverts are not the preferred method of a watercourse crossing from the perspective of protecting and improving the water environment.

5.4.6 Culverts, however, are generally cheaper and easier to build than clear span structures. In some cases, they may be the only feasible technical and cost-beneficial solution, particularly where an extension to an existing culvert is required. Therefore, they can be consented by the regulator for smaller, lower sensitivity watercourses if their adverse impact on the water environment can be minimised.

5.4.7 Guidance for environmentally sensitive culvert design can be found in the following additional references:

- DMRB CD 529: Design of Outfall and Culvert Details (DMRB, 2020[42]);
- Chapter 8 of the Environment Agency's Fluvial Design Guide (Environment Agency, 2010a[43]);
- Guidance on culvert design from the Construction Industry Research and Information Association (CIRIA) in Chapter 4 of Culvert Design and Operation Guide (CIRIA, 2010[44]);

[42] Design Manual for Roads and Bridges (DMRB), 2020. CD 529: Design of Outfall and Culvert Details. Available from: https://www.standardsforhighways.co.uk/prod/attachments/a7bfb30c-d084-4b28-b8d7-39dc4d14f5c0?inline=true
[43] Environment Agency, 2010a. Fluvial Design Guide. Available from: http://evidence.environment-agency.gov.uk/fcerm/en/FluvialDesignGuide.aspx
[44] Construction Industry Research and Information Association (CIRIA), 2010. Culvert Design and Operation Guidance (C689). Available from: https://www.ciria.org/Resources/Free_publications/Culvert_design_and_operation_guide_supplementary_technical_note_on_understanding_blockage_risks.aspx

- Guidance on scour from CIRIA in Manual on Scour at Bridges and Other Hydraulic Structures (CIRIA, 2015[45]); and
- Advice on minimising impact on fish passage in the Fish Pass Manual (Environment Agency, 2010b[46]).

5.4.8 The guidance is summarised as follows:

- Minimise the overall length of the culvert structure or extension so far as reasonably practicable;
- Where possible, construct the culvert online with the existing watercourse alignment. Minor re-grading or vertical adjustment of the channel may be required at detailed design;
- The culvert design will reflect the natural bed profile including bank-to-bank channel width, channel gradients and substrates where possible;
- A low-flow channel (sized appropriately to each watercourse) will be constructed within the culvert extension to maintain sufficient water depths and sediment transport through the culvert during normal flow conditions;
- Appropriate inlet and outlet structures will be provided to ensure smooth hydraulic transition and avoid potential erosion;
- Portal frame culverts (i.e. which allow for a natural bed) will be prioritised over box and pipe culverts (i.e. an artificial bed) where possible;
- Culverts will be designed with an appropriate natural bed substrate which reflects the existing channel bed;
- For box culverts (i.e. with an artificial bed), a depressed invert set slightly below the existing bed level is required (typically between 150mm and 300mm), allowing for natural bed substrates to be installed to form the bed level, which helps reduce disruption of channel velocities, maintain habitat connectivity and fish passage;
- A “buffer” zone will be created upstream and downstream of culverts to allow for the creation of habitats which will both enhance the watercourse, and incorporate features such as pools and marginal habitat which will allow fish to rest before entering the culvert.
- The overall culvert design will not in any way impede fish passage up and downstream (including installation of trash screens), and abrupt changes in light (and dark) should be avoided (introduce marginal and bankside planting);
- Where bed/bank protection is likely to be required at the culvert inlet and outlet, “hard” solutions will be avoided where possible in favour of “soft” or “green” measures; and
- Scour pools at the outlet of the culvert will be constructed to dissipate energy and provide resting areas for fish. This is especially important for steeper culverts (>3%) and/or where stream powers are high.

[45] Construction Industry Research and Information Association (CIRIA), 2015. Manual on Scour at Bridges and Other Hydraulic Structures (C742). Available from: https://www.ciria.org/Resources/Free_publications/manual_on_scour.aspx
[46] Environment Agency, 2010b. Environment Agency Fish Pass Manual. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/298053/geho0910btbp-e-e.pdf

Bed and bank reinforcement

5.4.9 Bank and bed erosion are part of the natural functioning of a river, however bed and bank protection may be required.

5.4.10 Guidance on the environmental aspects of bank protection can be found in the following additional references:

- DMRB CD 356: Design of Highways Structures for Hydraulic Action (DMRB, 2020)
- Chapter 8 of the Environment Agency's Fluvial Design Guide (Environment Agency, 2010a)
- Guidance on Green Approaches in River Engineering (HR Wallingford, 2017[47])
- Guidance on bank protection from the Scottish Environmental Protection Agency (SEPA, 2020[48]).

5.4.11 The guidance is summarised as follows:

- Minimise the extent of hard bed and bank protection so far as reasonably practicable, except at locations where it can be demonstrated that it prevents potential loss of life or is necessary to protect critical infrastructure; and
- Working with natural processes (and hence avoiding or minimising the need for hard protection) should be prioritised, where reasonably practicable. Softer, bioengineered solutions will in many cases afford appropriate protection and be a cheaper and more sustainable design.

Realignments

5.4.12 Watercourse realignments associated with the Scheme should be properly designed by a qualified fluvial geomorphologist to safeguard their long-term stability. Poorly designed realignments can increase or decrease sediment movements, resulting in instability through incision, bank erosion or excessive sediment deposition.

5.4.13 Any permanent watercourse diversion works required to realign watercourses will be designed on at least a like-for-like basis (including no net loss in total watercourse length within a water body), but will seek improvement where practicable. Designs will incorporate measures that enhance both in-channel and riparian habitat quality (e.g. provision of a multi-stage channel and marginal planting), and should be routed appropriately to provide a naturalised planform. The design of an appropriate low flow channel will also ensure the continuity of the existing sediment transport regime and aquatic life.

[47] HR Wallingford, 2017. Green Approaches in River Engineering: Supporting Implementation of Green Infrastructure. Available from: https://eprints.hrwallingford.com/1250/1/Green_approaches_in_river_engineering.pdf
[48] Scottish Environmental Protection Agency (SEPA), 2020. Reducing river bank erosion: A best practice guide for farmers and other land managers. Available from: https://www.sepa.org.uk/media/219450/bank_protection_guidance.pdf

5.4.14 Maintaining the existing bed gradient will ensure the continuity of the existing sediment regime. Too low and excessive substrate may begin to deposit, blocking culvert entrances and/or reducing flood flow capacity, this also reduces sediment supply downstream. Too steep and excessive bank erosion and/or bed incision may begin to occur increasing sediment supply downstream (potentially depositing within culverts). If the design requires a change of the bed gradient, mitigation such as step-pools, bed-checks or sediment traps may be necessary.

5.4.15 Existing substrates will be re-instated where possible, otherwise substrates will be matched to local material (e.g. using local quarries for supply). The suitability of substrates will be considered using empirical observations made by a qualified fluvial geomorphologist, in addition to sediment transport calculations (where appropriate).

5.4.16 Consultation with freshwater aquatic ecologists is essential at the outset to ensure the flora and fauna present in the watercourse and riparian zone is given appropriate consideration.

5.4.17 The need for a realignment in all cases will be avoided (or minimised) where possible. Unnecessary modification to a river channel may initiate instability as the channel attempts to recover to a natural course.

Drainage of run-off to surface water and groundwater

5.4.18 Sustainable Drainage Systems (SuDS) are the preferred approach to managing any potentially polluted run-off and will be implemented where technically feasible. All drainage systems will be designed in accordance with industry standards, with particular emphasis on appropriate pollution prevention and control measures (CIRIA, 2015[49]).

5.4.19 The potential consequences of any pollution incidents will be dealt with via the environmental management and contingency planning process to prevent or mitigate for any potentially contaminated run-off being routed to surface water or groundwater.

Deep foundations protruding into aquifer

5.4.20 Below ground structures (including deep foundations and retaining walls) may form a barrier to groundwater flow, depending on the groundwater flow direction. This can potentially reduce groundwater contributions to groundwater-dependant water features (e.g. water courses and any groundwater abstractions in the water body).

5.4.21 Where deep foundations extending beneath the groundwater table are required as part of the Scheme (e.g. piling, retaining walls), these will be designed in accordance with industry standards. Detailed designs will take into account the site-specific water level and flow monitoring data obtained from intrusive ground investigation for the Scheme. A piling risk assessment will be carried out to ensure the selected piling methods do not introduce contamination pathways into the aquifer.

[49] Construction Industry Research and Information Association (CIRIA), 2015. The SuDS Manual (C753). https://www.ciria.org/ItemDetail?iProductCode=C753&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91

5.5 Best Practice Guidance – Construction

5.5.1 Best practice guidance (as detailed below) will be incorporated into the construction of any Scheme components with the potential to impact upon a watercourse and/or its riparian zone, or a groundwater body. Such mitigation is considered to be embedded into the Scheme and aims to minimise (as far as reasonably practicable) the temporary impact of the works associated with the Scheme on the water environment.

5.5.2 The WFD impact assessment assumes that this best practice guidance for construction is embedded into the Scheme.

Run-off from construction sites to surface water and groundwater

5.5.3 Construction can generate significant risk of pollution to surface water bodies and groundwater bodies. Any risks will need to be fully mitigated by suitable control of construction practices and will be incorporated into an appropriate Environmental Management Plan (EMP).

5.5.4 Construction works will adhere to environmental best practice such as guidance provided in Pollution Prevention Guidance (PPG) notes, specifically PPG 5 for Works and Maintenance In or Near Water (Environment Agency, 2014a[50]) and PPG 6 for Construction and Demolition Sites (Environment Agency, 2014b[51]). All PPGs that were previously maintained by the Environment Agency were withdrawn in 2015 as being out-of-date and a new set of guidance notes are presently being issued as Guidance for Pollution Prevention (GPP) documents for Northern Ireland, Scotland and Wales (but not England). The series includes GPP5[52] for Works and Maintenance In or Near Water which may be used as a source of information for good practice.

In-channel works

5.5.5 The design process has sought to minimise the requirement for in-channel working during construction. Where in-channel working cannot be eliminated entirely, best practice guidance (as detailed in the CoCP) will be adhered to.

5.5.6 In-channel working will be undertaken during low flow periods (i.e. when flows are at or below the mean average) as far as practicable to reduce the potential for sediment release and risk of scour, and using appropriate methods to reduce the risk of pollution. Appropriate measures will be in place to ensure any contaminants from construction activities do not enter the watercourse.

5.5.7 The length of channel disturbed, and size of working corridor will be limited to a minimum. In addition, the length of tracking along the side of channels will be minimised as far as reasonably practicable to avoid creating new flow paths and a buffer zone around the watercourse will be maintained where possible.

5.5.8 Noise, vibration and light spill will be minimised as far as reasonably practicable by working back from the watercourses where possible. Construction lighting will be angled away from the watercourse to reduce the potential for disturbance.

[50] Environment Agency (Environment Agency), 2014a [withdrawn]. Pollution Prevention Guidelines: Works and Maintenance In or Near Water (PPG5). Available from: https://www.gov.uk/government/publications/works-in-near-or-over-watercourses-ppg5-prevent-pollution
[51] Environment Agency (Environment Agency), 2014b [withdrawn]. Pollution Prevention Guidelines: Construction and Demolition Sites (PPG6). Available from: . https://www.gov.uk/government/publications/construction-and-demolition-sites-ppg6-prevent-pollution
[52] https://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf?utm_source=website&utm_medium=social&utm_campaign=GPP5%2027112017

5.5.9 Consultation with an appropriately qualified aquatic ecologist should be undertaken to consider the seasonality of watercourse biota present. Any vegetation clearance required for construction should be minimised as far as reasonably practicable and re-instated where practicable.

5.5.10 Where the erection of temporary structures is required for construction, appropriate isolation techniques will be used. These measures will be in place for the minimum possible period of time to minimise disruption to flow, sediments and biota as far as reasonably practicable.

5.5.11 Where watercourses require permanent or temporary dewatering and/or over-pumping to permit construction activities, fish will be removed by means of electrofishing and relocated prior to dewatering. Water flow/passage will be sufficiently maintained as to not result in the drying of habitats downstream of construction activities.

Disturbance of invasive non-native species

5.5.12 Construction activities in, over and adjacent to water bodies offer a significant increase in the risk of the spread of Invasive Non-Native Species (INNS) associated with aquatic and riparian habitats. An initial baseline assessment will be undertaken to identify any particular species which need to be managed.

5.5.13 Any identified risks will need to be managed effectively during the construction period through the implementation of biosecurity control, such as the “check-clean-dry” procedures for plant, equipment and the workforce. The GB Non-Native Species Secretariat website[53] provides a key source of information for the identification of risks, appropriate control and management systems and disposal.

5.5.14 The Environment Agency will also be consulted to ascertain the status and distribution of invasive species in surface water bodies. Consideration will be given to the potential to create pathways for invasive species movement within/between water bodies, through for example, the removal of existing barriers e.g. artificial structures such as weirs and culverts.

Vegetation management

5.5.15 There is often the requirement to manage vegetation (both riparian and aquatic) during construction activities in, over and adjacent to water bodies. Vegetation clearance will only be undertaken following an ecological constraints assessment of the potential for vegetated habitats to support protected species (e.g. nesting birds, reptiles) and to determine the intrinsic ecological value of the habitat, plus the risk posed by INNS. Further information about vegetation management is presented in the Biodiversity chapter (Chapter 8) of the ES (TR010034/APP/6.3).

Groundwater dewatering

5.5.16 Local changes to groundwater levels associated with pumping out of subterranean works areas (e.g. deep foundations) may reduce groundwater contributions to groundwater-dependent water features (e.g. watercourses and any groundwater abstractions within the water body), which may have further negative effects.

[53] Non-Native Species Secretariat, 2020. Available from: http://www.nonnativespecies.org

5.5.17 The disposal of pumped water (as a result of groundwater dewatering) to surface water bodies may cause deterioration to water quality if contaminated.

5.5.18 Below ground structures, including deep foundations and retaining walls can form a barrier to groundwater flow, depending on the groundwater flow direction. This can potentially reduce groundwater contributions to groundwater-dependant water features (e.g. water courses and any groundwater abstractions in the water body). Deep foundations may also create rapid vertical flow pathways into the groundwater body for potentially contaminated run-off.

5.6 Surface Water WFD Impact Assessment

5.6.1 Best practice guidance for both design (Section 5.4) and construction (Section 5.5) are incorporated into the WFD impact assessment for each surface water body. Any residual effects are mitigated for using site-specific mitigation measures, as detailed in Section 5.9.

Etherow (Woodhead Res. to Glossop Bk.)

5.6.2 The complete WFD impact assessment matrix for Etherow (Woodhead Res. to Glossop Bk.) is presented in Appendix C. A summary of the impact assessment is presented below and visualised in Insert 5-1.

5.6.3 Within the water body, Scheme works including realignment and culverting of Tara Brook (WC_200), a new bridge crossing and floodplain reconfiguration at the River Etherow (WC_300), a new cutting at Mottram, and reconfiguration of agricultural land drains (WC_210, WC_211, WC_212, WC_213 and WC_214) resulting in loss of open channel, loss of watercourse baseflow, culverting and watercourse realignment have the potential to cause minor, localised adverse impacts on the water environment. However, the identified additional mitigation measures (Appendix C) are considered sufficient to minimise the potential impact of the Scheme on the water body (assuming that they are appropriately considered and developed at the detailed design stage).

5.6.4 Therefore, the WFD impact assessment for Etherow (Woodhead Res. to Glossop Bk.) concludes that the Scheme works pass both Test A (Potential to cause deterioration of current WFD Ecological Potential) and Test B (Potential to prevent future attainment of Good Ecological Potential), and are considered to have **no measurable impact** at the water body scale.

Etherow (Glossop Bk. to Goyt)

5.6.5 The complete WFD impact assessment matrix for Etherow (Glossop Bk. to Goyt) is presented in Appendix C. A summary of the impact assessment is presented below and visualised in Insert 5-2.

5.6.6 Within the water body, Scheme works include the installation of culverts on unnamed watercourses WC_330 and WC_340, a new cutting at Mottram, and realignment and culverting of Hurstclough Brook (WC_300). An approximately 600 m length of Hurstclough Brook (WC_300) to the southern side of the A57 link may also be affected by the Scheme alignment causing a reduction in the catchment contributions entering the watercourse reach by being diverted into interceptor channels on the northern side of the A57 link. Field observations indicate that a significant proportion of the flow in the potentially affected reach is derived from the upstream channel extent, such that the potential influence on the reach is considered to be of a localised, minor adverse impact. Since the interceptor channels are diverted back into the Hurstclough Brook (WC_300) directly upstream of the existing A57, there is no expected change in the overall surface water balance within the downstream receiving waterbodies.

5.6.7 These works have the potential to cause a minor, localised adverse impact on the water environment. However, the identified additional mitigation measures (Appendix C) are considered sufficient to minimise the potential impact of the Scheme on the water body (assuming that they are appropriately considered and developed at the detailed design stage).

5.6.8 Therefore, the WFD impact assessment for Etherow (Glossop Bk. to Goyt) concludes that the Scheme works pass both Test A (Potential to cause deterioration of current WFD Ecological Potential) and Test B (Potential to prevent future attainment of Good Ecological Potential), and are considered to have **no measurable impact** at the water body scale.

Glossop Brook (Long Clough Brook to Etherow)

5.6.9 Only indirect effects of the Scheme works are assessed for the Glossop Brook (Long Clough Brook to Etherow) surface water body.

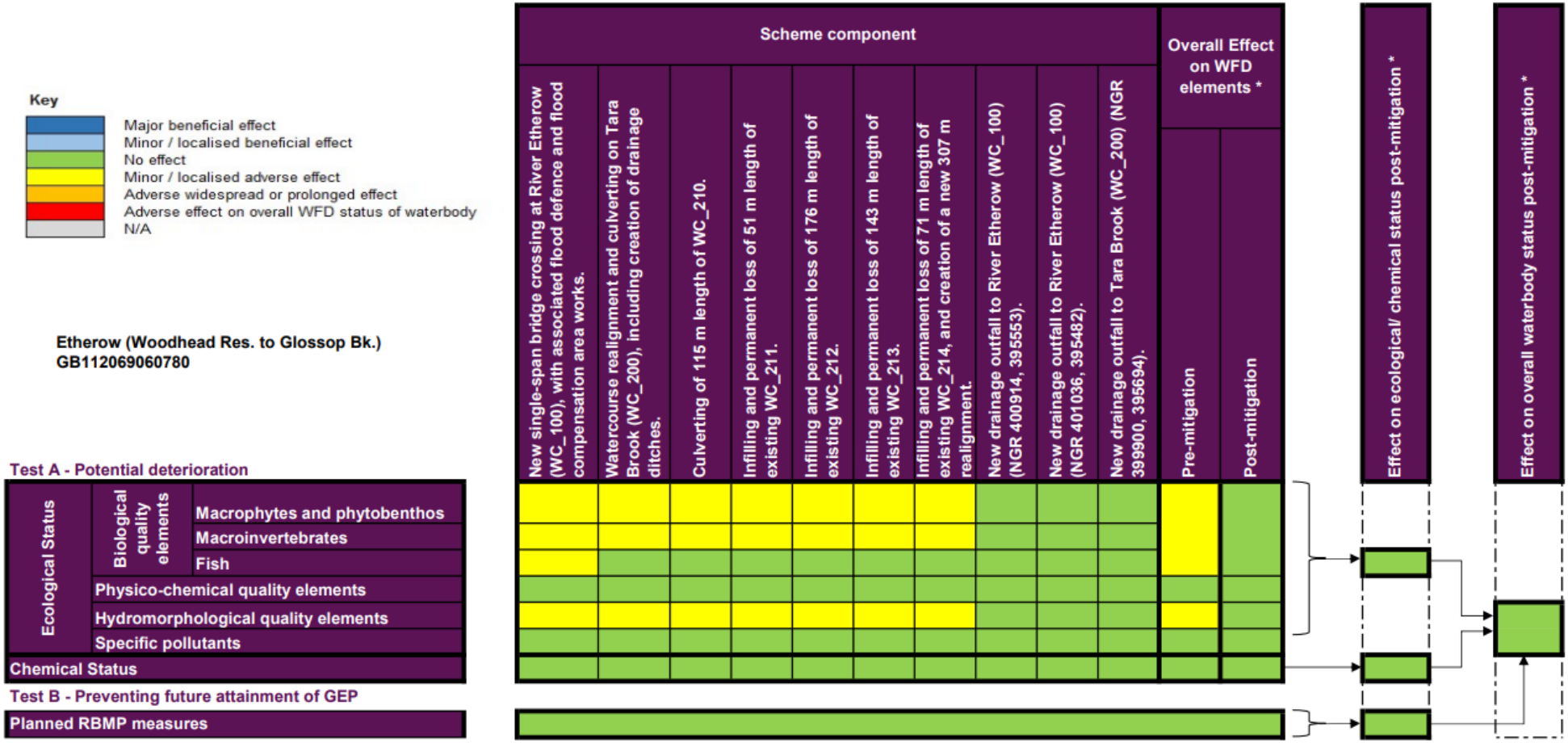
5.6.10 The confluence of Glossop Brook with the River Etherow (approximately 350 m downstream of the Scheme Boundary) acts as the trijunction where the Etherow (Woodhead Res. to Glossop Bk.), Etherow (Glossop Bk. to Goyt) and Glossop Brook (Long Clough Brook to Etherow) WFD surface water body catchments intersect. Therefore, Glossop Brook is upstream of the WFD surface water bodies in which the Scheme works are proposed and **no measurable impact** is expected at the water body scale.

Wilson Brook

5.6.11 Only indirect effects of the Scheme works are assessed for the Wilson Brook surface water body.

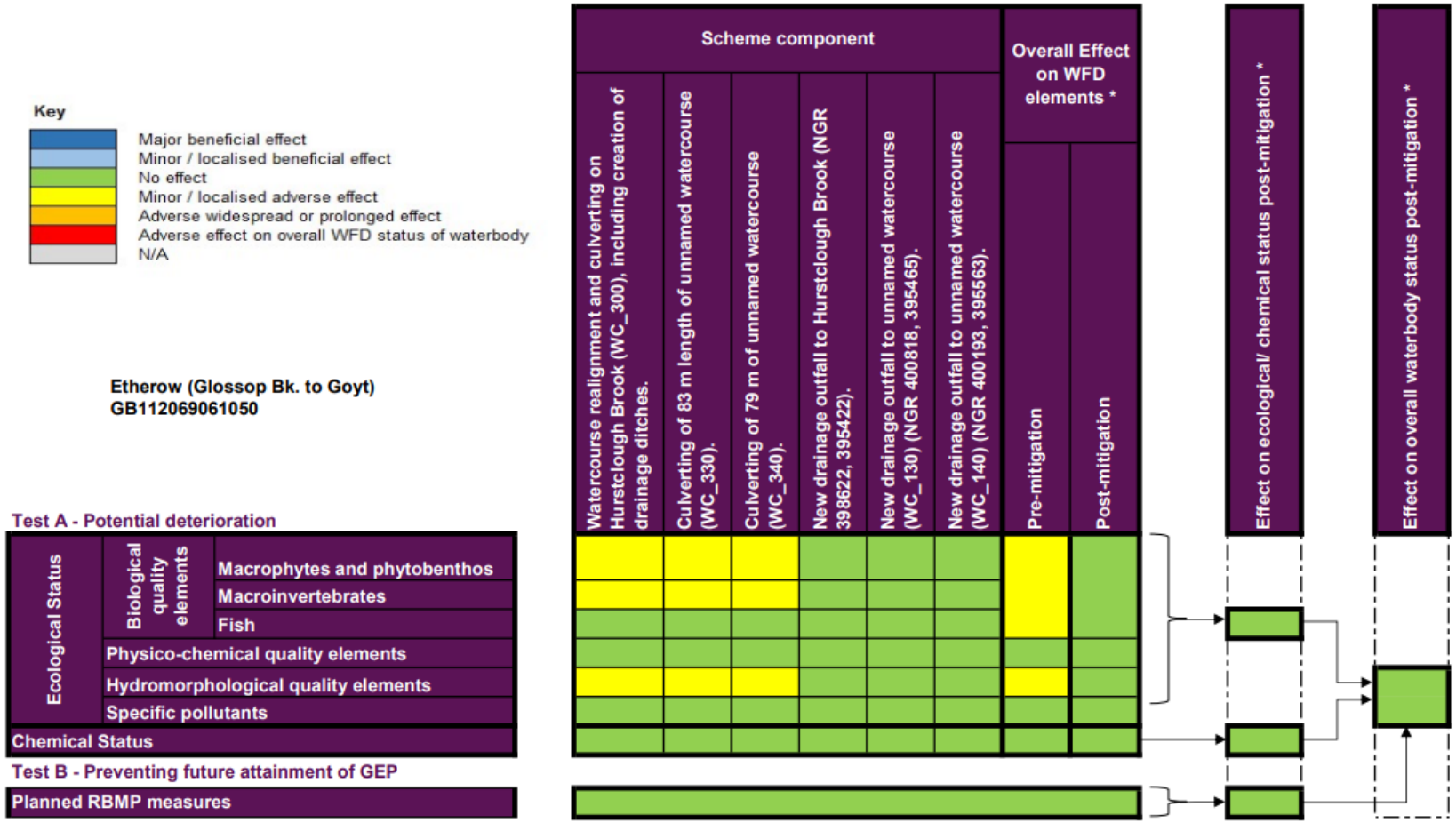
5.6.12 The very western extent (approximately 300 m) of the proposed Scheme Boundary is located within the Wilson Brook WFD surface water body. The works within this area of the Scheme are tying-in works between the existing M67 Junction 4 roundabout and the proposed A57 road. The proposed works have no linkage to watercourses within the Wilson Brook WFD surface water body, such that **no measurable impact** is expected at the water body scale.

Insert 5-1 – Summary of WFD impact assessment matrix for Etherow (Woodhead Res. to Glossop Bk.) WFD water body.



* Each of these assessments takes the category with the worst effect recorded on the scheme components contained within their assessment

Insert 5-2 – Summary of WFD impact assessment matrix for Etherow (Glossop Bk. to Goyt) WFD water body.



* Each of these assessments takes the category with the worst effect recorded on the scheme components contained within their assessment

5.7 Groundwater WFD Impact Assessment

5.7.1 The potential impacts to groundwater during construction are detailed in Table 5.4. These would include the same potential impacts as for surface water as well as effects relating to temporary dewatering, construction of deep foundations and road runoff. These have the potential to affect groundwater levels, flow pathways and groundwater quality.

5.7.2 This assessment of potential effects on groundwater is based on the currently available site-specific groundwater level data. Supplementary ground investigation is planned to address gaps in groundwater level information and additional hydrogeological assessment will be required following completion of the supplementary ground investigation.

Table 5.4: Potential groundwater impacts during construction.

Activity	Scheme element[54]	Potential impact
Temporary dewatering	Work 5 and 6 where the dual carriageway to the east of Mottram will be installed within a cutting will require temporary dewatering Work 33 – Mottram Underpass	Local changes to groundwater levels and groundwater flow pathways. Leading to potential effects on baseflow contribution to surface water features and local groundwater abstractions. Impact associated with pumping out of subterranean works areas (e.g. deep foundations) and disposal of pumped water to surface water bodies.
Installing deep foundations associated with new structures and installing cuttings	Work 5 & 6 to east of Mottram – cutting earthworks Work 31 – Old Mill Farm underpass Work 32 – Roe Cross Road Bridge & retaining walls Work 33 – Mottram underpass Work 34 – Carrhouse Lane underpass Work 35 – River Etherow Bridge	Installing deep foundations and cuttings may introduce a rapid vertical flow pathway into the aquifer for potentially contaminated runoff.
Vehicles accessing compounds, refuelling, oil/fuel storage tanks and accidental spillage, including during temporary highways works	Site compounds	Risk of untreated runoff from construction sites discharging through permeable surface geology direct to the aquifer.

[54] Work numbers refer to The Works Plan and Works Plan Schedule (application document reference TR010034/APP/2.3).

5.7.3 The potential impacts during operation to groundwater are summarised in Table 5.5. These cover the permanent effect of subsurface structures on groundwater flow and accidental spillages and drainage to groundwater. This assessment of potential effects on groundwater is based on the currently available site-specific groundwater level data. Supplementary ground investigation is planned to address information gaps and additional hydrogeological assessment will be required following completion of the supplementary ground investigation.

Table 5.5: Potential groundwater impacts during operation.

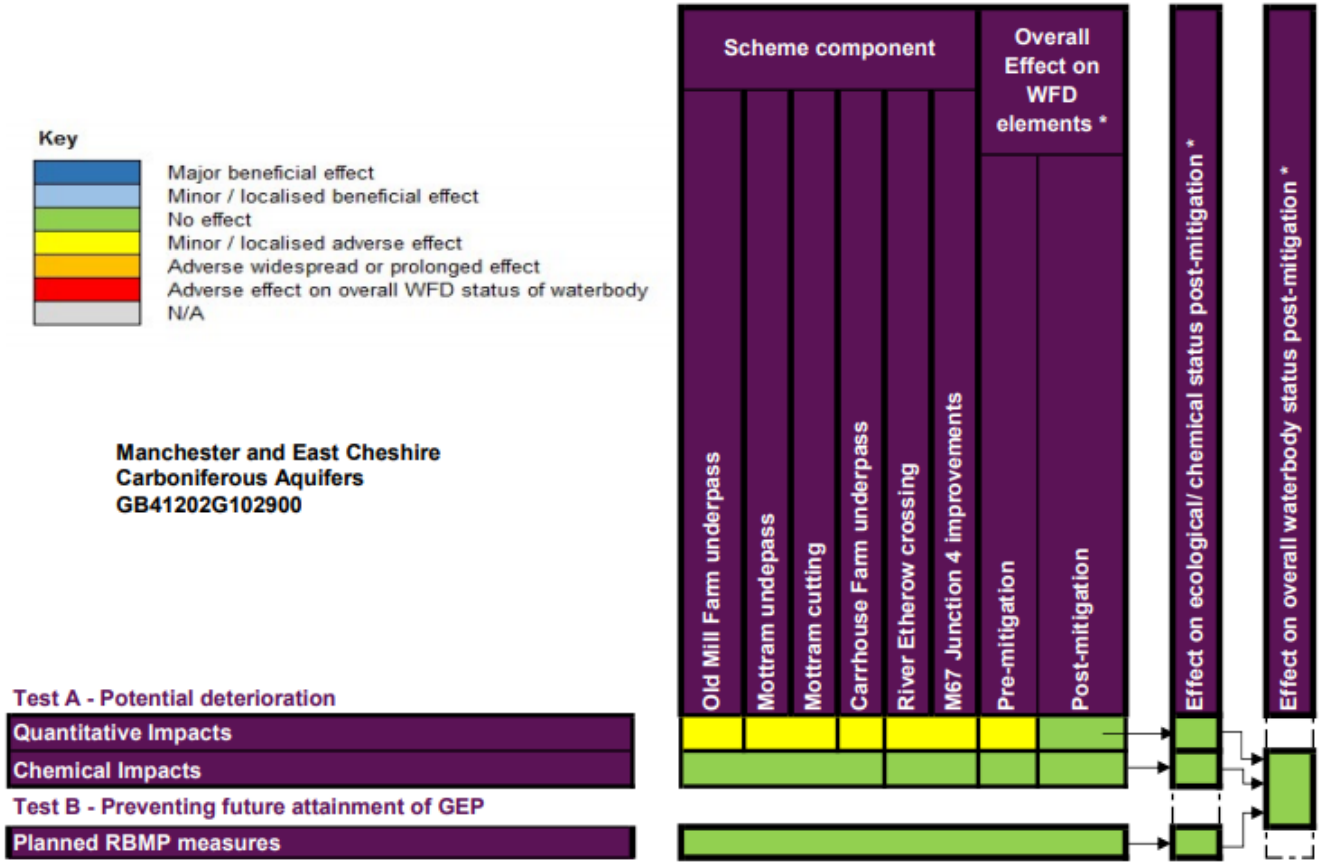
Activity	Scheme element[55]	Potential impact
Permanent disturbance of groundwater flow paths due to deep foundations, cuttings and concrete underpass structures	Work 5 & 6 to east of Mottram – cutting earthworks Work 33 – Mottram underpass	Subsurface structures and deep foundations which are part of the permanent design may cause a barrier to groundwater flow. This may lead to potential effects on baseflow contribution to surface water features and local groundwater abstractions. The deep foundations may also introduce a permanent rapid vertical flow pathway into the groundwater body for potentially contaminated runoff.
Accidental spillage from a highways accident	All new highways and associated drainage	Runoff from highways may have increased levels of suspended sediments, oils, metals, de-icing fluids and herbicides which can have adverse impacts upon groundwater quality if the spillage reaches the aquifers.

5.7.4 The complete WFD assessment matrix for the Manchester and East Cheshire Carboniferous Aquifers WFD groundwater body is included in Appendix C. A summary of the impact assessment is presented below and shown in Insert 5-3.

5.7.5 The assessment concludes that, with the proposed mitigation measures (see Section 5.9) in place, while there may be localised effects on groundwater flow, at the water body scale, the Scheme is anticipated to have **no measurable impact** on the groundwater body. The scheme components affecting the groundwater body are not considered to cause deterioration at the water body scale (thus passing Test A) and should not prevent future attainment of GES (Test B).

[55] Work numbers refer to The Works Plan and Works Plan Schedule (application document reference TR010034/APP/2.3).

Insert 5-3 – Summary of WFD impact assessment matrix for Manchester and East Cheshire Carboniferous Aquifers WFD groundwater body.



* Each of these assessments takes the category with the worst effect recorded on the scheme components contained within their assessment

5.8 Cumulative Impacts

5.8.1 Cumulative effects of multiple Scheme components within the same WFD water body have been accounted for within the assessment process, as described in Section 2.4.

5.8.2 The cumulative effects of Scheme components within the Etherow (Woodhead Res. to Glossop Bk.) and Etherow (Glossop Bk. to Goyt) WFD surface water bodies are summarised in Table 5.6.

5.8.3 Within the Etherow (Woodhead Res. to Glossop Bk.) WFD surface water body, the watercourse diversion at Tara Brook (WC_200) provides mitigation for the direct loss of existing open watercourse through infilling and culverting on Tara Brook (WC_200). There is also direct loss of open watercourse on the minor agricultural unnamed watercourses (WC_210, 211, 212, 213 and 214), as well as a watercourse diversion of WC_214. Overall, there is a net loss of 354 m in the total length of open watercourse within the water body, however these watercourses are predominantly ephemeral channels of low biological and morphological value such that the cumulative impact at the water body scale for Etherow (Woodhead Res. to Glossop Bk.) is considered to be **negligible**.

5.8.4 Within the Etherow (Glossop Bk. to Goyt) WFD surface water body, the watercourse diversion of Hurstclough Brook (WC_300) and the proposed backwater provide mitigation for the direct loss of open watercourse through infilling and culverting on Hurstclough Brook (WC_300). Unnamed watercourses WC_330 and WC_340 are proposed to be culverted for a length underneath the proposed Scheme alignment, both watercourses are minor agricultural drains which are predominantly ephemeral and of low biological and morphological diversity. This habitat loss is mitigated for by the proposed interceptor channels which capture catchment flows and redirect these through WC_330 and WC_340 into the Hurstclough Brook (WC_300) downstream of the Scheme. These interceptor channels are interconnected with the watercourse network and will provide additional, enhanced habitats compared to the existing minor drains. Overall, there is a net gain of 363 m in the total length of open watercourse within the water body. Therefore, the cumulative impact at the water body scale for Etherow (Glossop Bk. to Goyt) is considered to be **negligible**.

5.8.5 The cumulative impact at the water body scale for surface water bodies is considered to be **negligible**. Overall, there is a net gain of 9 m of open watercourse habitat across the Scheme. Since the water features affected by the Scheme are predominantly headwaters, cumulative effects can only transfer to downstream water bodies. The potential impacts on the downstream WFD water bodies are also considered to be negligible.

5.8.6 As there are no significant residual impacts identified for the WFD groundwater body, the cumulative impact for groundwater is considered to be **negligible**, and the potential impacts on the adjacent WFD water bodies are also considered to be negligible.

Table 5.6: Summary of intra-Scheme cumulative impacts for surface water

D Water Body	Watercourse	Activity (m)							
		Watercourse Loss[56]	Watercourse Culvert[57]	Watercourse Diversion[58]	Diversion Culvert[59]	Interceptor Channel[60]	Back-water[61]	Bridge[62]	Total
Etherow (Woodhead Res. to Glossop Bk.)	River Etherow (WC_100)	0	0	0	0	0	0	-18	**-18**
	Tara Brook (WC_200)	-304	-33	322	-72	0	0	0	**-87**
	Unnamed watercourse (WC_210)	0	-115	0	0	0	0	0	**-115**
	Unnamed watercourse (WC_211)	-51	0	0	0	0	0	0	**-51**
	Unnamed watercourse (WC_212)	-176	0	0	0	0	0	0	**-176**
	Unnamed watercourse (WC_213)	-143	0	0	0	0	0	0	**-143**
	Unnamed watercourse (WC_214)	-71	0	307	0	0	0	0	**236**
Water Body Total		**-745**	**-148**	**629**	**-72**	**0**	**0**	**-18**	**-354**

WFD Water Body	Watercourse	Activity (m)							
		Watercourse Loss	Watercourse Culvert	Watercourse Diversion	Diversion Culvert	Interceptor Channel	Back-water	Bridge	Total
Etherow (Glossop Bk. to Goyt)	Hurstclough Brook (WC_300)	-221	-56	220	-31	546	67	0	**525**
	Unnamed watercourse (WC_330)	0	-83	0	0	0	0	0	**-83**
	Unnamed watercourse (WC_340)	0	-79	0	0	0	0	0	**-79**
Water Body Total		**-221**	**-218**	**220**	**-31**	**546**	**67**	**0**	**363**
Scheme Total		**-966**	**-366**	**849**	**-103**	**546**	**67**	**-18**	**9**

[56] "Watercourse loss" refers to length of existing open watercourse infilled as a result of the Scheme.
[57] "Watercourse culvert" refers to length of existing open watercourse culverted as a result of the Scheme.
[58] "Watercourse diversion" refers to length of realigned open watercourse as a result of the Scheme.
[59] "Diversion culvert" refers to length of culverts associated with realigned watercourse.
[60] "Interceptor channel" refers to length of interceptor channel associated with the Scheme. These are connected to the watercourse network and are separate to the road drainage system.
[61] "Backwater" refers to length of existing open watercourse retained as a backwater environment connected to watercourse network.
[62] "Bridge" refers to length of open watercourse "covered" according to the bridge deck width.

5.9 Site-Specific Mitigation Measures

5.9.1 Best practice guidance for design and construction pertinent to both the surface water environment and groundwater environment are set out in Section 5.4 and Section 5.5 respectively. This best practice guidance should be adhered to in order to minimise the potential impact of the Scheme on the water environment.

5.9.2 Site-specific mitigation measures are identified where mitigation which goes beyond best practice is required to reduce the potential impact of the Scheme. These site-specific mitigation measures are to be incorporated into the Environmental Management Plan (EMP) (application document TR010034/APP/7.2) and the Register of Environmental Actions and Commitments (REAC) (application document TR010034/APP/7.3).

5.9.3 For surface water, site-specific mitigation measures are required for watercourse realignments during subsequent design to ensure that the channels are designed to be ecologically sensitive and to promote the natural hydromorphological regime (for example, allowance for two-stage channel profile, reinstatement/enhancement of riparian corridor). In particular, the realignment of WC_214 which will be located at the top of the road cutting and will need considerate design to ensure the channel is stable (for example, appropriate lining materials). The interceptor channels, whilst not direct watercourse realignments, are interconnected to the watercourse network and will be designed in accordance with the best practice principles of watercourse realignments, including ecological sensitivity and promotion of the natural hydromorphological regime. Retention of an existing 67 m length of Hurstclough Brook (WC_300) as a backwater environment of the proposed channel realignment will also need to be designed appropriately in order to ensure connectivity with the proposed watercourse realignment.

5.9.4 For groundwater, following planned supplementary ground investigation, an additional hydrogeological risk assessment will be undertaken which will enable design of site-specific mitigation measures. At this stage, mitigation principles for managing the risk to groundwater during construction and operation have been set out:

- Designing the drainage strategy to allow for management of groundwater contributions to surface water flow. Where possible, this would be in keeping with the current groundwater flow pathways.
- Secant piling is currently planned to be used during construction of the cutting and underpass to reduce impacts of dewatering on the surrounding environment. This would remain in place during operation. Should the hydrogeological risk assessment show groundwater flow to be perpendicular to the proposed piling, the piling would have a notable effect on local groundwater levels, reducing baseflow to surface watercourses. In this scenario, king pin piling can be used to allow groundwater flow across the piling, reducing the impact on groundwater levels.

5.10 Biodiversity Net Gain

5.10.1 An initial assessment of biodiversity units using the Defra Biodiversity Metric 2.0 has been undertaken for the Scheme. Field observations, coupled with professional judgement, were used to determine whether watercourses should be considered as river/stream or ditch type habitat (the latter being considered within the area habitats assessment as per Defra Biodiversity Metric 2.0 guidance[63]).

5.10.2 In determining whether a watercourse should be classed as river/stream or ditch type habitat, consideration has been given to whether the watercourse exhibits characteristics that are typical of fluvial systems (e.g. flowing water, active erosion/deposition and geomorphological and ecological features characteristic of river environments). If the channel is heavily modified and lacks typical river features, a professional judgement has been made as to whether it should be classified as a ditch and subsequently screened out of MoRPh survey (the method used for assessing River Condition under the Defra Biodiversity Metric 2.0).

5.10.3 Three watercourses were screened in as river/stream habitat for inclusion within the rivers and streams component of the biodiversity metric. These are: River Etherow (WC_100), Tara Brook (WC_200) and Hurstclough Brook (WC_300).

5.10.4 The Biodiversity Metric 2.0 rivers and streams component has been run based on the current Scheme design developed to support the DCO application. The calculator predicts the Scheme to provide a small gain in River Biodiversity Units (+ 0.38 units) resulting in a 2.09% total net change.

5.10.5 These calculations are based on a number of assumptions principally related to the ascribed distinctiveness and condition of the river baseline, creation and enhancement. This approach has been necessary to overcome limitations with the current Defra metric which is available only as a beta test version at the time of writing. Further details on RBU are provided within Biodiversity Baseline and Preliminary Assessment, within Appendix 8.1 of the ES (TR010034/APP/6.5).

5.11 Risk of Derogation

5.11.1 A summary of WFD compliance for all WFD water bodies assessed for this Scheme is presented in Table 5.7.

Table 5.7: Summary of WFD compliance assessment for all water bodies.

WFD Water Body	Assessment Conclusion	Test A	Test B	Risk of Derogation
Etherow (Woodhead Res. to Glossop Bk.)	No measurable impact at the water body scale.	Pass	Pass	No
Etherow (Glossop Brook to Goyt)	No measurable impact at the water body scale.	Pass	Pass	No
Glossop Brook (Long Clough Brook to Etherow)	No measurable impact at the water body scale.	Pass	Pass	No

[63] Natural England (2019) The Biodiversity Metric 2.0: auditing and accounting for biodiversity value. User guide (Beta Version, July 2019). Natural England

WFD Water Body	Assessment Conclusion	Test A	Test B	Risk of Derogation
Wilson Brook	No measurable impact at the water body scale.	Pass	Pass	No
Manchester and East Cheshire Carboniferous Aquifers.	No measurable impact at the water body scale.	Pass	Pass	No

5.11.2 At the current stage of design, the Scheme is not considered to cause deterioration at the water body scale (Test A) and should not prevent the future attainment of GEP (Test B) for any of the assessed WFD water bodies.

5.11.3 The works associated with the Scheme are localised in their extent and impact, resulting in **no measurable impact** at the water body scale for all of the assessed WFD water bodies.

5.11.4 Therefore, assuming the best practice guidelines outlined above for design and construction, and identified site-specific mitigation measures are adhered to, this WFD compliance assessment concludes that the Scheme is **likely to be WFD-compliant**.

5.12 Further Requirements

5.12.1 This WFD compliance assessment should be considered as a live document and will need updating during subsequent design stages.

5.12.2 This document will be shared with the design team to ensure best practice and other site-specific mitigation is identified and appropriately applied.

5.12.3 The best practice guidelines and mitigation measures identified will need integrating into the design and construction process. This will occur through liaison with the Scheme design team and design workshops.

5.12.4 Further consultation with the Environment Agency regarding this WFD impact assessment will continue as the Scheme progresses through detailed design.

5.12.5 Supplementary ground investigation, which commenced in February 2021 is being undertaken and, once complete, will be followed by an additional hydrogeological risk assessment. This will enable design of site-specific mitigation measures which will include design of drainage to account for groundwater and design of below-ground structures to mitigate impact on groundwater flow pathways.

6. Summary and Conclusions

6.1.1 A WFD compliance assessment has been undertaken for the proposed A57 Link Roads Scheme and is based on the current Scheme design developed to support the DCO application.

6.1.2 As per the PINS guidance, this WFD compliance assessment has been completed in three phases:

- Stage 1 (WFD Screening)
- Stage 2 (WFD Scoping)
- Stage 3 (WFD Impact Assessment).

6.1.3 Stage 1 (WFD Screening) identified WFD water bodies within the ZoI (0.5 km buffer around the Scheme Boundary for surface water and 1 km buffer for groundwater) to be considered at subsequent stages of this WFD compliance assessment.

6.1.4 Stage 2 (WFD Scoping) identified activities associated with the Scheme which may affect the water environment and established a baseline for each of the WFD water bodies identified in Stage 1 (WFD Screening).

6.1.5 Stage 3 (WFD Impact Assessment) included identification of individual Scheme components and the affected receptors, and field surveys to further assess the character of the affected receptors. A matrix-based approach to the WFD impact assessment was then used to assess the effect of each individual Scheme component on each of the individual WFD quality elements for a water body to be assessed.

6.1.6 The principle components of the Scheme affecting the water environment include: permanent loss, realignment and culverting of watercourses, new drainage channels, new drainage outfalls, a new underpass and cutting at Mottram, and a new bridge crossing on the River Etherow.

6.1.7 A detailed WFD impact assessment has been undertaken for each of the following four identified WFD surface water bodies:

- Etherow (Woodhead Res. to Glossop Bk.)
- Etherow (Glossop Brook to Goyt)
- Glossop Brook (Long Clough Brook to Etherow)
- Wilson Brook and one identified groundwater body:
- Manchester and East Cheshire Carboniferous Aquifers.

6.1.8 This WFD compliance assessment has identified that at the current stage of design, the Scheme components affecting the WFD water bodies are not considered to cause deterioration at the water body scale (Test A) and should not prevent future attainment of GEP (Test B). The cumulative effects of the Scheme components is also considered to be negligible at the water body scale, with an overall gain of 9 m of open watercourse habitat, and are not considered to have any adverse cumulative effects on downstream (or adjacent) WFD water bodies. Therefore, assuming the best practice guidelines for design and construction, and identified specific mitigation measures are adhered to, this assessment concludes that the Scheme is **likely to be WFD-compliant**.

6.1.9 Supplementary ground investigation is planned followed by an additional hydrogeological risk assessment. This will enable design of site-specific mitigation measures which will include design of drainage to account for groundwater and design of below-ground structures to mitigate impact on groundwater flow pathways.

6.1.10 The Biodiversity Metric 2.0 rivers and streams component has been applied based on the current Scheme design developed to support the DCO application. The calculator predicts the Scheme to provide a small net gain for the Rivers and Stream component with a gain of 0.3 River Biodiversity Units resulting in a 1.7% total net change in available river habitat.

6.1.11 Consultation has been undertaken throughout this assessment process with the Environment Agency and further consultation will continue, as appropriate, as the Scheme progresses through detailed design.

6.1.12 This WFD compliance assessment should be considered as a live document and will need updating during subsequent design stages.

Appendices

Appendix A. WFD Classifications

A.1 Surface Water

A.1.1 The current (2019, Cycle 2) WFD status for the four identified WFD river water bodies are summarised in Table A-1 to Table A-4. The tables also summarise the objectives set by the Environment Agency for the water bodies to work towards.

Table A-1: Etherow (Woodhead Res. to Glossop Bk.) WFD status (2019)

Water Body Name	Etherow (Woodhead Res. to Glossop Bk.)	
Water Body ID	GB112069060780	
Hydromorphological Designation	Heavily Modified	
Classification	2019 (Cycle 2)	Objectives
Overall water body	Moderate	Good by 2027
Ecological	Moderate	Good by 2027
Supporting elements (surface water)	Moderate	Good by 2027
Biological quality elements	Poor	Moderate by 2027
Macrophytes and Phytobenthos	Good	Good by 2015
Fish	Poor	Moderate by 2027
Invertebrates	Good	Good by 2015
Hydromorphological supporting elements	-	Not assessed
Physico-chemical quality elements	Good	Good by 2027
Acid Neutralising Capacity	High	Good by 2015
Ammonia (Phys-Chem)	High	Good by 2015
Biochemical Oxygen Demand (BOD)	-	-
Dissolved Oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	High	Good by 2015
Temperature	Good	Good by 2015
Specific pollutants	High	High by 2015
Chemical	Fail	Good by 2015
Priority substances	Good	Does not require assessment
Other pollutants	Does not require assessment	Does not require assessment
Priority hazardous substances	Fail	Does not require assessment

Table A-2: Etherow (Glossop Brook to Goyt) WFD status (2019)

Water Body Name	Etherow (Glossop Brook to Goyt)	
Water Body ID	**GB112069061050**	
Hydromorphological Designation	**Not designated artificial or heavily modified**	
Classification	**2019 (Cycle 2)**	**Objectives**
Overall water body	Poor	Moderate by 2027
Ecological	Poor	Moderate by 2027
Biological quality elements	Poor	Moderate by 2027
Macrophytes and Phytobenthos	Moderate	Moderate by 2015
Fish	Poor	Moderate by 2027
Invertebrates	Good	Good by 2015
Hydromorphological supporting elements	Supports Good	Supports Good by 2015
Physico-chemical quality elements	Moderate	Moderate by 2015
Acid Neutralising Capacity	High	-
Ammonia (Phys-Chem)	Moderate	Good by 2027
Biochemical Oxygen Demand (BOD)	-	-
Dissolved Oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Poor by 2015
Temperature	High	Good by 2015
Specific pollutants	High	-
Chemical	Fail	Good by 2015
Priority substances	Fail	Does not require assessment
Other pollutants	Does not require assessment	Does not require assessment
Priority hazardous substances	Fail	Does not require assessment

Table A-3: Glossop Brook (Long Clough Brook to Etherow) WFD status (2019)

Water Body Name	Glossop Brook (Long Clough Brook to Etherow)	
Water Body ID	GB112069060720	
Hydromorphological Designation	Heavily Modified	
Classification	**2019 (Cycle 2)**	**Objectives**
Overall water body	Moderate	Moderate by 2015
Ecological	Moderate	Moderate by 2015
Supporting elements (surface water)	Moderate	Moderate by 2015
Biological quality elements	Good	Good by 2015
Macrophytes and Phytobenthos	Good	Good by 2015
Invertebrates	Good	Good by 2015
Hydromorphological supporting elements	Supports Good	Supports Good by 2015
Physico-chemical quality elements	Good	Good by 2015
Acid Neutralising Capacity	-	-
Ammonia (Phys-Chem)	High	Good by 2015
Biochemical Oxygen Demand (BOD)	-	-
Dissolved Oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Good	Good by 2015
Temperature	High	Good by 2015
Specific pollutants	-	Not assessed
Chemical	Fail	Good by 2015
Priority substances	Good	Does not require assessment
Other pollutants	Does not require assessment	Does not require assessment
Priority hazardous substances	Fail	Does not require assessment

Table A-4: Wilson Brook WFD status (2019)

Water Body Name	Wilson Brook	
Water Body ID	**GB112069061280**	
Hydromorphological Designation	**Heavily Modified**	
Classification	**2019 (Cycle 2)**	**Objectives**
Overall water body	Moderate	Good by 2027
Ecological	Moderate	Good by 2027
Supporting elements (surface water)	Moderate	Good by 2027
Biological quality elements	Moderate	Good by 2027
Macrophytes and Phytobenthos	Moderate	Good by 2027
Fish	Moderate	Good by 2027
Invertebrates	Moderate	Good by 2021
Hydromorphological supporting elements	Supports Good	Supports Good by 2015
Physico-chemical quality elements	Moderate	Good by 2027
Acid Neutralising Capacity	-	-
Ammonia (Phys-Chem)	Moderate	Good by 2015
Biochemical Oxygen Demand (BOD)	-	-
Dissolved Oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
Specific pollutants	-	Not assessed
Chemical	Fail	Good by 2015
Priority substances	Good	Does not require assessment
Other pollutants	Does not require assessment	Does not require assessment
Priority hazardous substances	Fail	Does not require assessment

A.2 Groundwater

Manchester and East Cheshire Carboniferous Aquifers

A.2.1 The current (2019, Cycle 2) WFD status for the WFD groundwater body is summarised in Table A-5. The table also summarises the objectives set by the Environment Agency for the water body to work towards.

Table A-5: Manchester and East Cheshire Carboniferous Aquifers WFD status (2019)

Water Body Name	Manchester and East Cheshire Carboniferous Aquifers	
Water Body ID	**GB41202G102900**	
Classification	**2019 (Cycle 2)**	**Objectives**
Overall water body	Poor	Good by 2027
Quantitative	Good	Good by 2015
Quantitative Saline Intrusion	Good	Good by 2015
Quantitative Water Balance	Good	Good by 2015
Quantitative GWDTEs Test	Good	Good by 2015
Quantitative Dependent Surface Water Body Status	Good	Good by 2015
Chemical (GW)	Poor	Good by 2027
Chemical Drinking Water Protected Area	Poor	Good by 2027
General Chemical Test	Good	Good by 2015
Chemical GWDTEs test	Good	Good by 2015
Chemical Dependent Surface Water Body Status	Good	Good by 2015
Chemical Saline Intrusion	Good	Good by 2015

Appendix B. Scheme Works

A summary of the Scheme works affecting watercourses is provided in

B.1.1 Table 5.2. The individual Scheme works affecting watercourses in the Etherow (Woodhead Res. to Glossop Bk.) and Etherow (Glossop Bk. to Goyt) WFD river water bodies are presented in Table B-1 and Table B-2 respectively.

B.1.2 The individual Scheme works (including their descriptions and associated lengths) are directly transposed from The Works Plan and Works Plan Schedule (application document reference TR010034/APP/2.3).

Table B-1: Individual Scheme works affecting watercourses within the Etherow (Woodhead Res. to Glossop Bk.) WFD water body.

Watercourse Information		Baseline		Proposed			
Watercourse Name	River Type	Length (m)	Description	Works Schedule Number	Length (m)	Works Description	Category
River Etherow (WC_100)	WFD designated watercourse	18	Large, modified watercourse through agricultural land. Of moderate quality with some active fluvial processes and available aquatic habitat.	work 35	18	River Etherow Bridge - New single span bridge carrying single carriageway and bridleway over river. 42m span, 18m wide.	Bridge Crossing
Tara Brook (WC_200)	Ordinary watercourse	304	Small, minor tributary of the River Etherow which flows through agricultural land. Of low quality at this location with minimal flow, few active morphological features and little habitat complexity.	n/a	-304	304 m of Tara Brook (WC_200) to be infilled to accommodate new Scheme road alignment.	Watercourse Loss
				work 36 (x)	33	Culverted Watercourse - proposed culvert to carry existing watercourse below proposed footway.	Watercourse Culvert
				work 36 (xi)	72	Culverted Watercourse - proposed culvert to carry existing watercourse below proposed highway.	Watercourse Diversion Culvert
				work 36 (xii)	14	Proposed culvert for drainage ditch below proposed footway & access track.	Drainage Ditch Culvert
				work 36 (xiii)	14	Proposed culvert for drainage ditch below proposed footway.	Drainage Ditch Culvert
				work 45 (i)	47	Watercourse diversion South of Glossop Spur to tie in with existing water course	Watercourse Diversion
				work 45 (ii)	188	Watercourse diversion South of Glossop Spur to tie in with existing water course	Watercourse Diversion

Watercourse Information		Baseline		Proposed			
Watercourse Name	River Type	Length (m)	Description	Works Schedule Number	Length (m)	Works Description	Category
				work 45 (iii)	87	Watercourse diversion North of Glossop Spur to tie in with existing water course	Watercourse Diversion
				work 46 (i)	114	Drainage ditches on Glossop Spur	Drainage Ditch
				work 46 (ii)	33	Drainage ditches on Glossop Spur	Drainage Ditch
				work 46 (iii)	233	Drainage ditches on Glossop Spur	Drainage Ditch
				work 46 (iv)	614	Drainage ditches on Glossop Spur	Drainage Ditch
				work 46 (v)	17	Drainage ditches on Glossop Spur	Drainage Ditch
				work 46 (vi)	422	Drainage ditches on Glossop Spur	Drainage Ditch
				work 46 (vii)	162	Drainage ditches on Glossop Spur	Drainage Ditch
Unnamed watercourse (WC_210)	Ordinary watercourse	115	Small agricultural land drain of low quality.	work 36 (ix)	115	Culverted Watercourse - proposed culvert to carry existing watercourse below proposed highway	Watercourse Culvert
Unnamed watercourse (WC_211)	Ordinary watercourse	51	Small agricultural land drain of low quality.	n/a	-51	51 m of WC_211 to be infilled to accommodate new Scheme road alignment.	Watercourse Loss
Unnamed watercourse (WC_212)	Ordinary watercourse	176	Small agricultural land drain of low quality.	n/a	-176	176 m of WC_212 to be infilled to accommodate new Scheme road alignment. Existing alignment of WC_213 to be retained downstream of DCO boundary.	Watercourse Loss

Watercourse Information		Baseline		Proposed			
Watercourse Name	River Type	Length (m)	Description	Works Schedule Number	Length (m)	Works Description	Category
Unnamed watercourse (WC_213)	Ordinary watercourse	143	Small agricultural land drain of low quality.	n/a	-143	143 m of WC_213 to be infilled to accommodate new Scheme road alignment.	Watercourse Loss
Unnamed watercourse (WC_214)	Ordinary watercourse	71	Small agricultural land drain of low quality.	n/a	-71	71 m of WC_214 to be infilled to accommodate new Scheme road alignment.	Watercourse Loss
				work 44 (i)	58	Proposed watercourse to north of cutting to east of underpass	Watercourse Diversion
				work 44 (ii)	249	Watercourse Diversion to north of cutting to east of underpass	Watercourse Diversion

Table B-2: Individual Scheme works affecting watercourses within the Etherow (Glossop Bk. to Goyt) WFD water body.

Watercourse Information		Baseline		Proposed			
Watercourse Name	River Type	Length (m)	Description	Works Schedule Number	Length (m)	Works Description	Category
Hurstclough Brook (WC_300)	Statutory Main River	288	Small watercourse flowing through agricultural land. Of moderate quality with some active geomorphological processes and habitat availability.	n/a	-221	221 m of WC_300 to be infilled to accommodate new Scheme road alignment.	Watercourse Loss
				n/a	67	67 m of existing WC_300 to be retained as a backwater environment.	Backwater
				work 36 (iii)	9	Proposed culvert for drainage ditch below proposed footway & access track.	Drainage Ditch Culvert
				work 36 (iv)	18	Culverted Watercourse - proposed culvert to carry proposed watercourse below footway connection	Watercourse Diversion Culvert
				work 36 (v)	13	Culverted Watercourse - proposed culvert to carry proposed watercourse below footway connection	Watercourse Diversion Culvert
				work 36 (vi)	56	Culverted Watercourse - proposed culvert to carry existing watercourse (Hurstclough Brook) below proposed highway	Watercourse Culvert
				work 36 (vii)	33	Proposed culvert for drainage ditch	Drainage Ditch Culvert
				work 36 (viii)	47	Proposed culvert for drainage ditch	Drainage Ditch Culvert
				work 40 (i)	65	Highway drainage ditch to north of A57 link.	Drainage Ditch
				work 40 (ii)	68	Highway drainage ditch to north of A57 link.	Drainage Ditch
				work 40 (iii)	39	New watercourse to north of A57 link.	Interceptor Channel
				work 40 (iv)	106	Highway drainage ditch to north of A57 link	Drainage Ditch

Watercourse Information		Baseline		Proposed			
Watercourse Name	River Type	Length (m)	Description	Works Schedule Number	Length (m)	Works Description	Category
				work 40 (v)	31	Highway drainage ditch to south of A57 link road	Drainage Ditch
				work 41 (i)	330	New watercourse to north of A57 link	Interceptor Channel
				work 41 (ii)	122	New watercourse to north of A57 link	Interceptor Channel
				work 41 (iii)	45	New watercourse to north of A57 link	Interceptor Channel
				work 41 (iv)	10	New watercourse to north of A57 link	Interceptor Channel
				work 42	264	Highway Drainage ditch to south of A57 link	Drainage Ditch
				work 43	220	Diversion of Hurstclough Brook	Watercourse Diversion
Unnamed watercourse (WC_330)	Ordinary watercourse	83	Small agricultural land drain of low quality.	work 36 (i)	83	Culverted Watercourse - proposed culvert to carry existing watercourse below proposed highway	Watercourse Culvert
Unnamed watercourse (WC_340)	Ordinary watercourse	79	Small agricultural land drain of low quality.	work 36 (ii)	79	Culverted Watercourse - proposed culvert to carry existing watercourse below proposed highway	Watercourse Culvert

Appendix C. Impact Assessment Matrices

C.1 Assessment Details

C.1.1 The full WFD impact assessment matrices are presented in this appendix for the following two WFD surface water bodies:

- Etherow (Woodhead Res. to Glossop Bk)
- Etherow (Glossop Bk. to Goyt)

and the following one WFD groundwater body:

- Manchester and East Cheshire Carboniferous Aquifers.

C.1.2 The methodology used for the WFD impact assessment matrices is provided in Section 2.4, and the colour-coding key used is set out in Table 2.2.

C.1.3 The WFD impact assessment for each water body has been undertaken based on the current Scheme design developed to support the DCO application (presented in Scheme Layout Plans (TR010030/APP/2.8)). The following assumptions are made as part of the WFD impact assessment:

- The mitigation already embedded in this preliminary design (i.e. best practice guidance presented in Sections 5.4 and 5.5) is implemented;
- Additional specific mitigation (as summarised in Section 5.9 is implemented as developed and agreed with the Environment Agency (and Natural England); and
- Generic guidance on the principles of WFD-compliant design (also provided in Sections 5.4 and 5.5) is adhered to in subsequent detailed design of scheme components affecting the water environment.

C.1.4 Where a WFD element is not classified by the Environment Agency for the WFD water body, it is not considered in the WFD impact assessment.

C.2 Surface Water

C.3 Groundwater

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